TEFF PRODUCTION AND DISTRIBUTION: IMPLICATIONS FOR RURAL LIVELIHOODS IN ETHIOPIA

by

NAHUSENAY TEAMER GEBREHIWOT

Submitted for the degree of

DOCTOR OF LITERATURE AND PHILOSOPHY
in

DEVELOPMENT STUDIES

at the

UNIVERSITY OF SOUTH AFRICA

SUPERVISOR: DR CATHERINE NDINDA

JANUARY 2022

DECLARATION

Name: NAHUSENAY TEAMER GEBREHIWOT

Student number: 61195294

Degree: Doctor of Literature and Philosophy in Development Studies

Title of Thesis: *Teff* Production and Distribution: Implications for Rural Livelihoods in Ethiopia

I declare that the above thesis my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

I further declare that I submitted the thesis to originality checking software and that it falls within the accepted requirements for originality.

I further declare that I have not previously submitted this work, or part of it, for examination at Unisa for another qualification or at any other higher education institution.

SIGNATURE DATE

DEDICATION

This study is dedicated to my parents

Likemezemran Teamer Gebrehiwot (1914 E.C-1992 E.C) and

W/ro Tiblets Gebresilassie (1928 E.C -1983 E.C)

For me, you were wonderful parents. You brought me up, taught me love, patience, wisdom, and how to become a person! I will always remain grateful for all your kindness.

May the Lord place your Soul in Heaven!

ACKNOWLEDGEMENTS

First of all, I would like to express my sincere thanks to the Almighty God – the Father and the Son and the Holy Spirit, for His love, compassion, forgiveness and generosity and the prayer of Saint Virgin Mary, Mother of God.

Throughout this study, I received various support from many individuals and organizations. I am thankful to all. Firstly, I would like to express my sincere gratitude to my supervisor, Dr Catherine Ndinda, for her extraordinary commitment and patience in reviewing my work, in identifying relevant materials, in providing critical comments and guidance. Her understanding, encouragement and support were immensely useful in making this study possible.

I am also truly indebted to Mekelle University and the Ministry of Education for providing me with the opportunity to pursue my studies and financial support in covering part of the data collection expenses. I am also grateful to thank VLIR-UOS for financing part of data collection. It gives me great pleasure to present my sincere thanks for the support I got from the Agriculture and Rural Development Offices of Tahtai Maichew, Lomie, Shenkora na Minjar districts and Halaba zone. I am very grateful to all survey respondents, key informants and FGD participants from the case study areas. They are highly appreciated for their willingness and patience in providing answers to all the questions in the questionnaire and their active participation in the FGD and interviews. I am also very much grateful to all the key informants from the regional and Federal Ministry of Trade and Industry, the Federal Ministry of Agriculture and Rural Development, Federal Central Statistics Agency, Mekelle University, and wholesalers involved in the interview.

I am also thankful for the data collectors namely Mulugeta Gebretsadik, Daniel Kidane, Abraham Tamiru, Mulu Beriso and Misrach Mekonnen who have been working hard in the fieldwork during data collection. I am also grateful to thank Mr. Ashenafi Lemma, a language expert, who has been working on the translation of the FGD and key informant records and editing the whole dissertation. I would like to thank Mr. Said Mussa, a statistician, who has been assisting me in developing the econometrics models of the study. I would like to thank Mr. Teklay Mebrahtu, a driver, who has been working with me in the fieldwork during data collection.

I also received moral, financial, and technical support from my colleagues at Mekelle University and other institutions. I am very grateful to all of them. In particular, I wish to extend special thanks to Dr. Kassa Amare, Dr. Tekeste Berhanu, Dr. Aradom Gebrekidan, Dr. Daniel Teka, Dr. Amanuel Zenebe, Dr. Gebreyohannes Girmay, Dr. Alemtsehay Tsegay, Prof. Dr. Abebe Ejigu, Dr. Kidanemariam Gebre-egziabher, Dr. Asfafaw Hailesilassie, Dr. Negussie Efa Gurmessa, Dr. Abraha Hailu, Dr. Kibrom Gebresilassie, Dr. Abadi Leul, Dr. Kibrom Mulugeta, Dr. Kefelegn, Dr. Shibikom, Dr. Mehretu Yonas, Ms. Selamawit Girmay, Mr. Thomas Zenawi, Mr. Tadesse Wondem, Mr. Haile Yohannes, Mr. Tesfay Gebrehiwot, Mr. Gebreyesus Yimer, Mr. Mulugeta Hagos, Mr. Amanuel Hadera, Mr. Yemane Hailu, and Ms. Berkti Mehari. I would like to thank Dr. Hossein Azadi from Ghent University, Belgium, for his support in designing the instruments.

I am also very much thankful to all family members and colleagues, MU-IUC researchers, the staff of Mekelle University, Zikre Kidus Yared Mahletay Ze-Likawnt, clergies of Mekelle Debre-Amin Teklehaimanot and Menbere-Mengist St. Gabriel Church, Sebeka Gubae, and Debre-Amin Limat committee who contributed a lot in financing my medication and for their spiritual prayers. In this regard, it gives me great pleasure to present my sincere thanks especially to Mr. Yosef Mebrahtu, Dr. Tesfay Gebrekidan, Mr. Gebremedhin Gebre-egziabher and his wife Sr. Selomie Teamer, Ms. Besrat Teamer, Mr. Mesfin Halefom and his wife Ms. Asqual Teamer, Mr. Zenebe Aynekulu, Ms. Tiblets Gebru and and her whole family, Ms. Lemlem Hailesilassie, Ms. Sindayo Assefa and her whole family, Mr. Aynalem Assefa and his whole family, Mr. Teklay Gebre-egziabher and his wife Ms. Kindihafti Aynalem, Ms. Roman Berhane and her whole family, Likemezemran Gidena Hilawe and his whole family, Mr. Haregot Hilawe and his whole family, Mr. Sisay and his wife Ms. Etetu Abebe, Ms. Nireaya and her whole family, Aster Abay, Alemtsehay Abay, Kaleayou Ashebir, Cherkos Abay, Kindhafti Abay, Dr. Solomon Gebresilassie and his wife Ms. Kasech Getahun, Elsa, and all family members who have been engaged in financing my medication.

I am exceptionally indebted and at the same time wish to express my extreme appreciation and special thanks to my wife Ms. Freweyni Hailesilassie, for her love, patience, endurance and encouragement during the entire period of the study. She managed the difficult job of raising children while doing her job as well as taking care of my health during hospitalization. I am also grateful to thank my children, Amanueal and Maedot, who at their loving ages missed their father's love. My study would not have been possible without their love and support.

ABSTRACT

Teff (Eragrostis teff) is the most important cereal crop in terms of both production and consumption in Ethiopia. About 6.7 million smallholder farmers have been engaged in *Teff* production, covering more than 3 million ha of land and producing 52.8 million quintals of *Teff* crops. On the consumption side, *Teff* is a daily staple food crop for more than 50 million Ethiopians. The main aim of the study is to examine *Teff* production and distribution at the national levels and analyze its implications to the livelihood of the smallholder farmers in Ethiopia.

The study employed cross sectional survey design with a mixed approach. The sampling design used was multistage sampling. Literature review, household surveys, focus group discussions and key informant interviews were employed. A total of 248 survey respondents, 84 FGD participants and 25 key informants were involved in the study. The data were analyzed both qualitatively and quantitatively.

The research result indicates that the productivity of *Teff* has been increasing from 969 kg per ha in 2005/06 to 1,748 kg per ha in 2017/18 at the national level. The average *Teff* production of the survey respondents is about 1,104 kg per household while the average *Teff* supply to the market is about 806.27 kg per household. The revenue generated from the sale of *Teff* crops is Birr 16,784.73 per household per year. The sale of *Teff* crops on average contributes about 40.74% of the total annual revenue of the respondents. The findings indicate that *Teff* production and distribution have profound and far-reaching socioeconomic impacts on the lives of rural people.

To tackle the observed gaps and improve the performance of *Teff* production and distribution, introducing modern ways of farming and irrigation schemes at the household level and strengthening the monitoring of illegal trade are recommended. The contribution of this study can be seen from methodological approach and emerging development literature focusing on crop production and distribution that will be of significant use to academics and practitioners interested in crop value chains.

Key Terms: *Teff production; Livelihood; Input; Smallholder farmers; Ethiopia; Teff distribution; Channel; Price; Supply; Revenue; Cost of Teff production*

LIST OF ABBREVIATIONS

ADLI	Agricultural Development Led Industrialization
AMC	Agricultural Marketing Corporation
BoFED	Bureau of Finance and Economic Development
BOSTID	Board on Science and Technology for International Development
CADU	Chilalo Agricultural Development Unit
CARE	Cooperative for Assistance and Relief Everywhere
CGD	Compulsory grain delivery
CPA	Central Planning Authority
CPI	Consumer price index
CPSC	Central Planning Supreme Council
CRGE	Climate Resilient Green Economy Strategy
CSA	Central Statistics Agency
DA	Development Alternatives Organization
DAP	Diammonium phosphate
DDT	Dichlorodiphenyltrichloroethane
DFID	Department for International Development
EC	Ethiopian calendar
ECX	Ethiopian Commodity Exchange
EEA	Ethiopian Economics Association
EGTE	Ethiopian Grain Trade Enterprise
EIA	Ethiopian Investment Agency
EPRDF	Ethiopian peoples' Revolutionary Democratic Front
ESC	Ethiopian Seed Corporation
ESE	Ethiopian Seed Enterprise
FVCs	Food value chains
GDP	Gross domestic product
GNP	Gross national product
GoE	Government of Ethiopia
CRGE	Climate resilient green economy strategy
GTP	Growth and Transformation Plan

Ha	Hectare
IFAD	International Fund for Agricultural Development
IFPRI	International Food Policy Research Institute
IPMS	Improving the Productivity and Market Success of Ethiopian Farmers
IRD	Integrated rural development
Km	Kilometre
LDC	Less developed countries
MASL	Meters above sea level
MPP	Minimum Package Projects
MoARD	Ministry of Agriculture and Rural Development
MoFED	Ministry of Finance and Economic Development
MoTI	Ministry of Trade and Industry
N	Number of respondents
NPC	National Planning Commission
PASDEP	Plan for Accelerated and Sustained Development to End Poverty
PIF	Policy and Investment Framework
PRSP	Poverty reduction strategy paper
SD	Standard deviation
SL	Sustainable livelihoods
SNNPR	Southern Nations, Nationalities and People Region
SSA	Sub-Saharan Africa
UNDP	United Nations Development Program
UREA	A fertilizer that contains a ratio of nitrogen, phosphorus, and potassium
WB	The World Bank
WADU	Wolayta Agricultural Development Unit
WoARD	Woreda Office of Agriculture and Rural Development
WoFED	Woreda Office of Finance and Economic Development

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER ONE: INTRODUCTION AND BACKGROUND

1.1.Introduction

This chapter introduces the research topic and provides a contextual background for the study. It provides an overview of the research problem and outlines the challenges that hamper the production and distribution of *Teff* crops in Ethiopia. In this regard, it identifies the justification for the study, highlights the research questions, describes the general objective and specific objectives, scope and limitations of the study. Finally, it presents how this thesis is organized.

1.2.Background to the research problem

The global population is predicted to increase from 7.3 billion now to 9.8 billion by 2050. To feed all human beings with such a growth rate, it requires about 50% growth in food production (Bruinsma 2017). The SSA region is still challenged with rapid population growth which affects the ability of countries to assure stable supply and access to food. The population in the region has grown annually by 2.7% and increased from 507 million in 1990 to about 936 million in 2013 (FAO 2015). Despite accelerating globalization and economic growth, food security in most of the developing countries is still a problem (Funk and Brown 2009). Sub-Saharan Africa has the potential of agricultural resources such as land, water and labour required for the development of agriculture (UNDP 2012). However, in all areas of the continent, citizens are starving and malnourished due to irregular local food production, distribution and persistently lacking diets, especially among the poorest persons. In this regard, governments are not responding to the basic food needs of their citizens and thus hunger is prevailing in Africa (McGuire 2015).

In many poor developing countries, agriculture symbolizes the foundation of the economy (Alexandratos and Bruinsma 2012). Most farmers gain their livelihoods through the production of crops on the limited size of land (Acharya 2006). In this regard, some scholars argue that agriculture is the main source of the livelihoods for many poor people and it is assumed to be the base for poverty reduction (Dorward, Kydd et al. 2004). For instance, in Tanzania, near all rural households are farmers engaged in agriculture. About 53 percent of the farmers are directly engaged in crop production, 13 percent in livestock and 4 percent in agricultural wages. Those farmers derive their income directly from agriculture (Covarrubias, Nsiima et al. 2012).

Strengthening rural agriculture is believed to be the main approach to economic development and food security issues in developing countries. However, it is challenged by the need for institutional innovations to overcome market failures (Organization and Control 2008; Hazell, Poulton et al. 2010).

When we come to Ethiopia; after the downfall of the Derg regime, it has developed a new economic policy (free market economy) in 1991. Accordingly, market mechanisms have been changed and prices are decided by the free will of the buyers and sellers in the market (Association 2004). Attention was given by the government to the advancement of agriculture both as a source of food for consumption purposes as well as raw material for industries. In this regard, the conversion of subsistence agriculture of smallholder farmers to more market-oriented agriculture was one of the key strategies. As a result of such favourable conditions, a large number of smallholder producers are growing a variety of cereal products for the local market (MoFED 2006).

Botanically, *Teff* is named as Eragrostis tef and it is believed to be the smallest grain in the world (Gebremariam et al. 2014). It is the most important cereal crop in terms of both production and consumption in Ethiopia (FAO 2015). It is a major staple food crop in Ethiopia, as measured by some indicators such as acreage, harvesting, and consumption. Some research results indicate that *Teff* accounts for the largest share of the cultivated area (28.5% in 2011) (Demeke and Di Marcantonio 2013). Based on the report of Central Statistics Agency (CSA) of the Federal Democratic Republic of Ethiopia, about 6.7 million smallholder farmers have been engaged in *Teff* production in 2017/18 in Ethiopia, covering more than 3 million hectares of land and producing 52.8 million quintals (1 quintal = 100 kg, same as a standard bag) of *Teff* crops. The average national production is 17.48 quintal per hectare (Gideon 2016; CSA 2017/18; Cochrane and Bekele 2018). Mostly *Teff* is produced by small holder farmers at the central, eastern and northern highlands of the country (Birara 2017).

Like other agricultural commodities, *Teff* production and distribution systems are the combinations of multifaceted activities including production, handling, storage, transport, processing, packaging, wholesaling, and retailing. These activities are dependent on each other and enable society to meet its food requirements (Argenti and Marocchino 2005). They are performed by different actors in the value chain such as food producers (farmers), assemblers, importers, transporters, wholesalers, retailers, processors, shopkeepers, and service providers. They all need infrastructure as well as formal regulations to do their transactions in the market (Argenti and Marocchino 2005). The existence of efficient interaction and relationships among all the actors in the value chain is important for the success of marketing activities at all levels.

The increasing demand for *Teff* crops is creating new prospects for smallholder farmers and thus, understanding the relative advantages and disadvantages of the different channels of distribution is important for making a rational decision at the household level (Matthew and Todd 2009). Thus, having first-hand information about *Teff* production and marketing is essential to devise appropriate strategies aimed at promoting *Teff* production and market participation of smallholder producers. It is in line with this view that the study is conducted by characterizing *Teff* production and market participation of smallholders among different districts.

1.3. *Teff* production and distribution in Ethiopia

Teff is the most important cereal in terms of both production and consumption in Ethiopia (Crymes 2015; McGuire 2015). It is a major staple food crop in Ethiopia, as measured by some indicators such as acreage, harvesting, and consumption (Vandercasteelen, Beyene et al. 2018). The research result of some authors indicates that *Teff* accounts for the largest share of the cultivated area (28.5% in 2011). It is grown by 6.5 million smallholder households in Ethiopia and is cultivated on more than 3 million hectares of land, which represents one-third of total cereal acreage and about one-fifth of the gross cereal grain production (Demeke and Di Marcantonio 2013; Mottaleb and Rahut 2018; Demeke and Di Marcantonio 2019). On the other hand, the growing demand for local *Teff* is presenting new opportunities for smallholder agricultural producers, and understanding the relative costs and benefits of different local channels is important to maximize farm performance (Mohammed, Mustafa et al. 2009; Gideon 2016). *Teff* is likely to remain a favourite crop of the Ethiopian population, and the crop is also gaining popularity as a health food in the western world. It is a gluten-free crop, which makes it suitable for patients with celiac disease, which is an allergy to gluten protein (Spaenij-Dekking, Kooy-Winkelaar et al. 2005; Baye 2014; Cheng, Mayes et al. 2017).

Like other crops, *Teff* production and distribution systems are complex combinations of activities, functions, and relations among food producers, assemblers, importers, transporters, wholesalers, retailers, processors, shopkeepers, street vendors, providers of services such as credit, storage, information and extension services (Argenti and Marocchino 2005).

According to some scholars, although *Teff* is economically a very important cereal in Ethiopia, it is one of the lowest in terms of productivity. The main factors contributing to poor yield in *Teff* are lodging and drought. Lodging is considered the major bottleneck affecting the productivity of *Teff*. It is the dominant cereal crop in 83 high-potential agricultural districts, covering the highest area planted in the country. Yet, compared to the other major cereals, the *Teff* yield is relatively low as 25-30% of each of pre-harvest and post-harvest losses reduce the quantity available to consumers (Cannarozzi, Plaza-Wüthrich et al. 2014; Girma, Assefa et al. 2014).

Some researchers have identified six stages of the *Teff* value chain that included *Teff* research, seeds and inputs, on-farm production, post-harvest handling and processing, trade and marketing, and consumption and export. At each stage of the value chain, several bottlenecks were identified and strategies of overcoming them were discussed (Tamru 2013). However, the focus of this research is on *Teff* production and distribution.

Though *Teff* production and distribution were practiced for decades in the study area, it is not well supported by comprehensive research and thus it remains as a knowledge gap. Having first-hand information about *Teff* production and distribution is essential to devise appropriate strategies aimed at enhancing its value chain especially for the producers. It is in line with this view that the study was conducted by analyzing the production of *Teff* crops by smallholder farmers and their involvement in the *Teff* market. It also tries to assess the contribution of *Teff* crops to the livelihood of farmers.

1.4. Statement of the problem

Smallholder households account for 60% of global agriculture (Poole 2017). Smallholder agriculture is one of the principal economic occupations in the world and is the main source of income and employment for the 70% of the world's poor who live in rural areas. Almost all rural households in Africa directly or indirectly lead their livelihood based on agriculture (Poole 2017).

Considering its importance to the livelihood and the overall economy, Diao, Hazell et al. (2010) recommended that agriculture should be a key sector for development in Africa. Other researchers such as Wiggins, Kirsten et al. (2010) also proposed that if small-scale farming is to provide people with better livelihoods, productivity needs to be improved further. However, the sub-Saharan African farmers live in poverty and deprivation of food (Covarrubias, Nsiima et al. 2012).

Ethiopia is endowed with immense genetic diversity and potential, conducive ecological and socio-economic conditions. As a result, it has the potential for the advancement of agriculture throughout the country. Agriculture remains to be the largest contributor to the overall economy as a source of food, fiber, source of raw materials for industries, employment and as a source of foreign exchange (MoFED 2006). Like other developing countries in Africa, the government of Ethiopia gave attention and priority to the augmentation of agriculture in its policy as described in "Agricultural Development Led Industrialization" (Dorosh and Rashid 2013). In this regard, agricultural production and marketing were chosen as the main strategies for rural growth and food security (MoFED 2006).

Teff (Eragrostis *Teff*) is one of the major cereal crops in Ethiopia. The country is the largest *Teff* producing country and has adopted *Teff* as a staple crop (Hyejin Lee 2018). The country is producing *Teff* as cereal crops for both production and consumption (McGuire 2015). Among cereal crops, *Teff* covers the largest share of the cultivated area (28.5% in 2011) (Demeke and Di Marcantonio 2013). The country produces various *Teff* types such as *Magna Teff*, white *Teff*, *Sergegna Teff* and red *Teff* that are locally and globally cherished for their superior nutrition qualities. *Teff* is a national cereal crop in Ethiopia but mainly produced in four regions including Oromia, Amhara, Southern Nations, Nationalities and Peoples Region (SNNPR) and Tigrai. However, the major *Teff* producing areas are Gojam (Amhara) and Shoa (Oromia) (Fufa, Behute et al. 2011). It is produced mainly for the market as it has high market value as compared to other cereal crops. It is produced by smallholder farmers and *Teff* is the main source of income for farmers as compared to other cereal crops (Fufa, Behute et al. 2011). Nevertheless, the full potential of the *Teff* sub-sector has remained hugely untapped both in terms of production and distribution. Thus, the objective of this study is to review the household level factors affecting *Teff* production, distribution, and its contribution to the livelihood of smallholder farmers.

Teff is produced by smallholder farmers and it is the main source of income for farmers as compared to other cereal crops (Fufa, Behute et al. 2011). The compiled statistical report of Central Statistical Agency (CSA) indicates that the number of *Teff* producers has increased from 5,177,125 in 2005/06 to 6,771,977 in 2017/18 with the average growth rate of 10.90 % per annum. The research output of Seid Yimer (2011) in relation to *Teff* market participation and consumption indicated that socio-demographic characteristics such as household size, dependency ratio, employment status and education were important determinants of both the likelihood to participate in the Teff market and the level of consumption. However, little is known about the socio-demographic characteristics of the producers and features of *Teff* production among different districts in Ethiopia. Thus, the first objective of this study is to bridge this information gap by systematically examining the socio-demographic characteristics of *Teff* producers and features of *Teff* production in Ethiopia in different districts.

According to Bart Minten et al. (2013), important changes have happened in the country in the Teff value chain in the last decade both at the production level and on the consumption side. In this regard, the report of CSA indicates that the productivity of *Teff* crops increased from 969 kg per ha in 2005/06 to 1,748 kg per ha in 2017/18 (CSA 2017/18). Similarly, the Ethiopia Agricultural Transformation Agency (EATA) highlighted that the annual *Teff* production has been increasing by 11%, which has resulted in a 100% increase every seven years. About 5% of such an increase is attributed to expansion in area cultivated for *Teff* (EATA 2013).

Though the country allocated about 3,023,283.50 ha in 2017/18 of suitable land for *Teff* production, its productivity remained low (CSA, 2017/18). There are considerable variations in the productivity of plots growing *Teff* across Ethiopia (Getu Hailu et al. 2016). *Teff* is a very tiny cereal which is produced in a very laborious manual cropping system and has several problems in production and post-harvest management. Moreover, its yield per unit area is among the lowest of all world cereals (Assefa, Chanyalew et al. 2013). On the other side, the study results of Bereket et al. (2011) and Teklu and Tefera (2005) indicates that there is the potential for improving *Teff* productivity and they argued that farmers using improved methods and management practices, can obtain yields up till 2,500 kg per ha, while the yield potential under optimal management and when lodging is prevented, is as high as 4,500 kg per ha.

There is extensive work done in the area on *Teff* production. Some of the previous research done by researchers such as Hailu et al. (2015), Haileselassie et al. (2011), Ayalew et al. (2011), Alemu et al. (2018) and Getu (2014) focused on agricultural technologies, application of fertilizers, farmers' adoption level of row planting technology, technical efficiency in *Teff* production and production constraints. However, such studies do not give much attention in identifying the socio-economic variables affecting *Teff* production at household level. This calls for rigorous country and context specific empirical studies that closely look at the factors influencing *Teff* production operating under diverse natural and socio-economic settings. One focus area of this study is to bridge this information gap by systematically examining *Teff* productivity differentials at household level under the Ethiopian context, which is characterized by smallholder farming. Thus, the second objective of the thesis focuses on assessing the variables affecting *Teff* productivity differentials among farmers at household level from different districts.

Farmers produce *Teff* for market and some authors indicate that the average marketable surplus of *Teff* ranges between 26 to 75% of the harvested crop (Fufa, Behute et al. 2011; Gideon 2016). However, farmers in developing countries like Ethiopia are under intense pressure for enhancing their market orientation due to the increasing demand for agricultural commodities on domestic markets and abroad (Clarietta Chagwiza 2015). Some authors such as Coleman (1999) argued that smallholder farmers are not benefiting from the share of the consumer price, and they are not producing and selling in an organized system like cooperatives and thus part of their benefit may transfer to the middlemen. In this regard, the technical report of FAO documented that the value chain of the *Teff* crop is very long and it involves a lot of actors such as input suppliers, producers, traders (local assemblers and wholesalers), retailers, processors and finally consumers (FAO 2009). Similarly, Hyejin Lee (2018) argued that the Teff value chain in Ethiopia largely relies on traditional practices and the *Teff* market is limited by the government's export ban. In this regard, identifying the factors that limit the participation of smallholder farmers in *Teff* marketing requires rigorous empirical studies on the factors influencing *Teff* distribution. Thus, the third objective of the study is to systematically examine the different explanatory variables that affect the distribution of *Teff* by smallholder farmers through the analysis of the amount of *Teff* supplied to the market and thereby identifying the problems encountered by smallholder farmers in *Teff* marketing.

On the livelihood side, *Teff* is a daily staple food crop for over 50 million Ethiopians and accounts for 15 % of total calories consumed. *Teff's* grain is mainly used for making *Injera*, a spongy flatbread, the main national dish in Ethiopia as well as Eritrea (Berhane, Paulos et al. 2011). As per the research result of some authors, urban consumption is about 61 kilograms per year while 20 kilograms per capita per year is the consumption for rural areas (Berhane, Paulos et al. 2011). This shows the high consumption rate of *Teff* crops for urban dwellers. FAO also documented that *Teff* is nutritionally rich with iron, calcium and protein contents among cereal crops consumed in Ethiopia and thus it can substitute wheat and other cereal crops in food consumption (FAO 2015). According to Cheng et al (2017), nutritionally, 100 grams of *Teff* grains has 357 kcal, like that of wheat and rice. Yet, its grains are comparably rich in iron, calcium, and fiber (FAO 2015) and *Teff* with 11% of protein is an excellent source of essential amino acids, especially lysine: the amino acid that is most often deficient in grains (Ayalew et al. 2011). However, the knowledge on contributions of *Teff* to the livelihood of households in terms of consumption at household level and as source of income is limited and requires rigorous empirical studies. In this regard, although past studies in Ethiopia have looked at value chain analysis of *Teff*, literature on quantitative aspects of cost of *Teff* production at farmers' level and its profitability is scarce. Despite *Teff* trade being highly profitable, little is known about the farm level profitability of *Teff* production and its contribution to the revenue of the farmers. Therefore, one of the focuses of this study is to bridge the information gap by systematically analyzing the contribution of *Teff* to the livelihood of farmers. The fourth objective of the study is thus focusing on assessing the effect of *Teff* production and distribution to the livelihood of smallholder farmers. It tries to see the livelihood effects in terms of consumption of *Teff* at household level and profitability of *Teff* marketing at producers' level under the Ethiopian context.

The reason for studying *Teff* production and distribution at district level is that there is a growing need for agricultural production and consumption data, disaggregated by district level, to support evidence-based decision-making at local level. Detailed information at district level is essential to plan and evaluate interventions because many agricultural policy decisions are implemented at district level. Unfortunately, district-level data on *Teff* production and distribution, which is generated through a standard data collection methodology that allows comparisons among districts, do not exist. This suggests the need for studying the performance of each district in the context of its operational environment. Such studies require a research design that allows a deeper analysis at ground level that is based on a mix of quantitative and qualitative data collected. Such an approach would enable closely examine the *Teff* production, consumption, and market participation among farmers at household level as well as identifying the underlying opportunities and challenges of the *Teff* production, consumption, and distribution. To the best of our knowledge, this thesis is the first to provide an in-depth qualitative and quantitative analysis on *Teff* production and distribution at household level. Moreover, as far as the current researcher knows, this is the first empirical study that aims to systematically examine *Teff* production and distribution at household level in four districts from four different regional states.

An attempt is made to integrate the views of farmers and key informants (qualitative data) with data gathered using surveys on the one hand and comparing the findings among districts from different regions. It also tries to triangulate the results of the research with the findings of previously conducted research. The result enhances the understanding of *Teff* production and distribution at district level. Such use of micro-data allows examination of the effects of detailed household characteristics on *Teff* production and distribution that provides the degree of freedom to estimate many parameters.

What makes this research different is its effort to hook the production and distribution of *Teff* together and analyze the factors that affect production, consumption, and supply of *Teff* to the market. The study presents empirical evidence on how *Teff* production and distribution are functioning to the policymakers and development practitioners. The study is also helpful in creating a better understanding of how producers can get economic benefits from *Teff* production and distribution. It also serves as the base for future related research works. This study tries to fill the research gap by investigating the major household factors affecting *Teff* production, distribution, and consumption. It also assesses the contribution of *Teff* to the livelihood of farmers at district level by assessing the consumption of *Teff* and its profitability in the market. In addition, the constraints and opportunities of *Teff* production and distribution are reviewed at district level.

This research hopes to contribute to the literature of *Teff* production and distribution among smallholder farmers in Ethiopia. The research contributes to the literature on agricultural marketing in four main ways. First, it assesses the features of *Teff* production in the study areas; second, it identifies the household level variables affecting *Teff* production and distribution, third, it assesses the consumption of *Teff* at household (means of livelihood) for the rural households and fourth it analyzes the profitability (as source of income) of *Teff* to the farmers from marketing.

1.5. Research objective

1.5.1. Main objective

The main aim of the study is to examine *Teff* production and distribution at the national level and analyze its implications for the livelihood of the smallholder farmers in Ethiopia.

1.5.2. Specific objectives

To meet the main objective, the research has the following specific objectives:

- Describe the socio-demographic characteristics of *Teff* producers and features of *Teff* production in rural Ethiopia.
- Examine the explanatory variables that affect *Teff* productivity differentials across a group of farmers in the study areas.
- Identify the explanatory variables that affect *Teff* distribution differentials across a group of farmers in the study areas.
- Assess the effect of local and global *Teff* production and distribution to the livelihood of smallholder farmers.

1.6. Key research questions

The central research question of the study is "what are the effects of *Teff* production and distribution on the livelihood of rural farmers in Ethiopia?" In this regard, the specific questions of the study are highlighted below.

- What are the socio-demographic characteristics of *Teff* producers and features of *Teff* production in rural Ethiopia?
- What are the explanatory variables that affect *Teff* productivity differentials across a group of farmers in the study areas?
- What are the explanatory variables that explain *Teff* distribution differentials across a group of farmers in the study areas?

- What are the effects of local and global *Teff* production and distribution on the livelihood of rural farmers in Ethiopia?

1.7.Overview of the research design and methods

A cross-sectional survey, with a mixed approach considering both qualitative and quantitative research methods is used in this study. The cross-sectional research is a research approach in which the researcher investigates the situation in a population at a certain point in time. The sampling design that matches the selected research approach is multi-stage sampling whereby both purposive (non-probability sampling) and random sampling methods were used. Purposive sampling method was used to select top *Teff* producing regions, districts, *Kebeles*, sub *Kebeles*, key informants and FGD participants while the random sampling method was used to select survey respondents.

Primary data were collected from multiple sources using different tools. The data collection tools used in this study includes a literature /documentation review, structured questionnaire survey, focus group discussions and key informant interviews. The data were analyzed both qualitatively and quantitatively. The details of the study methodology are presented in chapter four.

1.8.Significance of the study

Agricultural marketing is the key focus in the government's development strategic document of Agricultural Development Led Industrialization (ADLI). In this regard, engaging farmers in value chains is considered as an efficient way to align the production systems of farmers with specific requirements of the processors and consumers, in such a way that all the actors in the value chain benefit, including the farmers.

Though *Teff* production and distribution were practiced for decades in Ethiopia, it is not well supported by comprehensive research. Thus, it is an issue that requires critical review. The increasing importance of *Teff* for food production and economic development, as well as the need for sustainable development of the *Teff* sector make this study very useful. There is also an ongoing debate about *Teff* production and distribution in Ethiopia and as a result, it is one of the development issues that need the attention of researchers. One of the central themes of this research is, therefore, to examine *Teff* production and the participation of *Teff* producers in the *Teff* value chains and analyze its implications for the livelihoods of smallholder producers in Ethiopia. In this study, we tried to analyze the practice of *Teff* production, distribution, and its implications for the livelihoods of farmers.

The study provides disaggregated data and basic information on *Teff* production and distribution and its implications for the livelihood of the farmers. This research hopes to contribute to the debate on *Teff* production and distribution in Ethiopia. It is principally exploratory and strives for a better understanding of what is happening at ground in relation to *Teff* production and distribution. It analyzes current practices of *Teff* farming with a view to understanding their potentials as well as their present and future implications for the livelihood of the smallholder farmers. This research is important because it focuses on smallholder farmers, which is one of the most persistent groups in Ethiopia. Yet, smallholder farmers have been described as the most disadvantaged and vulnerable with high levels of poverty.

In this regard, the study presents empirical evidence on how *Teff* production and distribution are functioning to the policymakers and development practitioners. The study is also helpful in creating a better understanding of how producers can get economic benefits from *Teff* production and distribution. It also serves as the base for future related research works. This research hopes to contribute to the literature of *Teff* production and distribution among smallholder farmers in Ethiopia.

1.9.Scope of the study

The study of *Teff* production and distribution is broad in scope. It can cover a wide range of actors in the *Teff* value chain. It deals solely with the *Teff* industry of Ethiopia, which has its own dynamics due to its location and the institutional structure within which it operates. This research does not intend to provide answers to all questions surrounding the issue of *Teff* value chain. However, it aims at identifying the socioeconomic variables accounting for *Teff* productivity and distribution differentials among a group of farmers in the four districts. Thus, due to the availability of time and fund constraints, the scope of this study is limited to the farmers and not all the actors in the *Teff* value chain. It provides insights into the production and distribution of *Teff* crops among smallholder producers. The literature, data collection and analysis of the findings mainly focus on *Teff* production and distribution by smallholder *Teff* producers and its implication for their livelihood in terms of *Teff* consumption and income from market participation in *Teff* marketing. Though the study includes few wholesalers from the *Teff* market as key informants, it doesn't cover all the actors (collectors, assemblers, traders, cooperatives, millers, processors, and consumers) in the *Teff* value chain. Moreover, *Teff* production and distribution appear to be more complex and could be conditioned by myriads of factors which may include political, socio-economic, and cultural factors. The scope of this thesis is limited to certain selected sets of factors which are primarily of economic nature. On the other side, livelihood is a broad concept that encompasses different forms of capitals (Human, Physical, Natural, Social and Financial). However, the focus of this research is on financial capital which is explained in terms of revenue generated from selling *Teff* crops and its contribution to livelihood improvement of the smallholder farmers.

In this research, we seek to identify the household level variables that affect *Teff* production and distribution and see its implications for rural livelihoods. It provides empirical evidence that may assist policy makers and development practitioners in understanding the conditions under which *Teff* productivity and distribution can be improved at smallholder farmers' level.

Geographically, this research is delimited in a purposively selected four regions (Oromia, Amhara, SNNPR and Tigrai) of the country. The study is conducted in four *Teff* growing districts from four regional states namely Halaba zone (Southern Nations Nationalities and People's Region (SNNPR)), Lomie district (Oromia region), Shenkora na Minjar district (Amhara region) and Tahtai Maichew (Tigrai region). Oromia and Amhara regions were selected by the researcher purposely as they are the top *Teff* producer regions in the country. SNNPR and Tigrai regions are selected as there is a high potential for the expansion of *Teff* production. Addis Ababa region is considered in the study as it is the central market for *Teff* crops. In this regard, due to the limited coverage, it is difficult to include all *Teff* growing areas and stakeholders which would provide further information. Thus, the samples may not fully represent the population of *Teff* producing farmers and actors in the value chain in Ethiopia. However, the study is meant to be helpful to contribute to a better understanding on how *Teff* production and distribution can become economically and socially beneficial for farmers in Ethiopia.

1.10. Limitations of the study

The research deals with examining *Teff* production and distribution at the national levels and its implications for the livelihoods of smallholder households. In this regard, it does not attempt to make a detail technical analysis of the *Teff* production systems neither does it evaluate the performance in reference to its specific inherent characteristics such as nutritional value of *Teff* quality (physical, physiological, germination rate, disease, and sanitary attributes) and other characteristics of *Teff* crop such as genetic attributes, plant type, duration of the growth phase, seed type, palatability, and other aspects of *Teff* production and consumption.

Lack of organized and adequate historical data of *Teff* production and distribution at regional levels is one of the limiting factors in this study. This emanates from the poor record handling and lack of relevant documents at government offices. Thus, the study has limitations in examining long-term changes in *Teff* production, distribution, and its implications for livelihood in the farming communities. As a result, recent data is used for the study from the cross-sectional survey (one-time survey).

Availability of limited funds and time for this research project were the constraints that determined to large extent, the use sampling method as a study rather than a census study. *Teff*-growing areas of Ethiopia and actors involved in the value chain of *Teff* marketing are vast and numerous. Due to the limited availability of time and resources, the researcher was unable to include all *Teff* growing areas and stakeholders which would provide further information. Thus, the samples may not fully represent the population of farmers and other stakeholders throughout the *Teff* growing parts of Ethiopia.

Methodologically, the sampling design is quite common in research studies concerning behavioural sciences and the merit of such a survey design is that it is simple and randomizes the differences among the sample items. However, the limitation of such a design is that the individual differences among the respondents do not control the extraneous variable. In this regard, like other social sciences, this study is conducted based on the assumption that all case study participants understood the importance of the problem under investigation, and that they provided adequate and true responses, according to their knowledge and experience.

The researcher used qualitative and descriptive approaches and methods with non-random sampling, which may have some influence on their representativeness and generalisation of the findings. Moreover, some participants of the FGDs at Halaba zone, require a translator of local language (Sidamigna) and the author therefore had to rely on a translator. However, this difficulty was minimised by using the services of a language expert from Hawassa University.

1.11. Definition of the key concepts

Household: a household may be either one person (household) or a multi-person household (a group of two or more persons) who live together and make common provisions for food and other essentials of living. They may be related or unrelated persons or a combination of both. These persons are taken as members of the household (CSA 2017/18).

Agriculture: the growing of crops and/or raising of animals for one’s own consumption and /or sale (CSA 2017/18, P.7).

Agricultural household: a household is considered an agricultural household when at least one member of the household is engaged in growing crops and/or raising livestock in private or in combination with others (CSA 2017/18, P.7).

Holding: a holding is all the land and /or livestock kept, which is used wholly or partially for agricultural production purposes (CSA 2017/18, P.7).

Crop production: the process of growing and harvesting of cereals, pulses, oilseeds, etc for one’s own consumption and/or sale (CSA 2017/18, P.8).

Cooperatives: an autonomous association of persons united voluntarily to meet their common economic, social and cultural needs and aspirations through a jointly owned and democratically-controlled enterprise (ICA 1995).

Development: is understood as a social condition within a nation, in which the authentic needs of its population are satisfied by the rational and sustainable use of natural resources and systems. This general definition of development includes the specification that social groups have access to organizations, basic services such as education, housing, health services, and nutrition, and above all else, that their cultures and traditions are respected within the social framework of a particular country (Giovanni E. 2001, P.1).

Distribution: is primarily concerned with the physical movement of *Teff* crops to the market by farmers for the purpose of generating an income from selling *Teff* crops. This is further explained by the amount of *Teff* crops supplied to the market. Hence, in this thesis, the amount of *Teff* supplied to the market by smallholder farmers was analyzed using different household and distribution related variables.

Livelihood: comprises the capabilities, assets (including both material and social resources) and activities for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets while not undermining the natural resource base (Ian Scoones 2009; p.175).

Wholesalers: These are licensed major traders operating in both the rural market and the urban market. They have a fixed establishment/site in the marketplace with a storage facility. They purchase large amounts of *Teff* products from producers. They sell large amounts of *Teff* to retailers and institutions (Tadesse 2016, P.24).

Processors: Those involved in processing these food commodities. In the *Teff* chain, processors refer to those businesses engaged in producing value-added products (*Injera*) from *Teff* cereal (Tadesse 2016, P.24).

Retailers: retailers are traders who have a fixed, established market facility in the marketplace that sell the *Teff* crops to the final consumers. They purchase *Teff* in bulk amounts from their suppliers (wholesalers and producers) and sell them in small amounts to consumers (Tadesse 2016 P.25).

Collectors: Non-licensed traders who run their business with wholesalers. They buy a large quantity of *Teff* products directly from producers in the vicinity of growers and sometimes at local markets and transport these to the marketplace to sell to wholesalers. Collectors usually use wholesalers' money collected ahead of time for purchasing (Tadesse 2016, P.25).

Brokers: are unlicensed traders who are often involved in wholesale trade. Brokers don't have a warehouse but facilitate buying and selling of other traders (Tadesse 2016, P.25).

Consumers: Final users of *Teff* crops as varieties of foods (Tadesse 2016, P.25).

1.12. Chapters layout

The thesis is organized in eight chapters.

Chapter one presents the introductory part which includes sections such as background, problem statement, objectives, research questions, limitations, scope and structure of the study.

Chapter two highlights' theories of development in general and specially theories of production, distribution and livelihood are presented. Past and present policy issues concerning the promotion of *Teff* production and distribution in Ethiopia are also discussed. The three main periods (Hailesilassie, Derg and EPRDF) *Teff* production and distribution policies and regulatory frameworks are examined.

Chapter three presents the literature review on factors affecting *Teff* production and distribution focusing on *Teff* producers. It discusses the theoretical foundations and frameworks that describe the context of *Teff* production and distribution in Ethiopia. It centers on exploring the dependent and independent variables that affect *Teff* production and distribution in the market at household level. Finally, it presents the conceptual framework for production and distribution to be used for analysis.

Chapter four outlines the research design and methods. This section includes the data type and sources, sampling and survey design, data collection procedure, data processing and analysis, and issues of validity and reliability. It also outlines the econometric model used in the study.

Chapter five deals with the first objective of the thesis which is related to providing highlights on the socio-demographic characteristics of *Teff* producers and features of *Teff* production. It also discusses the second objective of the thesis which states examining the explanatory variables that affect *Teff* productivity differentials across a group of farmers in the study areas. Whereas substantial literature was accessed during the research with particular reference to the findings, this chapter has a broader scope and place to present the results and findings from the fieldwork.

Chapter six covers the third objective of the research. In this regard, it tries to identify the explanatory variables that affect *Teff* distribution differentials across a group of farmers in the study areas. It tries to explore and discuss features of *Teff* distribution and identify the variables affecting the amount of *Teff* supplied to the market.

Chapter seven deals with the fourth objective of the research and tries to assess the effect of *Teff* production and distribution on the livelihood of smallholder farmers. The contribution of *Teff* to the livelihood of smallholder producers is seen from consumption of *Teff* crops by the household and from an income generated from the sale of *Teff* crops in the market. The effect of the global demand for *Teff* crops on production and distribution is also presented.

Chapter eight deals with synthesizing the findings and conclusion. It also puts policy implications in relation to *Teff* production and distributions to improve the livelihood of the producers and future research directions are introduced.

CHAPTER TWO: *TEFF* PRODUCTION AND DISTRIBUTION

2.1. Introduction

The economic performance of nations is highly influenced by the political process. The national macroeconomic policies and strategies are also influenced by the political factors and institutional arrangements, which in turn have a strong correlation with economic growth. This chapter deals with the theories of development that lead to the analysis of the macroeconomic policy of the government concerning *Teff* production and distribution. It discusses the theoretical foundations of development. It also looks into the theories of production, distribution and livelihoods. In this regard, the practice of *Teff* production and distribution is assessed in light of how the past and present policies aim at promoting *Teff* production and distribution in Ethiopia. The three main periods (Hailesilassie, Derg and EPRDF) and their policies and strategies about *Teff* production and distribution are examined. Examining the different macroeconomic policies and their significant role in determining the performance of agriculture and economic growth is the major focus of this chapter.

2.2. Theories of development

2.2.1. Concepts of development

The term development is understood as a social condition within a nation, in which the authentic needs of its population are satisfied by the rational and sustainable use of natural resources and systems and this utilization of natural resources is based on a technology, which respects the cultural features of the population of a given country (Reyes, 2001). This general definition of development includes the specification that social groups have access to organizations, basic services such as education, housing, health services, and nutrition, and above all else, that their cultures and traditions are respected within the social framework of a particular country (Giovanni E. 2001).

The theory of development, underdevelopment or dependent development introduced in the 1970s attempted to answer questions that appeared after the Second World War and the collapse of the world colonial system. The fundamental criteria that help understand the terms are indicators of a country's notable success in certain areas. The term is often used to underline the power and capability associated with a country being strong in economic, military, political, territorial, and other senses. Success leads to the attainment of corresponding status (Akop G. 2015).

According to Zambakari (2018) the debate in economics and specifically in development studies, about how to move a society and its industries forward has a longstanding history. The colonial conquest was partly justified as bringing development, modernization, and civilization to the so-called “backward or primitive societies.”

Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Sustainability is the foundation for today’s leading global framework for international cooperation-the 2030 agenda for sustainable development and its sustainable development goals (SDGs). Each of the 17 SDGs do have 169 specific targets to be achieved by 2030. The goals and targets are universal, meaning they apply to all countries around the world, not just poor countries. Reaching the goals requires action on all fronts-governments, business, civil society, and people everywhere all have a role to play (UN 2015).

According to Giovanni (2001), there are four theories that are used to synthesize the main aspects of development: modernization, dependency, world systems and globalization. These are the principal theoretical explanations to interpret development efforts carried out especially in the developing countries. These theoretical perspectives allow us not only to clarify concepts, to set them in economic and social perspectives, but also to identify recommendations in terms of social policies. The four theories and their prevailing assumption are discussed hereunder.

2.2.2. Modernization theory and development

Modernization theory studies the process of social evolution and the development of societies. According to Prateek (2017), there are two levels of analysis in classical modernization theory: the microcosmic evaluations of modernization, which focuses on the componential elements of social modernization; and the macrocosmic studies of modernization focused on the empirical trajectories and manifest processes of the modernization of nations and their societies, economies, and polities.

Modernization theory considers nature, economic situations, world market integration, and technological development or transfers of technology between ‘developed’ countries and ‘underdeveloped’ countries. It assumes that countries are underdeveloped simply because they are still at a very early stage of their own development, and to advance, they need to look at developed (particularly Western) countries. Western countries can be seen as archetypes, offering specific patterns or standards that countries can follow to achieve modernity (Scott 2017).

Fundamentally, modernization theory studies the process of social evolution and the development of societies. Given the complexity that arises from tracing the multidimensional development of social processes, the goal of discovering a single definitive social theory of evolution is perhaps the most ambitious research goal in all social science (Prateek 2017). The proponents of modernization theory claimed that underdeveloped countries were held back by certain cultural characteristics, or their lack of adherence to specific economic policies that followed given “stages of growth” (Ushehwedu et al. 2017 p.vi).

According to Giovanni (2001) the three assumptions for modernization theory are: a) Modernization is a systematic process. The attribute of modernity forms a consistent whole, thus appearing in a cluster rather than in isolation; (b) Modernization is a transformative process; for a society to move into modernity its traditional structures and values must be totally replaced by a set of modern values; and c) Modernization is an imminent process due to its systematic and transformative nature, which builds change into the social system.

According to this theory, the difference between underdeveloped societies and developed societies was just one phase; underdeveloped societies could also develop if they carefully analysed the phases that developed societies went through and followed the same route. According to Ridvan (2018), this theory which had held influence in the 1950s and 60s, was the subject of staggering criticisms after the late 60s and lost its dominant appeal soon thereafter. In this period, hectic criticism was being levelled at the negative sides of capitalist industrialism and development plans, which failed to ensure economic growth (Ridvan 2018).

In this regard, Cristóbal (2009) highlighted that in the early post World War II period development economists in devising a development path for the less developed countries (LDCs) tended to draw upon the various historic examples of development of the now developed countries (DCs) such as

Great Britain, Japan, and the Soviet Union. As most LDCs at the time were largely agricultural countries, development economists were particularly interested in examining the role that agriculture could play in the process of industrialization. However, there was controversy among economic historians as to the timing, magnitude and impact of the resource flows between agriculture and industry in the early stages of economic development (Cristóbal 2009).

Industrialization was seen as the way to modernity and development for countries emerging from colonialism and described at the time as backward. The lessons which development economists took from the successful development experience of the developed countries were that the transfer of a large agricultural surplus was a precondition for initiating a process of industrialization in LDCs (Ghatak and Ingersent 1984).

Agriculture was taken as a subsidiary sector whose task is to underpin an industrialization process in LDCs. Some authors such as Johnston and Mellor (1961) argued that agriculture's function in economic development was to supply food, raw materials, capital, labour, and foreign exchange for industry as well as creating a home market for domestically produced industrial products. Some development economists argued that industrialization would stimulate agriculture by offering employment and higher wages to those who migrate from the rural areas to the urban industrial areas and a market for agricultural commodities.

Despite its importance, the agricultural sector has not taken a central role in Ethiopia's national development plans especially during Hailesilassie and Derg periods. In this regard, the Monarchy's (especially from 1950-1974) period national development strategy was focused on industrial development through import substitution and industrialization (Aredo 1990; Cheru 1990; Pausewang, Cheru et al. 1990). The Derg period (1974-1991), also prioritized the industrial sector. According to Welteji (2018), this was done through mixed strategies: export-oriented (mainly during the Monarchy period) and industrial development-based import substitution, while the agricultural sector was frequently used as a source of foreign currency. Over the past half century, Ethiopia has gone through three ideologically distinct political regimes: the monarchic regime during 1950-1974, the central planning regime (Derg regime) during 1974-1991, and the regime that has been in power since the collapse of the Derg regime in May 1991. Each shift in political regime has been marked by dramatic change in economic policies with direct implications for the agricultural sector in terms of both access to factors of production and marketing of inputs and outputs. During the monarchic regime, the land tenure system was complex, private transfer of land was practically non-existent, and ownership was skewed with the state and the church maintaining control over large shares of agricultural land (Alemu et al. 2002; Geda 1960). In fact, it was one of the central forces that mobilized rural peasants and urban intelligentsia, with the popular slogan-land to the tiller, which eventually brought down the monarchic regime in 1974 (Shahidur et al. 2007; Adhana 1991).

According to Giovanni (2001), the critics of modernization theory include development is not necessarily unidirectional and modernization theory regards the need to eliminate traditional values and the fact that those traditional and modern values are not necessarily always mutually exclusive.

2.2.3. Dependency theory and development

Dependency theory is a popular theory within the social sciences to explain economic development of states. It is the result of an extensive search to find a theoretical framework to sufficiently analyse and explain both development and underdevelopment within the international system. According to Scott (2017), it is a mixture of various theories, including world systems theory, historical structure theory and neo-Marxist theory. It looks to external matters, such as politics, economics, and culture, and attempts to come to an understanding of how these issues influence development policies (Scott 2017).

The definitions of dependency all indicate that the relations between dominant and dependent states are dynamic because the interactions between the two sets of states tend to not only reinforce but also intensify the unequal patterns. Moreover, dependency is a very deep-seated historical process, rooted in the internationalization of capitalism. According to Giovanni (2001), the theory of dependency embodies four main points: a) To develop an important internal effective demand in terms of domestic markets; b) To recognize that the industrial sector is crucial to achieving better levels of national development, especially due to the fact that this sector, in comparison with the agricultural sector, can contribute more value-added to products; c) To increase worker's income as a means of generating more aggregate demand in national market conditions; and d) To promote a more effective government role in order to reinforce national development conditions and to increase national standards of living.

According to Ushehwedu et al. (2017), the analysis for dependency theory is grounded in global history and the interactions between economies in the world, whereas mainstream economics tends to be confined to what happens within the boundaries of the state. In these orthodox economic paradigms, the national economy is assumed to be relatively autonomous and can be analysed separately from the global economy. While a variety of perspectives existed within the broad school of dependency theory, they all rejected modernization theory's a historical approach to development and criticised its failure to account for the importance of the role of global economic and political structures (Ushehwedu et al. 2017).

According to Ridvan (2018), dependency theory develops a method of analysis that plots broader external factors and the international capitalist system against the progress perspective, which links the reasons for underdevelopment to internal, specific conditions. It draws attention to the imperialist relations between countries, asymmetrical relations between classes and unequal trading relations. The theory remains relevant in understanding the structural problems faced by many African countries. Dependency theory assumed that if you were a poor country and depended on the capitalist West, you could only become poorer (Ushehwedu et al. 2017). Yet the Asian examples demonstrated the possibility of dependent development despite their integration in the capitalist western world. Despite its explanatory power in understanding the operations of multinationals, there has been a very low contribution to the theory by scholars over the years.

2.2.4. World systems approach and development

A central element from which the theory of world systems emerged, was the different form that capitalism was taking around the world, especially since the decade of the 1960s. Starting in this decade, Third World countries had new conditions and as such, international financial and trade systems began to have a more flexible character, in which national government actions had less and less influence in attempting to elevate their standards of living and improve social conditions (Reyes 2001).

According to Giovanni (2001), the three main assumptions of the world-systems theory are: a) that there here is a strong link between social sciences - especially among sociology, economics and political disciplines and it recognizes that more attention is usually given to the individual development of each one of these disciplines rather than to the interaction among them and how these interactions affect in real terms the national conditions of a given society b) instead of addressing the analysis of each of the variables, it is necessary to study the reality of social systems; c) it is necessary to recognize the new character of the capitalist system that support open competition, more productive patterns in the industrial sector and wide groups of population which provided labour for the new established factories.

According to Giovanni (2001), the principal differences between the world-systems approach and the dependency studies are: a) the unit of analysis in the dependency theory is the nation-state level, for the world-system it is the world itself; b) concerning methodology, the dependency school posits that the structural-historical model while the world systems approach maintains the historical dynamics of world-systems in its cyclical rhythms and secular trends; c) the theoretical structure for the dependency theory is bimodal, (consisting the core and the periphery); according to the world systems theory the structure is tri modal (consisting the core, the semi periphery and the periphery); d) in terms of the direction of development, the dependency school believes that the process is generally harmful; however, in a world systems scenario, there is the possibility for upward and downward mobility in the world economy; e) The research focus of dependency theorists concentrates on the periphery; while world systems theorists focus on the periphery as well as on the core, the semi periphery and the periphery.

Given the characteristics, the world-systems theory indicates that the main unit of analysis is the social system, which can be studied at the internal level of a country, and from the external environment of a particular nation. In this last case the social system affects several nations and usually also an entire region (Giovanni 2001). The world systems most frequently studied in this theoretical perspective are systems concerning the research, application, and transference of productive and basic technology; the financial mechanisms, and world trade operations (Reyes 2001).

2.2.5. Globalization and development

Currently, because of the age of globalization, the world is becoming to be conceived as a village. One of the major projects of globalization is the integration of the political economy of the less developed regions into the global political economic order. Accordingly, during the past few decades the continent of Africa has been trying to integrate itself into the international political economy either forcefully or by consent (Tewodros 2011).

The driving force of this integration is the ideology of neoliberalism. Under this integration states are recommended or forced to open up their markets to foreign companies competitions, to minimize the role of the government in the economy including minimizing the government expense for social security and social goods, to create fertile grounds for the market to be the only means to distribute the wealth of a nation and the prices of goods and services to be determined based on the principles of demand and supply, etc (Tewodros 2011).

According to Giovanni (2001), the theory of globalization emerges from the global mechanisms of greater integration with particular emphasis on the sphere of economic transactions. In this sense, this perspective is like the world-systems approach. However, one of the most important characteristics of the globalization position is its focus and emphasis on cultural aspects and their communication worldwide. Rather than the economic, financial, and political ties, globalization scholars argue that the main modern elements for development interpretation are the cultural links among nations. In this cultural communication, one of the most important factors is the increasing flexibility of technology to connect people around the world. Globalization theories emphasize cultural factors as the main determinants which affect the economic, social, and political conditions of nations (Giovanni 2001).

Giovanni (2001) also described the main assumptions which can be extracted from the theory of globalization in three principal points. First, cultural factors are the determinant aspect in every society. Second, it is not important, under current world conditions; to use the nation-state as the unit of analysis since global communications and international ties are making this category less useful. Third, with more standardization in technological advances, more and more social sectors will be able to connect themselves with other groups around the world. This situation involves the dominant and non-dominant groups from each nation.

In this regard, in 1991 the EPRDF government declared a new economic policy of free market economic system to the country as it is believed that the adopted command economic system was one of the factors which adversely affect Ethiopian economic growth. Melkamu (2017) highlighted the results and failures of the replacement of command economy by free market, since 1991 as follows. The establishment of the Ethiopian Privatization Agency (EPA), privatizing financial institutions; open the economy for foreign direct investment in selected areas and devaluation of currency. According to Melkamu (2017), the EPRDF government has been with new economic policy which neo-liberal reform measure. Instantly, the Ethiopian currency was devalued, privatization and liberalization were authorized within selected areas. Land was constitutionally declared a state property; telecommunications, water and electricity supply as stated in proclamation were under the monopoly of the government (Melkamu 2017). In contrary, the failures were restrictions of foreign banks entry; reserved some investment areas for domestic investors; government monopoly in telecommunication, electricity, transportation (air and rail), and land (constitutionally declared as its government property) and shifting from free market to developmental state.

2.2.6. Developmental state and development

Since 1991 Ethiopia adopted neoliberalism “free market economy.” After 10 years, – from 2001– the free-market economy was replaced by the developmental state. Scholars claimed that developmental state economic policy is neither command nor free market. Its policy content is in between. According to Tewodros (2011), a developmental state is often conceptually positioned between “liberal open market economy and a centrally-planned model” and this means, the theory of developmental state is neither a capitalist nor a socialist by its nature.

Until 2001, this means for 10 years, the neo-liberal ideology was considered as a radical system transformation, involving a transition from state socialism to capitalist state formation. However, in 2001, the government shifted its economic policy from free market to democratic developmental state (Tsehai, 2009). Melkamu (2017) also highlighted that in 2001 the government of Ethiopia shifted its economic policy from free market to democratic developmental state as it is assumed that using developmental state many states achieved the real economic developments. The current government of Ethiopia, using China, Taiwan, Korea, and other counties as a role models, adopted this economic policy in order to enhance the economic growth of the country.

In short, currently Ethiopia encourages the involvement of private sectors to advance the country's economic development, however, the government is also actively involved in the economy. In this regard, the government replaced the free market economy into democratic developmental state which is neither command nor free market.

2.3. Theories of production, distribution and livelihoods

2.3.1. Theories of production

Agriculture plays a key role in food security and economic development and most of the world's population in rural areas depends directly or indirectly on agriculture for their livelihoods (Mehari 2002). Peasant farm households account for no less than a quarter of the world's population. Most are in developing countries where they can represent up to 70% of the national population (Bardhan and Udry 1999). According to Mariapia (2007), agricultural production is significantly dependent on the performance of farmers, and, at the same time, poverty is disproportionately concentrated among them. Smallholder farmers are farm households, with access to a piece of land and utilizing mainly household labour in farm production. According to Ellis (1992), they are in a larger dominant economic and political system that could affect their production behaviour, but fundamentally they are characterized by partial engagement in markets, which are often imperfect or incomplete. Hunt (1991) also identifies smallholder farmers as both production and consumption units; and a proportion of produce is sold to meet their cash requirements and financial obligations, and a part is consumed by them.

Jacques et al. (2017) argued that with more than 500 million family farms that constitute over 85 % of all farms worldwide, family farming is the predominant mode of agricultural production, producing food, preserving traditional food systems, contributing to a balanced diet, and safeguarding the world's agro biodiversity. Thus, it can be said that family farms are inextricably linked to domestic and global food security and livelihoods (Jacques et al. 2017). Stefan Dercon and Douglas Golli (2014) indicated that most people in sub-Saharan Africa live in rural areas (61.4%), and most Africans work in agriculture (57.3%). They also argue that that farm size is extremely small in most African production settings; with almost all land holdings under 5 hectares (ha). By contrast, in the European Union's 27 member countries, average farm size in 2007 was 12.6 ha, with 30% of farms larger than 5 ha (Stefan Dercon and Douglas Golli 2014).

Understanding the theories of their modes of production is a primary concern in any poverty alleviation strategies. In this thesis, production theories are reviewed as a major wellspring of theoretical and empirical research on farm household production choices in developing countries. It provides a wide-ranging literature review of different microeconomic approaches to smallholder farmers' economy. In this regard, Udemezue et al. (2018) identified about five general models for agricultural development as indicated below.

2.3.1.1. The Frontier Model

In this theory, expansion of the area cultivated or grazed represents main way of increasing agricultural production. According to Mehari (2002), the frontier model assumes that land is physically infinite had it not been for transportation costs and problem of accessibility. In this model, transport cost and accessibility play a crucial role in determining the land rent and the agricultural frontier, and thereby land area under cultivation. In this approach, land is assumed to be homogeneous, and differ only by the location as measured by distance from a centre (village). In this respect, as many development thinkers conclude, none of developing countries are deficient of the required resources for their development but they are owners of underdeveloped resources. These resources are underdeveloped due to various inhibitions such as their inaccessibility, lack of technical knowledge, non-availability of capital and the small extent of markets (Jhingan 1997). As per the argument of Areid Angersen (1994), there is scarcity of good land close to the centre (land with low distance cost). Udemezue et al. (2018) also argued that because of rapid population growth, the model did not last; the limits to the frontier model were quickly reached.

In the case of Ethiopia, given the subsistence agriculture dominated by cereal producers who produce 80% of total agricultural output and the primitive and unchanging technology, the means to increase output has been observed to be through increasing the size of farmland (Alemayehu 1993). This ensures that with traditional agricultural technologies, farm production is almost completely dependent upon the natural resource available. This justifies the application of the frontier theory in Ethiopia wherein agricultural production among the smallholders is almost completely dependent on the available natural resources (land mainly) (Mehari 2002). Thus, the available resources in Ethiopia must be evaluated in the context of such perspectives, since the new lands recommended for cultivation are not free of the inhibitions.

2.3.1.2. The conservation models

The conservation theory is concerned with the application of the laws of diminishing returns to the agricultural sector with the assumptions that land for agricultural production is scarce and becoming more so soil exhaustion is possible and action to prevent decreases in yields or to increase land productivity will have only slow effect at best (Mehari 2002). According to Udemezue et al. (2018), the conservation model emphasized the evolution of a sequence of increasingly complex land and labour-intensive cropping system, the production and use of organic manures and labour-intensive capital formation in the form of physical facilities to use land and water resources more effectively. This model was the only approach to intensification of agricultural production that was available to most of the world's farmers. Thus, Udemezue et al. (2018), pointed out that as land scarcity increases, poorer land is used causing the marginal productivity of labour and land to decrease. To forestall these declines, high priority is attached to maintaining soil productivity at its present level or attempting to return the soil to its original presumably more productive level in the extreme conservation model (Udemezue et al. 2018). However, Steven and Jabara (1988) argued that the conservation model fails to recognize the contribution of industrially produced inputs in increasing agricultural production as well as the impact of technological changes on the types of the demand for land in agriculture. That is, non-farming uses of land do really increase with the decrease in the relative importance, share and role of the sector resulting from technological advances in the economy.

According to Mehari (2002), in the current socio-economic development policy of Ethiopia, the development strategy of the agricultural sector emphasizes that the development effort should be in line with a guiding principle of conservation based agricultural development strategy. As a result, the conservation model has explicit legal and policy bases of application in the country. After considering Agricultural Development Led Industrialization (ADLI) as the priority task in the macro development strategy in current Ethiopia, there are few new inclusions in relation to agricultural development efforts in the policy framework ensuring the application of conservation model (including the issues of sustainable agriculture and environmental protection) (Mehari 2002).

2.3.1.3. The Urban-Industrial Impact Model

This model relates agricultural productivity and development with the distance from and development effects of urban/ industrial areas. According to Ruttan (1988), such industrial development stimulates agricultural development by expanding demand for farm products, supplying the industrial inputs needed to improve agricultural productivity and drawing away surplus labour from agriculture. Steven and Jabara (1988) also hypothesized that the determinant factor of productivity and development in agriculture to be the distance and cost of transporting agricultural products to the urban market, i.e., bulky and perishables tend to be near urban and industrial areas while the less perishables tend to be produced far away on lower cost land.

In the conservation model, location variations in agricultural development were related primarily to differences in environmental factors. It stands in sharp contrast to models which interpret geographical differences in the level and the rate of economic development primarily in terms of the level and rate of urban-industrial development (Udemezue et al. 2018). Initially, the urban-industrial impact model was formulated to explain geographic variations in the intensity of the farming system and in the productivity of labour in an industrialized society. Later this model was expanded to explain the more effective performance of the factor and product markets linking the agricultural and non-agricultural sectors in regions characterized by rapid urban-industrial development. According to Udemezue et al. (2018), the model has been tested extensively in the limited states but has received only limited attention in the less developed world.

When we come to Ethiopia, this model can be said to have been partially practiced when the first effort was made to develop the economy in 1945 when the ten-year program of industrial development was prepared (Mehari 2002). At that initial stage of the policy practice, industrial development was believed to change and develop the whole economy, while the remaining sectors were considered to change and develop because of the increased industrialization. Thus, it is said that partially because of the spatial factor (urbanization by its merit) was not stated explicitly (Mehari 2002). By implication, the model has also been partially exercised in the subsequent few urban as well as industrial development policy, planning practices and budgetary allocations of the country. Although all policies, plans and strategies on paper say a lot about the importance of the agricultural sector, the practices were far from the promises. As a result, the agricultural sector of Ethiopia did not get the right share in budgetary allocation as much as its contribution and expected role to play in the development of the whole economy. By this analysis, the spirit of industrial fundamentalism and urban industrial impact models is not eroded although both the industrial as well as agricultural sectors couldn't show any transformations since long in the country (Mehari 2002).

2.3.1.4. The Diffusion Model

In the diffusion model, agricultural development is assumed to be based on devoting considerable resources to increasing the flow of information to farmers about new agricultural technology and new institutional arrangements and teaching tradition to bound farmers how to make more economically rational management decisions about the uses of resources they have access (Udemezue et al. 2018). Moreover, it is an approach recommended from observed variations of land and labour productivity among farmers and regions as evidenced empirically (Hayami and Ruttan 1985). To narrow down such differences, the development of agriculture in the diffusion model is realized through more effective dissemination of technical knowledge carried out by extension workers (Mehari 2002).

The diffusion approach to agricultural development rests on the empirical observation of substantial differences in land and labour productivity among farmers and regions. The route to agricultural development, in this view, is through more effective dissemination of technical knowledge and a narrowing of the productivity differences among farmers and among regions (Udemezue et al. 2018). Before the development of modern agricultural research systems' substantial effort was devoted to crop exploration and introduction. The model was developed emphasizing the relationship between diffusion rates and the personality, characteristics, and educational accomplishments of farm operators (Udemezue et al. 2018).

The developments that led to the establishment of active programs of farm management research and extension occurred at a time when experiment-station research was making only a modest contribution to agricultural productivity growth (Mehari 2002). A further contribution to the effective diffusion of known technology was provided by the research of rural sociologists on the diffusion process. The limitations of the diffusion model as a foundation for the design of agricultural development policies became increasingly apparent as technical assistance and community development programs, based explicitly or implicitly on the diffusion model, failed to generate either rapid modernization of traditional farms or rapid growth in agricultural output (Udemezue et al. 2018).

According to Mehari (2002), the practice in Ethiopia has proved similar condition to produce similar conditions. Although the initial efforts of extension activities on disseminating and demonstrating fertilizer application, partially improved seeds cultivation and new farming practices have shown good results, it could not be sustained. The effort to acquaint farmers with new farming practices has not registered a significant result even at the beginning. The reason for all is that, on the one hand, the per head income of farmers is not so much enabling to go beyond the common expenses. On the other hand, the prices of inputs are continuously increasing so that limiting further diffusion among the smallholder farmers of Ethiopia (Mehari 2002). However, for the Ethiopian case, the diffusion model has relatively better importance, wider bases for practices as well as strong sides for applications as compared to others. Actually, in Ethiopia, currently, there is a new extension demonstration and training program of this model type. This program could change production and productivity level although the result is not significant and could not be sustained. As to the extension agents, the workers are recruited from the localities where they are supposed to be assigned so that they know sufficiently their areas/societies of their assignment which is one of the bottlenecks of diffusion otherwise (Mehari 2002).

2.3.1.5. The High Payoff Input Model

The inadequacy of policies based on the conservation, urban-industrial impact and diffusion model led to a new perspective in the 1960s. The key to transforming a traditional agricultural sector into a productive source of economic growth is an investment designed to make modern, high pay off inputs available to farmers in poor countries (Udemezue et al. 2018). According to Mehari (2002), this new conception, transformation of traditional agriculture was believed to be undertaken by investments aimed at increasing the availability and supply of modern high pay off inputs to farming activities. Peasants, in traditional agricultural systems were viewed as rational, efficient resource allocators. They remained poor because in most poor countries, there were only limited technical and economic opportunities to which they could respond (Udemezue et al. 2018).

According to Ruttan (1977), the new high pay-off inputs were classified into three categories.

a) The capacity of public and private sector research institutions to produce new technical knowledge
b) The capacity of the industrial sector to develop, produce and market new technical inputs.
c) The capacity of farmers to acquire new knowledge and use new inputs effectives.

Based on these facts, Schultz (1964) had hypothesized that investment in agricultural technology development and human capacity building could enable to produce more productive technologies and productive farming people. This in turn could lead to generating new technologies, adopting the available ones to the economies of poor countries and ideally, overcome the problems of inappropriateness of the inputs produced in advanced countries. He added that such investments would improve the availability and prices of modern agricultural inputs which could be determinant to growth of the agricultural sectors of poor countries. As he summarized the experiences of advanced countries, higher productivity capital equipment and other inputs were the sources of the new high pay off inputs. From this, he recommended for the emphasis on such investments which he thought to be the key to economic growth from the agricultural sectors of poor countries (Schultz 1964).

According to Mehari (2002), although this model is criticized for the problems of inapplicability at the micro level, it is implicitly applied in Ethiopia. For instance, the institution for Rural Technology is trying to produce and introduce new inputs and equipment designed for improved agricultural production and productivity but practically unable to be fully effective. The main reason is that some of the materials produced entail a large amount of money as compared to the financial background of the farmers (Mehari 2002).

At last, Mehari (2002) concluded that despite all development measures undertaken, the Ethiopian agriculture is still a very traditional sector exposed to drought, which affects millions automatically, and unable to feed the producers sufficiently and sustainably, let alone its strength in the socio-economic linkage effects. Accordingly, Mehari (2002) suggested that the evaluation is also needed for appropriate mixes/specification of models for the country.

2.3.2. Theories of distribution

Agriculture is an occupation as well as an economic enterprise. It is intimately linked with food security, health, and nutrition through direct consumption and market linkages. The participation of farmers in markets is an important determinant of well-being and development (Poole 2017). According to the report of the World Bank (2017), smallholder agriculture is one of the principal economic occupations in the world and is the main source of income and employment for the 70% of the world's poor who live in rural areas. Smallholder households account for 60% of global agriculture. Most farming households produce a diverse range of farming products, crops and livestock which fit into the home economy in different ways. Despite its significance, agriculture is just one of several diverse and competing sources of livelihood support.

Farmers face several challenges in agricultural supply chains in emerging economies that contribute to extreme levels of poverty. According to Kris, Joel et al. (2017), one common challenge is that farmers only have access to one channel, often an auction, for which to sell their crops. Developing insights into the structural drivers of farmer and supply chain profitability in emerging markets and understanding the participation of farmers in different channels is important for channel choices.

Agri-food global supply chains witnessed rapid and profound changes in the last decades, including a strong increase in agri-food trade and a consolidation of supply chains (Dequiedt 2018). These changes have had a huge impact on smallholder farmers: positive if they are able to participate in the global value chain and exploit the opportunities it offers in terms of access to new markets for inputs and/or products; and negative if they are excluded from global value chains because they are unable to meet the requirements for entry. Reaching those markets is often not direct and necessitates intermediaries that may act as gatekeepers of the global value chain (Dequiedt 2018). In this regard, Gómez, and Ricketts (2013), tried to analyse the food value chain (FVCs) typology (traditional, modern, traditional-to-modern and modern-to-traditional) that takes into account the participants, the target market and the products offered. The four models of food distribution are discussed below.

2.3.2.1. Traditional food value chains

Traditional traders buy primarily from smallholder farmers and sell to consumers and traders in local markets. Consumers in traditional Food Value Chains (FVCs) follow long-established patterns and most often purchase food directly from smallholder farmers and traders in regional/local markets, or from a network of traditional retailers that includes independently owned businesses. Product availability in these FVCs tends to be seasonal. Traditional FVCs are common in small rural markets located relatively close to production regions. Products delivered by traditional FVCs travel longer distances to reach urban consumers, primarily in lower-income neighbourhoods (Gómez and Ricketts 2013). This form of distribution is common in Ethiopia as smallholder farmers are directly engaged in the supply of marketable surplus to the nearby markets or consumers are directly purchasing products from farmers and traders.

2.3.2.2. Modern food value chains

Domestic and multinational food manufacturers procure primarily from commercial farms and sell through modern supermarket outlets. These FVCs are largely driven by the expansion of modern retail enterprises in developing countries, primarily in urban areas with a large consumer base. They generally involve domestic and multinational food manufacturers and wholesalers, as well as commercial agribusinesses and farms. In general, modern FVC participants coordinate the supply chain through formal, well-documented contractual arrangements that feature predetermined product standards, volume requirements, and purchase prices (Gómez and Ricketts 2013). Such tight coordination, together with access to a network of global and domestic suppliers, allows modern FVCs to offer a wide year-round assortment of fresh and processed/packaged food products. These chains also generally benefit from economies of size in the production, marketing, and distribution of shelf-stable packaged/ processed foods. Considering the Ethiopian case, modern food value chains are limited to major food manufacturers, and they are found in major cities.

2.3.2.3. Traditional-to-modern food value chains

In this case, **s**upermarkets and food manufacturers source food from smallholder farmers and traders. These chains are characterized by smallholder farmers and traders selling primarily high-value crop and livestock products (e.g., meats, dairy products, fruits, and vegetables) to modern supermarkets and food manufacturers. These FVCs are interesting primarily for their impacts on the nutrition of smallholder farmers and traders, not of end consumers (Gómez and Ricketts 2013). The impacts come from higher-income opportunities, which may involve selling products to supermarket supply chains directly; or indirectly, through off-farm employment in food production and post-harvest activities. Here we focus on participation in domestic markets because developing-country FVCs are primarily domestically oriented, and focus on nutritional implications for smallholder farmers and traders in rural areas because most of them are net food buyers.

2.3.2.4. Modern-to-traditional food value chains

Domestic and multinational food manufacturers sell through the network of traditional traders and retailers. These FVCs consist of food manufacturers utilizing traditional wholesale and retail networks to market primarily processed/packaged foods. Two key characteristics of these FVCs are that food manufacturers often benefit from economies of scale in production and distribution, and from an increased ability to coordinate the downstream supply chain (as opposed to having to negotiate with large, powerful supermarkets). These two characteristics allow modern-to-traditional FVCs to implement intensive, year-round distribution strategies for processed/ packaged foods, targeting lower income consumers in urban areas as well as consumers who get their food from smaller, remote markets in rural areas (Gómez and Ricketts 2013).

When we come to Ethiopia, important changes have happened in the *Teff* value chain in the last decade both at the production level and on the consumption side (Bart Minten et al. 2013). Modern inputs are increasingly adopted in *Teff* production, quality and convenience demands are on the rise among *Teff* consumers, and the *Teff* marketing system is becoming more efficient. These changes resulted from an interplay of on the one hand, the increasing availability of improved varieties and chemical fertilizer and an improved extension system in rural areas, and on the other hand, the increasing downstream demand for commercial *Teff* driven by growing incomes, urbanization, and high-income elasticities for *Teff* (Bart Minten et al. 2013). The changes upstream have especially happened in those areas that are reasonably well connected to the city, illustrating the importance of market access and demand as drivers for rural and agricultural transformation (Wiggins 2000).

2.3.3. Theories of livelihood

Agricultural development is a subset of rural development. Agriculture plays a key role in food security and economic development and most of the world’s population in rural areas depends directly or indirectly on agriculture for their livelihoods. The main aim of agricultural development is the improvement of material and social welfare of the people (Webb and Von Braun 1994).

Therefore, agricultural development is often seen as an integrated approach to improving the environment and wellbeing of the people of the community (Webb and Von Braun 1994). According to Mehari (2002), rural areas cannot attain development without their agriculture being developed because the majority of the rural dwellers are engaged in agricultural practices as their major source of income. Creating a sustainable agricultural development path means improving the quality of life in rural areas, ensuring enough food for present and future generations, and generating sufficient income for farmers (Mehari 2002). Supporting sustainable agricultural development also involves ensuring and maintaining productive capacity for the future and increasing productivity without damaging the environment or jeopardizing natural resources. According to Scoones (2009), livelihood perspectives provide a distinctive initial point for comprehensive analysis of complex and highly dynamic rural contexts.

According to Pasteur (2001), a livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base.

Sustainable livelihood approaches are based upon evolving thinking about poverty reduction, the way the poor live their lives, and the importance of structural and institutional issues. According to Caroline and Diana (1999), the principles and concepts of sustainable livelihoods are a way of thinking about the objectives, scope, and priorities for development, in order to enhance progress in poverty elimination. In this regard, sustainable livelihoods aim to help poor people achieve lasting improvements against the indicators of poverty that they define.

In identifying the areas and the focus of sustainable livelihoods approach and agricultural development of developing countries, Mehari (2002) argued that respect for and recognition of local knowledge and local management of natural resources, and efforts to promote the capabilities of current generations without compromising the prospects of future ones are critical points. Consequently, economic, and environmental sustainability, adequate farmers' income, productive capacity for the future, improved food security and social sustainability are important elements of developing countries' agricultural development (Mehari 2002). The sustainable livelihood approach has had a considerable influence upon the policies and strategies of several development agencies, notably the UK's Department for International Development (DFID), the United Nations Development Programme (UNDP), the Food and Agriculture Organization (FAO), and many non-governmental organizations (NGOs) (Valdés et al. 2011).

According to Stephen et al. (2009), the livelihoods approach puts people at the centre of development and people rather than the resources they use or the governments that serve them are the priority concern. Adhering to this principle may well translate into providing support to resource management or good governance. But it is the underlying motivation of supporting people's livelihoods that should determine the shape of the support and provide the basis for evaluating its success. Livelihood analysis, using an assets framework could help foster appreciation of the way that combinations of assets are vital to secure livelihoods. Assets are not simply resources that people use in building livelihoods; they give people the capacity to be and to act (Webb and Von Braun 1994).

When we think about a sustainable livelihood approach, analysing the vulnerability context that frames the external environment in which people exist comes first. People's livelihoods and the wider availability of assets are fundamentally affected by critical trends as well as by shocks and seasonality over which they have limited or no control (DFID 1999). The factors that make up the vulnerability context are important because they have a direct impact upon people's asset status and the options that are open to them in pursuit of beneficial livelihood outcomes (DFID 1999). Shocks can destroy assets directly (in the case of floods, storms, civil conflict, etc.). They can also force people to abandon their home areas and dispose of assets (such as land) prematurely as part of coping strategies. Recent events have highlighted the impact that international economic shocks, including rapid changes in exchange rates and terms of trade, can have on the very poor (DFID 1999). Trends may (or may not) be more benign, though they are more predictable. They have a particularly important influence on rates of return (economic or otherwise) to chosen livelihood strategies. Seasonal shifts in prices, employment opportunities and food availability are one of the greatest and most enduring sources of hardship for poor people in developing countries (DFID 1999).

Sustainable livelihood approaches are based upon evolving thinking about poverty reduction, the way the poor live their lives, and the importance of structural and institutional issues. They draw on three decades of changing views of poverty. Participatory approaches to development have highlighted great diversity in the goals to which people aspire, and in the livelihood strategies they adopt to achieve them. Sustainable livelihood approach appears to offer a practical way of bringing together a variety of concepts, lessons, and ideas. They help reinforce best practice and focus on core development issues, though they are neither a cause nor a panacea (Caroline and Diana 1999). Sustainable livelihoods (SL) are a way of thinking about the objectives, scope, and priorities for development, in order to enhance progress in poverty elimination. SL approaches rest on core principles that stress people-centred, responsive, and multi-level approaches to development (Caroline and Diana 1999). In this regard, clearer identification of livelihood strategies would provide a clearer base on which to focus practical poverty reduction interventions and to assess outcomes. The sustainable livelihoods approach seeks to develop an understanding of the factors that lie behind people's choices of livelihood strategies and then reinforce factors which promote choice and flexibility.

According to Caroline and Diana (1999), the keyways in which SL approaches have been used and found useful is to include the following components.

- supporting systematic analysis of poverty and its causes, in a way that is holistic – hence more realistic – but also manageable.
- promoting a wider and better-informed view of the opportunities for development activities and their likely impact; and
- placing people and the priorities they define firmly at the centre of analysis and objective-setting (Caroline and Diana 1999).

Allison and Horemans (2006) as well as Stephen et al. (2009) highlighted the components of the five assets of livelihood as follows and they recognized that the interaction among these assets is desirable and inevitable.

a. Natural capital consists of natural resource stocks (such as land, water, forests, air quality, genetic resources, and biodiversity) and environmental services (hydrological cycle, pollution sinks, etc).

b. Physical capital comprises infrastructure such as roads, transportation, buildings, water supply, energy, communication facilities, production equipment and technologies.
c. Financial /Economic capital consists of cash, liquid assets, credit/debt, savings, other economic assets, and government transfers.
d. Human capital includes formal education, skills, indigenous knowledge, health, and nutrition.
e. Social capital includes relations and organizations that provide access to social resources (networks, social claims, social relations, affiliations, and associations), opportunities, safety nets, and emotional wellbeing.

Based on the argument of Lucrezia Tincani (2015), rural livelihoods in Africa are increasingly being examined through the lens of the Sustainable Livelihoods Framework (SLF), which assumes that the poor behave as “strategic managers” in negotiating their livelihoods outcomes by selecting livelihood activities according to their entitlements and access to resources, as mediated by the parameters of institutional contexts. Since the beginning of the concept of sustainable livelihoods, it has been largely taken by several social organizations as development strategies to support the eradication of poverty (Valdés et al. 2011). The SL approaches are centred on the search for human capabilities and values that enable groups to face problems and obstacles where they are living, and to subsequently reinforce and achieve empowerment fairly and democratically. The approaches are used by international organizations including the United Nations Development Program (UNDP), Department for International Development (DFID), International Fund for Agricultural Development (IFAD), Cooperative for Assistance and Relief Everywhere (CARE) and the Development Alternatives Organization (DA) that seeks to achieve sustainable solutions (Valdés et al. 2011). Valdés et al. (2011) provide critical analyses of the methodological approaches used by different institutions as indicated in Table 2.1 below.

In this study, CARE sustainable livelihood approach is used for analysis. This is because CARE includes some DFID initiatives in its strategies, but also it considers activities for home maintenance as means to arrive at a result. As such, the approach also seeks a greater focus on capacities of the people at the micro-level, personal empowerment, and commonality among groups (Krantz, 2001; Lindenberg, 2002).

Table 2.1: Comparative summary of the methodological approaches for SL

Approach	Purpose	Strengths	Weaknesses	Reference
UNDP	Improve sustainable livelihoods of vulnerable groups	Increase the capacity of adaptive strategies to address the problems of vulnerable groups	Does not consider the relations of power and dominance that sometimes exist in socially disadvantaged communities.	Krantz, 2001
DFID	Eradicating poverty by making livelihoods the goal of development efforts	Identifies the capitals of livelihoods and the relationship of power as a transforming process that should be examined.	Lacks programming framework. Difficulty of initiating the methodology at the micro-level without relying on the macro-level	Farrington et al., 1999; Krantz, 2001
IFAD	Improve the quality of people's lives above the resources of their governments.	Builds supporting networks based on people-centered that actively participate in projects	Minimizes the importance of natural resource conservation.	IFAD, 2009
CARE	Strengthen the capacity of the poor to themselves take initiatives and secure their way of life	Considers people who are active rather than passive to receive external help	Uses rapid appraisal participatory methods where people are objects more than participatory subjects.	Krantz, 2001
DA	Develop livelihoods that satisfy current necessities without compromising future generations.	Develops highly sustainable local technologies more than importing external technologies to increase dependence.	Does not possess a programming framework and does not clearly establish how to achieve its goals.	DA, 1999

Source: Valdés et al. (2011)

2.4. Foundations of macroeconomic policies and strategies in Ethiopia

Having the highest poverty status in the world, Ethiopia is one of the most under-developed nations. It is in east Africa and the total area of the country is 1,127,127 square km (MoFED 2012). It is bordered by The Sudan on the West, Eritrea on the North, Djibouti and Somalia on the East, and Kenya on South. The United Nations projections indicate that the population of the country is approximately 110.14 million in 2019, which ranks 14th in the world (United Nations 2017). Ethiopia is the most populous country in the continent of Africa after Nigeria.

Agriculture is the main economic sector of Ethiopia. Some authors described that the direct contribution of the agriculture sector (crops, livestock, forestry, and usually fisheries) to the functioning of the national economy is reflected by its participation in national Gross Domestic Product (GDP), its foreign exchange earnings, and its role in supplying raw materials and as the source of labour to other sectors. In this regard, based on the government report, Ethiopia is an agrarian country and agriculture accounts for 45% of its GDP, more than 83% of employment, over 90% of the export market and 92% of the raw materials for the industry (MoFED 2012; Dorosh and Rashid 2013).

In addition to its central role in providing a livelihood to the citizens of Ethiopia, agriculture also plays a considerable part in the development of other sectors such as industry and trade. However, the outstanding challenge for Ethiopia, which has existed for a long time, remains the difficulty of achieving improvement in the living standard of the population in the face of a fast-growing population (Authority 2012). In this regard, the challenges of national food production have long been a policy concern in Ethiopia. The dependence on rain-fed agriculture has a direct implication on macro policy in general and agricultural policy. As per some authors, such as Geda (2001) the degree of dependence of the national economy upon subsistence agriculture is extremely high for Ethiopia. Unless a fundamental policy action is taken against it, the sustainability of good macro performance is not warranted (Brietzke 1976).

How countries choose their development strategies may be varied. Most countries give priority to the structural characteristics of the economy and the government's socio-economic objectives when they set their development agendas, policies, and strategies (FAO 2009). National macroeconomic policies and strategies are developed and implemented considering the political factors and institutional arrangements, which in turn have a strong correlation with economic growth (FAO 2009). The economic performance of Ethiopia is highly influenced by the political process. In terms of its contribution to GDP and providing employment opportunities, the agricultural sector played the largest role in Ethiopia throughout the country's history. Agriculture still plays a leading role in terms of employment and as a source of livelihood (MOFED 2006; Gebrehiwot and Mengistu 2014).

Ethiopia is one of the countries that have experimented with several food production strategies (Ricket 1991). Recognizing the importance of agriculture, the Government of Ethiopia (GoE) has focused efforts on improving the production and productivity of the agricultural sector in its policy and investment framework (PIF) (ETHIOPIA'S and PIF 2010). According to Alemayehu (2000), land resources, family labour, oxen ownership, availability of inputs and extension services are the main determinant factors in boosting and improving agricultural production. Efforts have been exerted by the government to improve the availability of such resources and the necessary support was being given to the farmers at ground level. However, due to social upheavals, war and natural calamities over the last three decades, the productivity of the agriculture sector is still low and the country has been suffering from recurrent droughts (Alemayehu 2000; Omiti, Parton et al. 2000).

In this respect, it is evident that labour and land are abundant relative to the capital in Ethiopia (Gebrehiwot and Mengistu 2014). Some researchers such as Teshome (2006) argued that land is the principal source of the Government's policy issue throughout the history of Ethiopia, and it has been a political instrument as well as an economic device. The improvements in agricultural performance are therefore dependent on how these key factors of production are addressed (Teshome 2006).

On the other hand, the agricultural marketing system in Ethiopia is also characterized by supply shortage (insufficient product) which can be attributed to lack of farm inputs, technology, finance, preservation and storage facilities; high transaction costs; lack or ill-functioning institutions and weak transport and communication infrastructure (Staal, Delgado et al. 1997; Gabre-Madhin 2001; Biénabe, Coronel et al. 2004). These factors impose significant constraints on proper market functioning and deter agricultural producers' behaviour from the viewpoint of market-oriented production. Producers are largely smallholders working individually with no market power and suffer from information asymmetry that weakens their tendency to participate in the market (Boger 2001; Salami, Kamara et al. 2010).

According to some researchers, many governments try to stabilize commodity prices through different economic policies and strategies (Gilbert 2010). In this regard, the Ethiopian development strategies can be seen within three phases. Before 1974, the macro economy of the country was market-led economic systems (Geda 2001). However, during the Derg regime, the shift in political paradigm to the socialist system resulted in the economic and property rights insecurity of the people (Geda 2001). The post-Derg period (since 1991) is again taking us back to the market-oriented system of the imperial regime. The detrimental impact of such political processes on macro performance leads the country to a market-led economic system again. Let us see the details of macroeconomic policies and their significant role in determining the performance of agriculture and its economic growth.

2.4.1. The Imperial regime (pre-1974)

The Imperial regime was characterized by a political system dominated by the land-owning aristocracy at the apex of whose power structure is the King. It largely pursued a market based economic policy during 1960-1974 (Alemayehu 2001). During the Imperial period, the land tenure system was feudalistic (landlordism); complexes, the use of modern inputs was limited and as a result productivity of cereal crops was low. Lack of integrated agriculture packages and the absence of modern farming techniques were the reasons for the low agricultural productivity and inequality in rural areas (Cheru 1990; Pausewang, Cheru et al. 1990). In addition, peasants were the subjects of the regional lords to whom they had to provide nearly all their produce (Geda 1960).

Other researchers also described that the pre-1975 agrarian economy of Ethiopia meets the criteria of the tributary economy whereby a political elite is extracting goods and labour from primary producers. It had mixed ownership that included lands of the state, the crown, the Orthodox Church, individuals, and cohesive communities. Although bequests were the predominant land transfer, rental markets (mostly sharecropping) were active; markets were small but expanding (Cohen and Weintraub 1975; Chole 1990). As per the report of some researchers, the real Gross Domestic Product (GDP) grew by an average of 4% per annum (the per capita growth is 1.5%).

This is a period where the modernization of the economy, as well as the building of infrastructure, was aggressively carried out (Alemayehu 2000).

Concerning macroeconomic policy, the imperial government established the National Economic Council (chaired by the emperor) to coordinate the state's development plans during 1954/55 to promote agriculture and industrial productivity and thereby improving the livelihood of all Ethiopians. The National Economic Council played a significant role in the preparation of the first and second five-year plans of Ethiopia (Ofcansky and Berry 1991).

The objectives of the First Five-Year Plan (1957-61) were to develop infrastructure (essentially transportation, construction, and communications) and to accelerate agricultural development by promoting commercial agriculture (Feoli, Vuerich et al. 2002). The objectives of the Second Five-Year Plan (1962-67) were diversification of production, the introduction of industrial processing plants and enhancing the capacity of the economy; thereby increase the growth of the country (Feoli, Vuerich et al. 2002). The Ministry of Planning was established and prepared the Third Five-Year Plan (1968-73) that pursued to facilitate Ethiopia's economic well-being by raising manufacturing and agro-industrial performance. During this planning period, attention was given to the growth of agriculture, manufacturing, transportation and communication (Feoli, Vuerich et al. 2002).

According to some researchers, the development planning efforts of the imperial regime could not materialize its prime objective (i.e. the transformation of subsistence agrarian economy) and improve the living standards of the masses (Deressa, Hassan et al. 2011). Some of the factors that contributed to the failure were the government's lack of administrative and technical capabilities to implement a national development plan and staffing problems in the planning agency. According to Balcha (2011), many projects failed due to lack of the necessary resources (personnel, equipment, and funds), poor organizational structure and management inefficiency in leading such complex development initiatives. Above all, the political and institutional structure (system) were the major obstacles to being able to transform the economy and achieve sustainable economic growth (Deressa, Hassan et al. 2011).

The challenges of national food production have long been a policy concern in Ethiopia. One of the central aims of the large-scale integrated rural development projects that dominated the

Ethiopian rural development scene from the late 1960s was increasing yields through the supply of new crop varieties and inorganic fertilizers (Cohen and Weintraub 1975). The Chilalo Agricultural Development Unit (CADU) project was the first and most prominent of these efforts, started with much fanfare in 1967 and was run with Swedish support for eight years (Cohen 1987; Dejene 2000). This was followed by similar programs, such as the Wolayta Agricultural Development Unit (WADU) in Wolayta, which ran until the early 1980s with support from the World Bank. Extensive research efforts were undertaken, starting in the mid-1960s, by the Ethiopian (Imperial) Institute of Agricultural Research and FAO, focused on testing fertilizers with a range of key crops in different places of the country. The result was a Minimum Package Program which was launched by the government in 1971. In various guises, a package approach, linking the supply of external inputs (seeds and fertilizer) to a credit program, has been the center-piece of the Ministry of Agriculture's extension program since then (Deressa, Hassan et al. 2011).

According to Kidane, Alemu et al. (2005) the Integrated Rural Development (IRD) project was costly to replicate widely and shifted into Minimum Package Projects (MPP) in 1971. The MPP focused on providing minimum services like fertilizers and credit and was expected to cover the whole country at the end of the 1970s. However, its operation was discontinued in the mid-1970s as donors withdrew from funding due to their dissatisfaction with the new political situation of the time. After ten years, in 1981, the second phase of Integrated Rural Development (Minimum Package Project II) was started with the financial support of the World Bank (Kidane, Alemu et al. 2005). The end of the Imperial period is also known for the introduction of modern commercial farms. This period ended following the popular revolution in 1974, the beginning of the second period as indicated below.

2.4.2. Development trajectory under the *Derg* Regime

In 1974, emperor Haile Selassie was overthrown in a coup by the *Derg* regime, which established a Marxist military government led by Mengistu Hailemariam (Keeley and Scoones 2000). According to Adhana (1991), the Soviet-supported regime which carried out a radical land reform by ending the landlordism associated with the imperial system. Following the 1975 Land Reform Proclamation, the military government abolished the feudalistic land ownership arrangements and established semi-collectivist land use in which a socialist form of land tenure reform for the use of agricultural land by peasants, but not ownership (Adhana 1991). It was done by the removal of land from landowners. The hiring of labour and sales of land was prohibited because of their perceived inconsistency with Marxist socialism (Belete 1989; Adhana 1991).

The Land Reform Decree of 1975 (strengthened by a supplementary decree) abolished feudal agrarian relations, outlawed capitalism in the agricultural sector, made land accessible to all peasants during 1975-1977 based on usufruct and provided for a socialist transformation of Ethiopian agriculture (Adhana 1991). Supporting the argument of Adhana, some argued that the *Derg* regime that led the country for 17 years (1974-1991) nationalized the land and abolished the feudalistic land management system and redistributed most of the land among rural households which form new agrarian relations and mechanisms of accessing land. The objective of the land redistribution was to allocate equal land area per household and thereby improve the performance of agriculture (Holden, Shiferaw et al. 2004).

According to some authors, as soon as the *Derg* regime took over in 1974, it brought a radical change in land ownership and management. In this regard, Teshome (2006) highlighted that the government nationalized all land and introduced a new motto "land to the tiller" which abolished not only the feudalistic land ownership but also the relationship of landowners and tenants. Though the land reform got the support of the citizens, it was blamed for two things. It did not compensate the landowners and the land distribution was made under strict conditions that farm plots could not be sold, mortgaged or transferred in any way except to one's children (Alemu, Oosthuizen et al. 2002).

The period 1974–1991 was witnessed to be a centralized economic system (socialism), where the state played a significant role in all spheres of economic activity (Zerihun 2008). Economic policy during the *Derg* regime was largely guided by the central planning organ. According to some authors, about six annual development campaigns were carried out by the Central Planning Supreme Council (CPSC) between 1978-1984 (Feoli, Vuerich et al. 2002). The campaigns were primarily designed to instil socialist production ideology among rural farmers. Massive resettlement and villagization programs were launched to promote collectivization. Under collectivization, the peasantry was forced to give up their individual farms and join collective farms. However, according to Zerihun (2008), despite such efforts, collectivization campaigns (the process by which farmland is aggregated) could not sweep rural Ethiopia as it did in other socialist countries for it was less coercive.

Though the objectives of villagization programs in Ethiopia were similar with that of Ujamaa in Tanzania, the peasantry was forced to give up their individual farms and join collective farms. On the other side, Ujamaa was a social and economic policy developed and implemented in Tanzania after it gained independence from Britain. It is the legacy of Julius Nyerere in the quest for social and economic development in Africa (Jaimungal 2019). It aimed at bringing pleasant producers together in villages for cooperative production based on equality of opportunity and self-help. At first, the policy was voluntary, stressing that the peasants themselves should initiate, control, and run their villages. According to Jaimungal (2019) the idea and principles of "Ujamaa" were used and incorporated to the nation's development policies, and to connect with the nations principles without interference from capitalism. The development policies align more with dependency theorists. It focuses on domestic economies, the adoption of socialism and the importance of self-reliance and independence. They also believed capitalism was a new form of colonialism, and that self-reliance was the only way to break the dependency link. There was to be a massive emphasis on rural development with the accent placed on communal living in villages organized on the principle of Ujamaa, foreign capital was to be nationalized, leaders were to dispossess themselves for wealth, the people were to be educated for development, and equality promoted in general (Jaimungal 2019).

The *Derg* regime developed some mechanisms to control agriculture such as collectivized agriculture, state control prices, input supply and marketing. In this regard, the government was intending to transform the livelihood of rural people through resettlement and by creating new villages (Keeley and Scoones 2000). Moreover, it instituted restrictions not only on grain exports but also on grain movements within Ethiopia, from surplus areas to food-deficit ones (Lightbourne 2007). The planning office was directly involved in formulating targets and following up on their realization.

The *Derg* regime developed a ten-year long-term plan (1984/85 to 1993/94), intending to address structural problems that hinder the development of the nation. The Ten-Year Perspective Plan was modified by a three-year plan (1987-1990) and further into annual plans. Attention was given to the productivity of selected cereal crops such as *Teff*, barley, wheat, maize, and sorghum (Alemayehu 2001). The long-term plan was discontinued after the introduction of a Mixed Economic Policy in March 1990 which brought an end to collectivized agriculture under which multiple farmers run their holdings as a joint enterprise. As a result, lands belonging to all collective farms were distributed to members (Alemayehu 2001).

One of the main aims of this plan was to bring about structural transformation. This can be seen in the planned targets of reducing the share of agriculture in GDP from 48.3% at the beginning of the planning period to 39.1% at the end of the planning period; increased the share of industry from 16% to 23%; and real GDP growth of 6.9% per annum during the target period. Despite such political commitment, many of the targets were not realized. Growth remained at about 2%, the sectoral share remained stagnant, and in general by 1990, just before the downfall of the regime, all economic indicators deteriorated (Alemayehu 2000).

According to some authors, the government has been unable to provide basic services for the steady development of agricultural productivity, yet the peasantry has shown a remarkable willingness to break with its traditional practices (Adhana 1991). He also concluded that the inability to date for Ethiopia to deal with the factors that lead to famine rests not so much with the peasantry, but rather more with shortcomings in the government programs of agricultural rehabilitation and development (Adhana 1991). In this regard, most of the government programs and projects implemented in Ethiopia failed and as a result, the food production and productivity didn’t achieve their targets (Kebede 1993).

According to Benin, Smale et al. (2004) to speed up the establishment of socialist production relations in rural areas, marketing and pricing policies, which marginalized private peasant farms, were introduced. This limited production growth made the economy vulnerable to natural calamities as witnessed in the 1980s (Benin, Smale et al. 2004). Therefore, their marginalization had a serious impact on the overall performance of the economy (Alemu, Oosthuizen et al. 2002).

Cereals constituted by far the most important annual crop to farm households, accounting for more than 80% of the total area planted with annual crops. The rest is cultivated with pulses and oilseeds. Among cereals, maize and *Teff* have the largest shares, respectively accounting for 25% and 23%. Different studies have found that given the size and diversity of Ethiopia, due to the differences in household choices, income and prices for different crops, the level, and type of grain consumption varies from region to region (Alemayehu 2000; Klugman and Loening 2007).

As per the report of some researchers, the annual cereal per capita consumption (kg per person per year) in Ethiopia was increasing from time to time such as 40.7 kg for years 1961-70, 42.2 kg for years 1971-80, 51.3 kg for years 1981- 90, 60.7 kg for years 1991- 00 for years and 76.7 kg for years 2001-03 (Mkumbwa 2011). Though *Teff* crop is produced in rural areas by farmers, its consumption is high in urban non-poor dwellers as compared to rural households and poor households. Geographically, the consumption of *Teff* crops is high for the northern highlands as compared to south-central highlands. The regional pattern is reversed for maize and wheat, for which per capita consumption of rural households is higher in the south-central highlands than in the northern highlands (Klugman and Loening 2007).

The marketing mechanism adopted to extract resources from agriculture was conducted through the Central Planning Authority (CPA), which was the highest body engaged in production and marketing decisions. Production targets were imposed on the lowest production at individual peasant farms through a vertically administered hierarchy. A government marketing parastatal called the Agricultural Marketing Corporation (AMC) was established in 1976 (Alemu, Oosthuizen et al. 2002).

In the 1980s Ethiopian farmers were required to sell a portion of their output to the government at fixed prices under the compulsory grain delivery (CGD) system. To increase the grain procurement capacity of the Agricultural Marketing Corporation, grain quotas, fixed procurement pricing systems and grain checkpoints were introduced. Under such a system, producers were allowed to buy and sell farm output on the local market after meeting their obligation. As per some researchers, such a system affects the resource allocation decisions of farmers and their livelihoods (Alemayehu 2000; Alemu, Oosthuizen et al. 2002).

The CGD is likely to have reduced the long-run acreage share (and thus the long-run supply) of the crops. It is likely to have done so directly and indirectly (through lower market prices) reducing farm households' returns from these crops. Due to low food production, people in Ethiopia faced a chronic food deficit which was only made good through external food aid. Agriculture, apart from being unable to supply agricultural raw materials required by the manufacturing sector failed to generate sufficient foreign exchange earnings for the procurement of operating inputs and thereby affecting the productive capacity of all sectors (Alemayehu 2000).

The estimated elasticity of acreage demand for *Teff* production implies that CGD had reduced the long-run acreage share (and thus the long-run supply) of *Teff*. The conclusion of a researcher indicates that if comparable effects were exerted on other crops by CGD, the overall direct impact may have been significant, particularly in the light of considerable food insecurity Ethiopia suffers from (Alemayehu 2000).

At the national level, the average share of farm households in EAMC's (Agricultural marketing corporation, AMC) total domestic purchases range from 60% for maize to 76% for *Teff*. It is highly demanded as a food crop, particularly in urban areas. Partly as a consequence of this demand, it is the most commercialized food crop, constituting a major source of cash income for farm households. For the same reason, *Teff* has also been the main target of EAMC in its cereal procurement effort. On average, it accounted for 36% of EAMC's annual cereal purchases from farm households. As a result, the imposition of the *Teff* 'quota' on-farm households is likely to have had a very large impact on their cash income and welfare (Alemayehu 2000).

Generally, during this period, the overall performance of the economy was lower than that registered before 1974. On average, GDP grew by about 1.7% during this period. The corresponding population statistic was 2.9%. The income per head, therefore, fell on average by 1.2% per year (Zerihun 2008).

2.4.3. Development trajectory under EPRDF

Since the 1980s, trade liberalization has become an increasingly common feature of economic policy in developing countries (Allaro 2012). States that assume active roles in productive economic spheres tend to guide their interventions by development policies and strategies (Gebrehiwot and Mengistu 2014). According to Melkamu (2017), the International Financial Institutions (IFIs) are institutions which provide finance to the national governments for the purpose of poverty reduction and economic prosperity. Africans were the "beneficiary" of loan and aid provided by IFIs, but they are compelled to reform their national government policies according to the expected "conditionality" (Santos-Paulino and Thirlwall 2004). The conditionality is highly interrelated with the notion of neoliberalism. Other researchers also stated that developing countries have liberalized their trading regime intending to gain static and vibrant gains from trade for both the growth of export and imports and consequently improved welfare

(Santos-Paulino and Thirlwall 2004). In this regard, the Ethiopian economy needed a transition from a war economy to a peace economy and from a centrally planned to a market-led economy (Adhana 1991).

In this regard, in 1991, the EPRDF government has been with new economic policy which neo-liberal reform measure. Instantly, the Ethiopian currency was devalued, privatization and liberalization were authorized within selected areas. Other sectors like, land was constitutionally declared a state property; telecommunications, water and electricity supply as stated in proclamation were under the monopoly of the government (Melkamu 2017).

The 1991 change in government has not brought a change in the land tenure system. Land continues to be a public property where land users are entitled to usufruct rights. Land marketing and permanent land transfers are prohibited. These rules were further consolidated in 1995 when they were incorporated into the constitution (supreme law of the land). Regarding the ownership and utilization of land, the constitution in its Proclamation No. 1/1995, Article 40, No.3 stated the following.

> The right to ownership of rural and urban land, as well as all-natural resources, is exclusively vested in the State and the peoples of Ethiopia. The land is a common property of the Nations, Nationalities and Peoples of Ethiopia and shall not be subject to sale or other means of exchange (Gazeta 1995).

Concerning the conditions to land access, the constitution makes it clear in its proclamation No. 1/1995, Article 40, No.4 that any Ethiopian who wants to earn a living has the right to access land as indicated below.

> Ethiopian peasants have the right to obtain land without payment and the protection against eviction from their possession (Gazeta 1995).

Based on the federal constitution, the mandate for land administration is given to regional states. The four main regions of Ethiopia (Amhara, Oromia, SNNP, and Tigrai) adopted proclamations on land use in 2002–03, in particular in the north (Tigrai and Amhara). Proclamations were adopted in southern regions in 2003 (Lightbourne 2007). The size of land ownership on which farmers grow for both subsistence and cash crops ranges between half and one hectare. To minimize the frequency of land allocation, the regional states developed land leases policies ranging from 25 to 50 years duration and such leases are transferable (Lightbourne 2007).

The Government of Ethiopia has been implementing its strategy of Agricultural Development-Led Industrialization (ADLI) that sees agriculture as the engine of growth (Minten, Stifel et al. 2012; MoFED 2012). In this regard, in the agricultural sector, Ethiopia has a comprehensive and consistent set of policies and strategies that reflects the importance of the sector in the nation's development aspirations (MoFED 2012). Agricultural Development Led Industrialization (ADLI) is a central pillar of economic policy in the agriculture sector. In line with this, there are other policy issues including Policy and Investment Framework (PIF) and the Five-Year Growth and Transformation Plan (GTP). The Goal of the PIF is to "contribute to Ethiopia's achievement of middle-income status by 2020". The objective embodies the concepts of producing more, selling more, nurturing the environment, eliminating hunger and protecting the vulnerable against shocks; all of which are embodied in various national policy instruments (MoFED 2012; Kahsu 2018).

In the Five-Year Growth and Transformation Plan (GTP) 2010-11 to 2014-15, agriculture is seen as the key driver of economic development with particular attention to scaling-up the best agricultural practices to provide a foundation for the expansion of the industrial sector (MoFED 2010). The Growth and Transformation Plan (GTP) envisages that the country's GDP per capita would grow from 378 USD in 2010 to 1,271 USD in 2025. Besides, the Climate Resilient Green Economy (CRGE) strategy projects that the contribution of agriculture will diminish from 42% to 29%, indicating migration of jobs from the agriculture sector to industry and services (MoFED 2012).

The Plan for Accelerated and Sustained Development to End Poverty (PASPED) documented that the market strengthening relates to improving both the functioning of local markets so farmers capture greater benefits, and improving integration with regional and global markets for commercial agriculture. Particular interventions include a better market information system that collects and disseminates information on prices and demand for food crops, livestock, and cash crops; the development of market infrastructure, especially in small-to-medium-sized towns which can serve as growth poles; and the development of agricultural cooperatives and other marketing institutions. In describing the policy and strategy changes, Ethiopia has had near-total deregulation of agricultural marketing and increased competition have improved farm-gate prices for grains and coffee (White and Leavy 2001; Rahmato 2008; Demeke and Haji 2014).

However, many smallholder farmers are poorly connected with market systems as they lack market information and their bargaining power to benefit fully from market transactions is low (Teferi 1992). As a result, they receive a smaller share of the consumer price of their products than they should. A major effort of the government centers on support for farmers' cooperatives to strengthen the power of small farmers to participate in the liberalized market environment whereby farmers are free to produce and sell their crops anywhere and at anytime, with a target of 70% of farmers being in cooperatives by 2010. However, a lot of effort needs to be exerted to enhance the level of market participation since the majority of smallholders are not well integrated with the market yet (Dejene 1989; Teferi 1992; Demeke and Haji 2014).

The PASDEP document also describes about the commercial agriculture whereby the private sector takes the lead as a strategy but the government helps with ensuring the flow of information on international markets and opportunities; establishing a level playing field; making available the necessary infrastructure, and access to land, and providing selected direct support for getting access to new technologies (MoFED 2006; Teshome 2006).

On the other side, despite the emergence of many microfinance institutions, only 6% of smallholder farmers in Ethiopia have access to financial services. The PASDEP also gave attention to promote the saving and credit service cooperatives and the expansion of rural microfinance institutions (Ababa 2006; Teshome 2006).

Ethiopia's rural development policy and strategies prioritize the transformation of smallholder subsistence agriculture to market-oriented production. In this regard, the government is focusing on strengthening extension services by allocating substantial human resources and budget. For instance, the Ethiopian government has allocated more than 16% of its annual budget to the development of agriculture and attained an annual mean agricultural growth rate of more than 8% for the last 8 years (Gecho, Ayele et al. 2014).

Existing government direction to transform smallholders from subsistence-oriented to the market-oriented production systems is proving to have an encouraging result. Smallholders represent the vast majority of Ethiopian farmers; about 37% of the farming households in the country cultivate less than 0.5 hectare and about 87% cultivate less than 2 hectares. Only 12.8% of the farmers own more than 2 hectares of land and 0.9% own more than 5 hectares (Se, Dorosh et al. 2010; CSA 2011).

Although Ethiopia has made substantial progress in increasing food production, rising household incomes and establishing a safety net, tens of millions of people remain vulnerable to adverse shocks that have major implications for food supply, prices and household welfare (Robinson, Willenbockel et al. 2010). In this regard, since 2006, the country was experiencing double-digit inflation, reaching more than 40% in 2008. The inflation of the period is mainly related to ever-soaring food prices (Durevall and Sjö 2012). In this regard, Ethiopia has banned the export of grains for an indefinite period in a way to stabilize the domestic price of grains.

In early 2008, Ethiopia was hit hard by the global food crisis, and possibly had one of the highest food price inflation rates in Africa. The high food price inflation is mainly attributed to the sharp rise in cereal prices. The overall consumer price index (CPI) inflation rate reached a historical peak of over 60% in July 2008 (Loening and Mikael Imru 2009). Due to accompanying macroeconomic imbalances, such as the lack of foreign exchange and pressure on the balance of payments, Ethiopia has faced a deeper crisis than many other countries in the Africa region. Some authors also stated that the food crisis fundamentally revealed that Ethiopia's impressive official growth rate has not removed the longstanding problem of pervasive food insecurity, the absence of alternative sources of income other than agriculture to diversify risks, and may point to structural weaknesses of the economy, in particular, its severe vulnerability to price shocks (Loening, Rijkers et al. 2008; Loening and Mikael Imru 2009). As food accounts for 57% of total household consumption expenditure, high food prices during 2007-2008 caused severe hardship for the people, especially the most vulnerable segments of the population. In this regard, it should be considered that cereals are dominant in Ethiopia taking the lion's share of the household budget and food price inflation mainly comes from the rise in the price of cereals (Woldie and Siddig 2009).

Some authors analyzed the factors affecting the major grain prices in Ethiopia and reported that the liberalization of the grain market was found to have a major impact on access to grain by the households in the country (Asfaw, Tolossa et al. 2010; Chawarika 2016). They further illustrate the importance of macroeconomic fundamentals in the food security of the nation particularly the liberalization of grain markets by enhancing access. Finally, they recommended that local agricultural farmers should have wide market access on which farmers can sell their products, and also be linked to international markets. Similarly, the price which farmers receive for their agricultural commodities has a great influence on their food security status (Asfaw, Tolossa et al. 2010; Chawarika 2016).

Ethiopia's state-led development strategy has contributed to considerable poverty reduction and progress toward achieving the Millennium Development Goals (MDGs). In this regard, since 1992 Ethiopia has instituted a series of medium to long term plans and focused policies such as the Agriculture Development Led Industrialization (ADLI), Poverty Reduction Strategy Paper (PRSP), a Plan for Accelerated and Sustainable Development to End Poverty (PASDEP) in 2005/6 - 2009/10/. In 2010, Ethiopia also unveiled a Growth and Transformation Plan (GTP) for the period 2010/11-2014/15. At the same time, a Climate Resilient Green Economy Strategy (CRGE) was developed in 2011 and launched at the 17th conference of the parties to the United Nations Framework Convention on climate change in Durban in 2011 (César and Ekbom 2013; Melke 2013). These policies and strategies indicate the government's direction to transform smallholders from subsistence-oriented to market-oriented production systems.

In terms of the results of the above policies and strategies on livelihood, the Federal Democratic Republic of Ethiopia National Plan Commission (2017) report indicates that integrating with its national development frameworks, Ethiopia has implemented the Millennium Development Goals (MDGs) which spanned the period 2000 to 2015 and registered remarkable achievements. The MDGs were implemented through effective government leadership and coordination of all stakeholders in an organized and structured manner throughout the country. The integration of MDGs with the national development frameworks enabled full access to the national budget allocated and human capital deployed for the implementation, coordination, monitoring and evaluation of the national development frameworks by avoiding duplication of efforts. Ethiopia had also a recent experience in evaluating and capturing best practices and identifying challenges from the national review it had conducted on the performance of the MDGs were important lessons of experiences have been drawn at the national level with which Ethiopia has made significant contributions to the preparation of the 2030 Global Agenda for Sustainable Development (Federal Democratic Republic of Ethiopia National Plan Commission 2017).

Despite the complex national and international economic conditions, rapid economic growth has been registered during the past five years. It grew on average at 10.1 percent per annum, which is about double the growth rate registered by its peers in the world. The growth was broad based and inclusive in the sense that it was translated into better human development outcomes. This growth performance has enabled it to sustain rapid growth over the last 12 years within a stable macro-economic environment (Federal Democratic Republic of Ethiopia National Plan Commission 2017).

Based on the report of the Central Statistical Agency (CSA), land productivity of the major crops has increased during GTP I period. Average productivity of the major crops by smallholder farmers for the main season increased from 15.7 quintal per hectare in 2009/10 to 21.5 in 2014/15 (CSA 2016). Average productivity growth of selected cereals such as maize, *Teff*, barley and wheat for the last 12 years (2003/04 – 2014/15) stood at 6.2, 5.8, 4.8 and 5.4 percent, respectively. On the other hand, growth of cultivated area with these cereals averaged 4, 4.3, 1.5 and 4.4 percent, respectively. Likewise, growth of production of these cereals averaged 10.7, 10.4, 6.3 and 10 percent, respectively. This shows that the main source of increase in production of these cereals is land productivity growth rather than expansion of cultivated area (Federal Democratic Republic of Ethiopia National Plan Commission 2017).

According to the National Plan Commission (2017) report, given the bulk of the rural population derives its livelihood from agriculture and poverty is by and large a rural phenomenon, agricultural growth has been a major driver of poverty reduction in Ethiopia. The proportion of the population living below the national poverty line fell from 38.7% in 2003/4 to 29.6% in 2010/11. This study clearly indicated that the proportion of the population living in poverty has fallen in both rural and urban areas. By the end of 2014/15; the proportion of the population living below the national poverty line was estimated to decline from 29.6 to 23.4 percent. This progress shows that the country is on track to achieve the target of reducing income poverty by half by the end of 2014/15 (Federal Democratic Republic of Ethiopia National Plan Commission 2017). In summary, as per the research result of Welteji (2018) and Alemu et al (2002), the development trajectory of Ethiopia and its results is summarized in Table 25 in the annex.

2.5. The place of *Teff* and its contribution to the national economy

In Ethiopia, agriculture directly supports about 80% of the population in terms of employment and livelihood and contributes more than 40% of the country's Gross Domestic Product (GDP). Furthermore, it generates about 90% of the export earnings and supplies around 75% of the raw material requirement of agro-based domestic industries (MoFED 2012). Agriculture in Ethiopia is subsistence. The major food crops are produced in almost all regions of the country despite the variation in the volume of production across the regions. The variation may be attributed to the extent of area devoted to each crop type, variations of soil fertility, weather conditions (rainfall, temperature, wind, etc changes) and a shift in preference for the crops grown (CSA 2017/18).

There are two cropping seasons in Ethiopia, i.e., *Belg* (short rainy season) which runs from March to May and *Meher* (main rainy season) which occurs in June to September. *Belg* rains are mainly used for land preparation and planting long cycle crops such as maize. The *Meher* rain is used for planting potato, green paper, haricot bean, sweet potato and to some extent *Teff* (Bechaye 2011). Most farmers depend on rain-fed agriculture and use mixed farming. Thus, both crop production and animal husbandry are commonly practiced. Crop yield per area (amount of crop harvested per amount of land cultivated) is the most commonly used indicator for agricultural productivity. Crop yields are inevitably affected by many factors, these are weather, soil fertility, amount of fertilizer used, input price, changes in farming practices, quality of seed varieties, and use of irrigation schemes (CSA 2017/18).

According to the Central Statistics Agency (CSA), grain crops refer to the major crop category which includes cereals**,** pulses and oilseeds, which constitutes the major food crops for the majority of the country's population. Grain crops also served as a source of income at the household level and they are a contributor to the country's foreign currency earnings, among others. Within the category of grain crops**,** cereals are the major food crops both in terms of the area they are planted and volume of production obtained. They are produced in a larger volume compared with other crops as they are the principal staple crops. Cereals are grown in all the regions with varying quantities (CSA 2017/18). The results of *Meher* season post-harvest crop production survey conducted by CSA indicate that a total 12,677,882.27 hectares of land are covered by grain crops i.e. cereals, pulses and oilseeds, from which a total volume of 306,126,383.06 quintals (1 quintal = 100 kg) of grains are obtained from peasant holdings (CSA 2017/18).

Within the category of grain crops**,** cereals are the major food crops both in terms of the area they are planted and volume of production obtained. Out of the total grain crop areas, about 80.71% (10,232,582.23 hectares) was under cereals. *Teff*, maize, sorghum and wheat took up 23.85% (about 3,023,283.50 hectares), 16.79% (about 2,128,948.91 hectares), 14.96% (1,896,389.29 hectares) and 13.38% (1,696,907.05 hectares) of the grain crop area, respectively. Cereals contributed 87.48% (about 267,789,764.02 quintals) of the grain production. Maize, *Teff*, wheat and sorghum take the highest share of production as compared to other crops. In this regard, maize, *Teff*, wheat and sorghum made up 27.43% (83,958,872.44 quintals), 17.26% (52,834,011.56 quintals), 15.17% (46,429,657.12 quintals) and 16.89% (51,692,525.40 quintals) of the grain production, in the same order (CSA 2017/18).

In terms of the number of farmers involved in cereal production, maize takes the lead followed by *Teff*, sorghum, wheat and barley. In terms of land covered by cereal crops, *Teff* takes the lead followed by maize, sorghum, wheat and barley. In terms of productivity per ha, maize takes the lead (39.44 quintals per ha) followed by rice (28 quintals per ha), wheat (27.36 quintals per ha) and sorghum (27.26 quintals per ha). The productivity of *Teff* (17.48 quintals per ha) is low as compared to other crops (CSA 2017/18). For the details, please refer to Table 2.2 below.

Table 2.2: Number of producers, area cultivated and production of grain crops

Crop	**Number of producers**	**Area covered in hectares**	**% Distribution**	**Production in quintals**	**Yield (Qt/ha)**
Grain Crops	15,670,567.00	12,677,882.27	100	306,126,383.06	
Cereals	15,051,667.00	10,232,582.23	80.71	267,789,764.02	
Teff	**6,771,977.00**	**3,023,283.50**	**23.85**	**52,834,011.56**	**17.48**
Barley	3,505,609.00	951,993.15	7.51	20,529,963.72	21.57
Wheat	4,212,518.00	1,696,907.05	13.38	46,429,657.12	27.36
Maize	10,573,934.00	2,128,948.91	16.79	83,958,872.44	39.44
Sorghum	5,368,096.00	1,896,389.29	14.96	51,692,525.40	27.26
Finger millet	1,765,407.00	456,057.31	3.6	10,308,231.53	22.60
Oats/'Aja'	205,700.00	25,896.22	0.2	526,318.93	20.32
Rice	161,376.00	53,106.79	0.42	1,510,183.30	28.44

Source: CSA, Agricultural sample survey (2017/18)

Pulses grown in 2017/18 (2010 E.C.) covered 12.61% (1,598,806.51 hectares) of the grain crop area and about 9.73% (29,785,880.89 quintals) of the grain production. Faba beans, haricot beans (white), haricot beans (red), and chickpeas were planted to 3.45% (about 437,106.04 hectares), 0.71% (about 89,382.68 hectares), 1.71% (about 216,803.91 hectares) and 1.91% (about 242,703.73 hectares) of the grain crop areas, in the same order. The production obtained from faba beans, haricot beans(white), haricot beans (red) and chickpeas were 3.01% (about9,217,615.35 quintals), 0.48% (about 1,482,128.42 quintals), 1.22% (3,727,664.85 quintals) and 1.63% (4,994,255.50 quintals) of the grain production, respectively (CSA 2017/18).

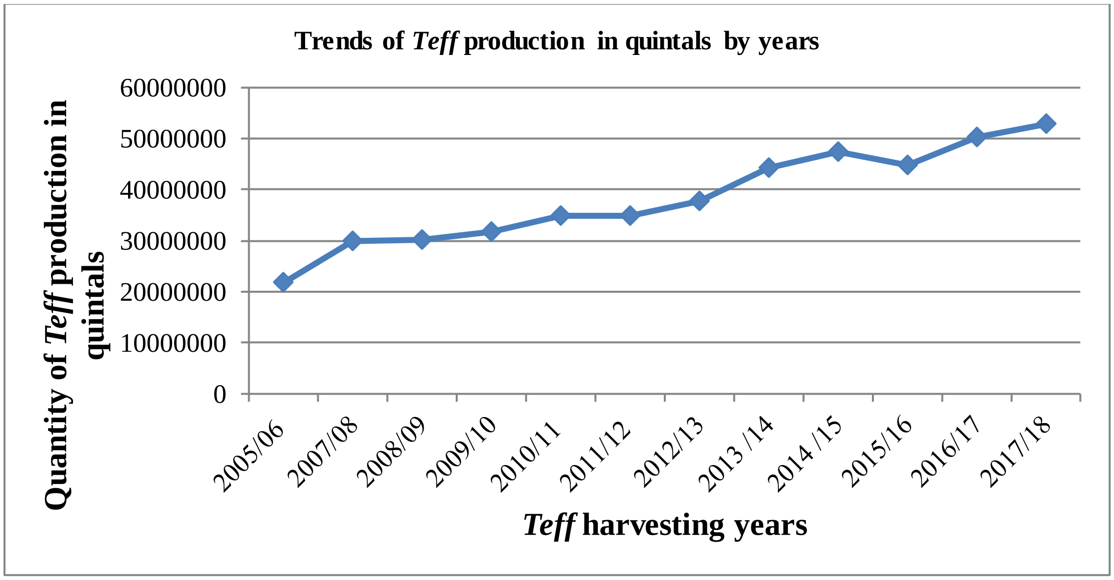
Oilseeds added about 6.68% (846,493.53 hectares) of the grain crop area and about 2.79% (8,550,738.16 quintals) of the production to the total national grain. Neug, sesame and linseed covered 2.29% (about 290,494.94 hectares), 2.92% (about 370,141.06 hectares) and 0.62% (about 79,044.51 hectares) of the grain crop areas and 1.06% (about 3,233,448.82 quintals), about 0.84% (2,559,034.30 quintals) and 0.29% (about 882,096.51 quintals) of the grain production, respectively (CSA 2017/18).

2.6. Trends of *Teff* production at national level

Teff is the preferred staple food and mostly grows in the highlands. It can be grown under a wide variety of agro-climatic conditions, such as elevations from zero to 2,800 metres above sea level (masl), under a similarly wide variety of moisture, temperature, and soil conditions. Its optimal growing conditions coincide with its traditional production areas: 1,800–2,100 masl, average annual rainfall of 750–1,000 mm, and average annual temperature of 10–27°C (Mohajan 2013).
The compiled statistical report of Central Statistical Agency (CSA) indicates that the number of *Teff* producers has increased from 5,177,125 in 2005/06 to 6,771,977 in 2017/18 with the average growth rate of 10.90% per annum. Similarly, the area covered by *Teff* crops throughout the nation increased from 2,246,016.59 ha in 2005/06 to 3,023,283.50 ha in 2017/18 which shows the average growth rate of 11.22% per annum. Likewise, *Teff* production increased from 21,755,976.79 quintals in 2005/06 per year to 52,834,011.56 quintals in 2017/18 per year. The productivity of *Teff* crops also increased from 969 kg per ha in 2005/06 to 1748 kg per ha in 2017/18 (CSA 2017/18) (for the details, please refer Table 2.3, Figure 2.1 and Figure 2.2 below). Such increase of *Teff* production can be attributed to the increase of the number of farmers engaged in *Teff* production and increase of land coverage. On the other side, the *Teff* productivity increase can be

attributed to the use of agricultural inputs such as improved seed, fertilizers, chemicals and improved method of farming practice by smallholder farmers.

Figure 2.1: Trends of *Teff* production at national level in quintals by years



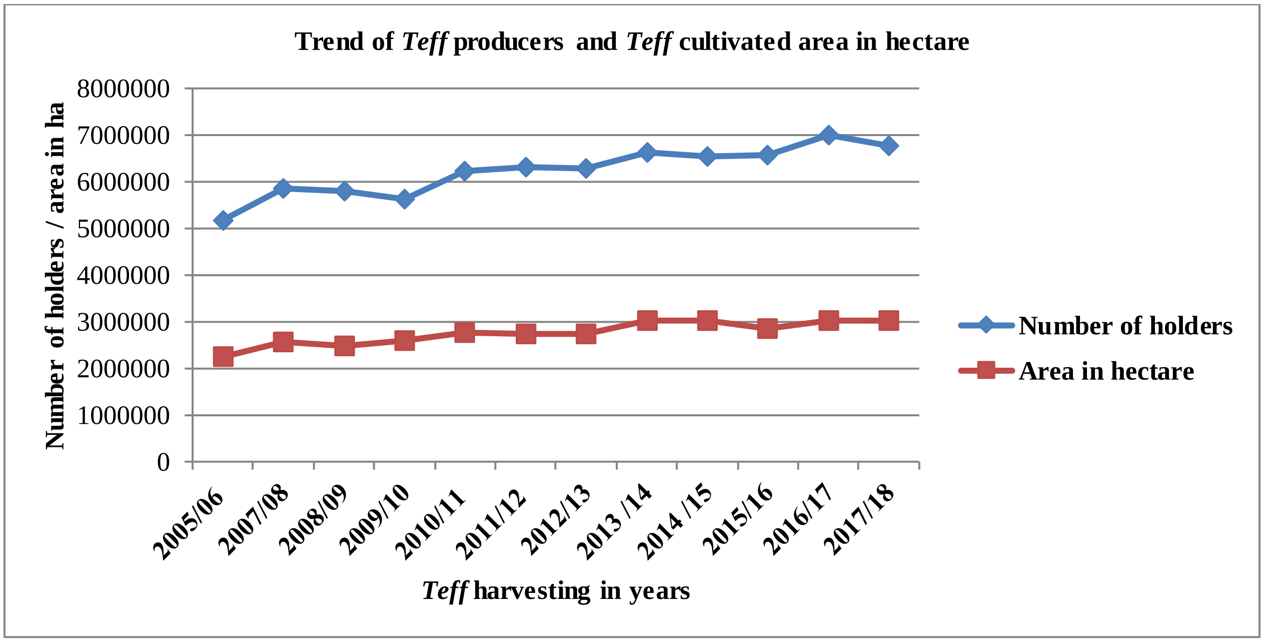
Source: CSA, Agricultural sample survey (2017/18)

Table 2.3: Trends of *Teff* production at national level by holders, area and production

Year	Number of holders	Area in hectare	*Teff* production in quintals	*Teff* yield (qt/ha)
2005/06	5,177,125	2,246,016.59	21,755,976.79	9.69
2007/08	5,850,536	2,565,155.22	29,929,234.99	11.67
2008/09	5,805,045	2,481,333.00	30,280,181.00	12.20
2009/10	5,630,440	2,588,661.00	31,793,743.00	12.28
2010/11	6,235,502	2,761,190.05	34,834,826.26	12.62
2011/12	6,300,048	2,731,111.67	34,976,894.64	12.81
2012/13	6,281,777	2,730,272.95	37,652,411.66	13.79
2013 /14	6,613,090	3,016,521.90	44,186,421.95	14.65
2014 /15	6,536,605	3,016,062.55	47,506,572.79	15.75
2015/16	6,562,325	2,866,052.99	44,713,786.91	15.60
2016/17	6,999,333	3,017,914.36	50,204,400.47	16.64
2017/18	6,771,977	3,023,283.50	52,834,011.56	17.48

Source: CSA, Agricultural sample survey (2017/18)

Figure 2.2: Trends of number of *Teff* producers and *Teff* cultivated areas in ha



Source: CSA, Agricultural sample survey (2017/18)

CHAPTER THREE: THEORETICAL AND CONCEPTUAL FRAMEWORK

3.1. Introduction

Chapter three presents the theoretical and conceptual framework for the explanatory variables affecting *Teff* production and distribution. It centers on exploring the dependent and independent variables that affect *Teff* production and distribution at household level. Finally, it presents the conceptual framework for *Teff* production, distribution and livelihoods to be used for analysis.

3.2. Livelihood and food security situation in Africa

Food insecurity is the situation that exists when people lack secure access to sufficient amounts of safe and nutritious food for normal growth and development and active and healthy life (FAO 2015). Food insecurity may be caused by the unavailability of food, insufficient purchasing power, inappropriate distribution, or inadequate use of food at the household level (Díaz-Bonilla 2015). Food security remains a crucial issue in many developing countries, especially given recent commodity price spikes and the impact of trade reforms (McCorriston, Hemming et al. 2013).

Achieving the eradication of global hunger by 2030 is the key objective of the United Nations system as reflected in the new post-2015 sustainable development agenda. Globally, about 108 million people were reported to be facing crisis-level food insecurity or worse in 2016. This represents a 35% increase compared to 2015 when the figure was almost 80 million (Sassi 2018). Based on the latest estimates of FAO, about 800 million people in the world suffer from hunger, i.e. lack of necessary calorie intake. This corresponds to about 11% of the entire population. Less than 15 million are affected in what the FAO defines as the developed regions; the vast majority of those affected live in low-income and middle-income countries. When we see the issue at the macro-region level the highest prevalence of hunger is observed in SSA (23.2%), followed by Southern Asia (15.7%) (Burchi, Scarlato et al. 2016).

Local agricultural capacity is the bedrock of food security in sub-Saharan Africa (AfDB 2011). Agriculture determines the availability of food, the first link in the chain of food security. For most Africans, especially the poor, agriculture is also the wellspring of income and work, core elements of human development. Despite its importance, agriculture has performed below its potential in sub-Saharan Africa and as a result low farm productivity is the main feature of the sector (Diao, Hazell et al. 2010).

As patterns of consumption and production continue to evolve, trade in agricultural and food products plays an increasingly important role in ensuring that growing demands from food-deficit countries can be satisfied (FAO 2015). High food prices, while being a potential opportunity for farmers who are net producers, have also acutely impinged on food security in several countries, severely constraining food access for vulnerable households. Prices largely declined on the international cereal market in 2016, reflecting downward pressure from ample global inventories and an increase in world cereal production in 2016 (Sassi 2018). Lower commodity prices and a difficult global economic environment have furthermore contributed to the worsening food security situation, including for the largest regional economies (Bruinsma 2017).

Food insecurity, a complex and multi-faceted phenomenon, is currently one of the international community's main priorities, especially in sub-Saharan Africa (SSA). As food insecurity in SSA is most widespread in pockets of extreme poverty, particularly in rural areas, traditional agricultural or general economic interventions alone are unlikely to generate substantial improvements (Francesconi and Heerink 2010). The rapid population growth of the SSA region is still a challenge which affects the ability of countries to ensure sustainable access to food. The population in the region has grown annually by a 2.7% increase from 507 million in 1990 to about 936 million in 2013 (FAO 2015). In many countries, the worsening situation in 2015 and 2016 can be attributed to adverse climatic conditions, often linked to the El Niño phenomenon, resulting in poor harvests and the loss of livestock. Conflict, sometimes in combination with drought or floods, also contributed to severe food insecurity in several countries (FAO 2015).

Sub-Saharan Africa is the poorest region in the world. The average real per capita income in 2010 was $688 compared to $1,717 in the rest of the developing world. Over the past 30 years, GDP growth per capita in SSA has averaged 0.16% per year. This failure of growth over the long term has resulted in high levels of poverty in the region (FAO 2015). In almost all of them, production is dominated by the primary sector in agriculture. Some researchers such as Bruinsma (2017) argued that agriculture is marked by low productivity with little application of science and technology. In sub-Saharan Africa, the prevalence of undernourishment appears to have risen from 20.8% to 22.7% between 2015 and 2016, and the number of people undernourished rose from 200 million to 224 million, accounting for 25% of the 815 million people undernourished in the world in 2016. At the same time, the proportion of the population that has experienced severe food insecurity because of their inability to access food has risen in the region (Chauvin, Mulangu et al. 2012; Bruinsma 2017).

A majority of sub-Saharan Africa's population lives in rural areas where poverty and deprivation are the most severe. Since almost all rural households depend directly or indirectly on agriculture and given the sector's large contribution to the overall economy, it might seem obvious that agriculture should be a key sector in development (Diao, Hazell et al. 2010). SSA has the necessary fertile land and labour to be food self-sufficient. However, the scarcity of major inputs including adequate water and fertilizers are the major challenges of the sector (Diao, Hazell et al. 2010). Agriculture in SSA is mostly rain-dependent, and this dependence makes it vulnerable to late rainfall onsets and prevents it from obtaining the best possible output (Chauvin, Mulangu et al. 2012). Also, since food in SSA is mostly produced by smallholder farmers, inputs such as fertilizers are mostly not available. Fortunately, governments and development partners around the continent have put in place various rural development programs that seek to subsidize fertilizer costs to make them widely available (Chauvin, Mulangu et al. 2012).

3.3. Agriculture and livelihoods in Ethiopia

The livelihoods approach starts with understanding the differential capability of rural families to cope with crises. It focuses on the assets of rural people, and how different patterns of asset holding (land, stock, food stores, savings, etc.) can make big differences to the ability of families to withstand shocks (Swift 1989). Livelihood studies were brought to the centre stage of development studies in the late 1990s and the beginning of the new millennium when the so-called Sustainable Livelihood Framework was strongly promoted by the Department for International Development (DFID), the British state development cooperation agency (De Haan 2012).

Agriculture constitutes the source of livelihood and the largest share of employment for the majority of the rural population in Ethiopia (Etana and Tolossa 2017). In Ethiopia, it constitutes the source of livelihood for the majority of the rural population and creates the largest share of employment. The agricultural sector is also dominated by smallholder households and it is a viable means of generating income for the farmers (Asfaw, Tolossa et al. 2010). However, the sector is challenged, among others, by the continued decline in per capita landholding and environmental degradation (Ezra 2003). Food shortages and economic underdevelopment are the major challenges of Ethiopia though it is endowed with a wide range of crop and agro-ecological diversity (MoFED 2012). According to MoFED and some authors, food security in Ethiopia, and elsewhere in Africa, is a major socio-political issue. Its economic wellbeing is also highly dependent on the success or failure of its agriculture (MoFED 2012; Abate, Shiferaw et al. 2015).

Considering the dependency of its 85% of the population on agriculture for their food and income, Ethiopia gave attention to developing food security and nutrition policies and strategies to support its development agriculture. These include the Food Security Strategy (2002), the National Nutrition Strategy and the National Nutrition Program (2008), the Growth and Transformation Plan (GTP I and II) covering 2011-20, and the Agriculture Sector Policy and Investment Framework (PIF) 2010-2020 (McGuire 2015). However, the agriculture sector is challenged by frequent droughts that trigger a widespread livelihood crisis. Production losses have also severely weakened food security and the purchasing power of households forcing many to sell agricultural assets and abandon their livelihoods (Alemu, Oosthuizen et al. 2002; AfDB 2011).

According to the CSA report of CSA, the average household size is approximately 5.1 persons in rural areas and 3.9 persons in small-town areas. The dependency ratio in rural areas is higher (105%) than that of the small-town areas (74%) (Jaudy and Kukenovaz 2011; CSA 2013). Although the country has witnessed promising changes in economic growth, in 2015 about 32% of the population was estimated to be undernourished in the country (McGuire 2015).

Ethiopia has registered substantial progress in human, social and economic development over the past decade. However, the challenge is to sustain this progress. Growth was rapid and inclusive, averaging 10.9% per year since 2004. Extreme poverty fell from 55% in 2000 to 33% in 2011 (Gebreeyesus 2016). Although most Ethiopians are rural dwellers and subsistence farmers, the poorest 40% tend to be even more likely to live in rural areas and engage in agriculture (Loening, Rijkers et al. 2008). In this regard, addressing the problem of food insecurity remains one of the development challenges of Ethiopia.

3.4. *Teff* production in Ethiopia

Ethiopia is the native home of *Teff* (Baye 2014). It is adapted to a large variety of environmental conditions and widely grown up to 2800 meters above sea level (m.a.s.l.) under various rainfall, temperature, and soil conditions (Haileselassie, Stomph et al. 2011). *Teff* is a semi-endemic crop, i.e. a crop that originated in a definable centre and with limited dispersal, and that its centre of origin is Ethiopia (Andersen and Winge 2005). It is relatively resistant to many biotic and abiotic stresses and can be grown under different agro-ecological conditions, ranging from lowland to highland areas (Haileselassie, Stomph et al. 2011). In spite of its low yield/ productivity relative to other cereals, *Teff's* contribution to the national economy cannot be overemphasized. *Teff* ranks first in total production and total cultivated cropland among other major cereals grown in Ethiopia. *Teff's* land productivity, however, lags behind major cereals such as maize and wheat (Hailu, Weersink et al. 2015).

Regardless of its economic contribution and potential, *Teff* is a very tiny cereal which is produced in a very drudgery system and has a number of problems in its production and postharvest management. In production, the system requires more labour as compared to other crops and the yield is one of the lowest compared to other world cereals (Cheng, Mayes et al. 2017). On the other hand, *Teff* is also a tiny cereal that is subject to loss particularly during the harvesting and threshing processes (Minten, Engida et al. 2016). Despite of Ethiopian government's policy to expand crop production for exports, domestic consumption, and universal food security, the productivity of *Teff* is the lowest among cereal crops (Haile, Tesfaye et al. 2004; MoFED 2012; Amentae, Tura et al. 2016; Tura, Goshub et al. 2016; Cheng, Mayes et al. 2017).

According toTura, Goshub *et al* (2016) *Teff* is a major food crop in Ethiopia and Eritrea but is a minor cereal crop worldwide. The report of MoFED (2012) indicates that yields of *Teff* are low (around 1200 kg per ha) despite fertilization with urea and diammonium phosphate. It is a tropical low-risk cereal that grows in a wider ecology. *Teff* production is mainly characterized by limited use of improved seeds, inefficient agronomic practices and fragmented farm plots (MoFED 2012). Its production is labour-intensive and with limited access to technology, there are no large-scale *Teff* producers in the country (Berhe 2009; FAO 2015).

The low productivity of *Teff* may reflect the low research and development investment in *Teff* seed improvement, a short history of *Teff* genotype improvement programs, limited resource for *Teff* research as well as lack of spillover from international research given that *Teff* is only produced in a major way in Ethiopia and Eritrea (Shita, Kumar et al. 2019). Though it is a national staple, the production is concentrated in Oromia, Amhara, SNNPR and Tigrai regions. Based on the data from the Central Statistics Agency (2017), during the 2016-2017 (2009 EC) *Meher* growing season, about 50.2 million quintals (1 quintal = 100 kg, same as a standard bag) of *Teff* were produced by smallholder households. In the same year, it was grown by 6.5 million smallholder households in Ethiopia with more than 3 million hectares of land, which represents one-third of total cereal acreage and about one-fifth of the gross cereal grain production (CSA 2017/18).

3.5. Theoretical foundations for *Teff* production and distribution in Ethiopia

3.5.1. Socio-demographic characteristics of *Teff* producers and features of *Teff* production

Teff [Eragrostis Tef (Zucc.) Trotter] is an important crop in the agricultural and food economy of Ethiopia. On the production side, *Teff* is Ethiopia's most important crop. In 2016/17, *Teff* was grown on 3,017,914.36 ha of land with total production of 50,204,400.46 quintal (1 quintal is 100 kg, same as a standard bag) and average production 16.64 quintal per ha (CSA 2017). *Teff* is a major staple crop for Ethiopian farmers, but national yield levels are low. According to Getu Hailu et al. (2016), *Teff* was grown by 43 per cent of all Ethiopian farmers.

Teff (Eragrostis teff) is the most important cereal crop in terms of both production and consumption in Ethiopia (FAO 2015). It is a major staple food crop in Ethiopia, as measured by some indicators such as acreage, harvesting, and consumption. Some research results indicate that *Teff* accounts for the largest share of the cultivated area (28.5% in 2011) (Demeke and Di Marcantonio 2013). Based on the report of the Central Statistics Agency (CSA) of the Federal Democratic Republic of Ethiopia, about 6.7 million smallholder farmers have been engaged in *Teff* production in 2017/18 in Ethiopia, covering more than 3 million hectares of land and producing 52.8 million quintals of *Teff* crops. The average national production is 17.48 quintal per hectare (Gideon 2016; CSA 2017/18; Cochrane and Bekele 2018). It represents one-third of total cereal acreage and about one-fifth of the gross cereal grain production (Demeke and Di Marcantonio 2013; Mottaleb and Rahut 2018; Demeke and Di Marcantonio 2019).

According to some scholars, although *Teff* is economically a very important cereal in Ethiopia, it is one of the lowest in terms of productivity (Joachim et al. 2016). The main factors contributing to poor yield in *Teff* are lodging and drought. Lodging is considered the major bottleneck affecting the productivity of *Teff*. The traditional broadcast sowing method has been also identified as one of the major constraints to increased *Teff* yields (Joachim et al. 2016). *Teff* is the dominant cereal crop in 83 high-potential agricultural districts, covering the highest area planted in the country (Cannarozzi, Plaza-Wüthrich et al. 2014; Girma, Assefa et al. 2014). *Teff* is also a national cereal crop in Ethiopia but mainly produced in four regions including Oromia, Amhara, SNNPR (Southern Nations, Nationalities and Peoples Region) and Tigrai (for the details, please refer table 3.1 below).

Table 3.1: Cultivated area and *Teff* production by regions in 2017/18 (2010 EC)

Regional states	Number of holders	Area in hectares	Production in quintals	Yield (Qt/Ha)	Contribution to national production	Rank
Oromia	2,765,117.00	1,443,847.96	25,814,577.48	17.88	48.86 %	1st
Amhara	2,539,035.00	1,138,030.51	20,394,482.71	17.92	38.60 %	2nd
SNNP	973,880.00	248,124.17	3,704,149.19	14.93	7.01 %	3rd
Tigrai	449,049.00	167,748.72	2,579,060.58	15.37	4.88 %	4th
Benishangul	42,791.00	24,529.72	328,696.77	13.40	0.62 %	5th
Afar	1931	919.72	12,480.76	13.57	0.02 %	6th
Gambela	145	68.79	564.06	8.20	0.00 %	7th
Somali	29	13.92	NA	NA	NA	8th
Harari	*	*	*	*	*	
Dire Dawa	*	*	*	*	*	
Total	**6,771,977.00**	**3,023,283.51**	**52,834,011.55**	**17.48**	**100.00**	

Remark: NA means data is not available and * stands for no *Teff* production at all
Sources: CSA (2017/18) Area, Production and Yield of Crops for Private Peasant Holdings

The compiled statistical report of Central Statistical Agency (CSA) indicates that the number of *Teff* producers has increased from 5,177,125 in 2005/06 to 6,771,977 in 2017/18 with the average growth rate of 10.90% per annum. Similarly, the area covered by *Teff* crops throughout the nation increased from 2,246,016.59 ha in 2005/06 to 3,023,283.50 ha in 2017/18 which shows the average growth rate of 11.22% per annum. Likewise, *Teff* production increased from 21,755,976.79 quintals in 2005/06 per year to 52,834,011.56 quintals in 2017/18 per year. The productivity of

Teff crops also increased from 969 kg per ha in 2005/06 to 1,748 kg per ha in 2017/18 (CSA 2017/18). This figure indicates that on average a farmer allocates 0.45 ha for *Teff* production and the average production is 780.19 kg per household.

However, *Teff's* land productivity lags behind major cereals such as maize and wheat. In this regard, Getu Hailu *et al* (2015) identified that the national average yield for *Teff* is approximately 100 percent below the national maize yield and 38 percent lower as compared to the national wheat in the 2010/11 crop year. They also found that *Teff* output could be increased by approximately 25% with the available inputs and technology through investments directed to improved gender-sensitive extension service and infrastructure development (Getu Hailu et al. 2015).

The report of CSA (2018) indicates that out of the total grain crop area, 80.71% (10,232,582.23 ha) was under cereals. *Teff*, maize, sorghum and wheat took up about 3,023,283.50 hectares (23.85%), 2,128,948.91 ha (16.79%), 1,896,389.29 ha (14.96%) and 1,696,907.05 ha (13.38%) of the grain crop area, respectively. Cereals contributed about 267,789,764.02 quintals (87.48%) of the grain production. Maize, *Teff*, wheat and sorghum made up 83,958,872.44 quintals (27.43%), 52,834,011.56 quintals (17.26%), 46,429,657.12 quintals (15.17%) and 51,692,525.40 quintals (16.89%) of the grain production, in the same order.

3.5.2. Examining explanatory variables affecting *Teff* productivity differentials

Agriculture can be an important engine of growth and poverty reduction. Some researchers such as Tarawali, Herrero et al. (2011) have recognized that agriculture is an engine of growth and poverty reduction in countries where it is the main occupation of the poor. The issue of increasing agricultural productivity has become the main concern of governments following a considerable increase in food prices (Haile, Tesfaye et al. 2004; Conradie, Piesse et al. 2009). Farmers produce *Teff* as an important crop for family food consumption and income generation purposes. As rational economic agents, farmers consider different issues as factors in making production and marketing decisions (Getnet 2007; Urgessa 2011). According to the literature and previous theories, the major factors affecting *Teff* production are described hereunder.

Sex of the head of the household:

Women make essential contributions to the agricultural and rural economies in all developing countries. Some of their activities typically include producing crops, tending animals, processing and preparing food, working for wages in agricultural or other rural enterprises, collecting fuel and water, engaging in trade and marketing, caring for family members and maintaining their homes (Barrett 2008; Haileselassie, Stomph et al. 2011). But, as per the report of some scholars, the agriculture sector is underperforming in many countries in part because women, who are often a crucial resource in agriculture and the rural economy, face more severe constraints than men in terms of accessing productive resources that reduce their productivity (Agada and Evangeline 2014).

In a study of post-harvest losses for *Teff* crops, female farmers were found to be more prone to high levels of losses than their male counterparts since *Teff* is very labour-intensive (Minten, Tamru et al. 2016). Other researchers argued that male-headed households tend to have more man-hours available for *Teff* harvesting and other farming activities compared to their female counterparts who have additional tasks and family responsibilities at home that reduce their available man-hour. In addition to these, female farmers may not be physically as strong as male farmers due to biological and sociological matters (Agada and Evangeline 2014; Amentae, Tura et al. 2016). In this regard, some researchers recommended that the positive contribution of females to agriculture needs policy attention on the promotion and empowerment of females through equal access to resources, technology, credit, and other facilities (Keller and Mbewe 1991; Mussema 2006).

Research outputs of some scholars indicate that the proportion of female-headed households ranked as ‘very poor’ was higher than that of male-headed households. A larger proportion of male-headed households ranked rich as compared to female-headed households (Nehru and Dhareshwar 1994). Other researchers also observed that gender disparity disadvantaged women concerning overall economic status as well as access to basic services and as a result, women have been considered as one of the food insecure groups (Cagatay 1998). Therefore, in this study it is expected that male-headed households produce more than women-headed households.

Age of the head of the household:

The expected influence of age is assumed to have a positive presumption as farmers get older, they could acquire skills to produce more. In this regard, some researchers argued that the higher the age of the household head, the more stable the economy of the farm household as older people have a relatively better experience in the farming activities (Kidane, Alemu et al. 2005). Moreover, older household heads are expected to have better access to land than younger heads. Younger men either have to wait for land distribution or have to share land with their families. Other researchers also arrived at a similar conclusion regarding the relationship between the age of a household head and agricultural production (Maharjan and Joshi 2011; Mwita, Otieno et al. 2011).

Household family size:

Household size is expected to influence the agricultural production status of households. The majority of farm households in Ethiopia are small-scale semi-subsistence producers with limited participation in non-agricultural activities (Hussein and Janekarnkij 2013). Increasing family size tends to exert more pressure on consumption than the labour it contributes to production. Thus, a negative correlation between household size and food security is expected as food requirements increase in line with the number of persons in a household (Humphrey, Costigan et al. 2003; Obamiro, Doppler et al. 2003).

Economically active members of the household:

Some researchers reported that the availability of labour is an important determinant of household production and food security, especially in subsistence-oriented households given the necessary landholding and rainfall (Kidane, Alemu et al. 2005). In subsistence farming, households with larger labour supplies are better positioned to increase the production of their land. Availability of a relatively larger labour force can be an advantage to those households who strive to achieve food security, provided that the excess labour force is engaged in other income-generating activities (Thomas and Leatherman 1990; Dixon, Gibbon et al. 2001).

Teff production is the function of labour and availability of the labour force is assumed to have a positive relationship to volume production. In this context, family size is expected to have a positive impact on *Teff* production and a negative impact on market participation and volume of sale (Haileselassie, Araya et al. 2016). Thus, in this study, it is expected that the availability of labour will affect agricultural production and thus food security positively. Referring to the labour-intensive *Teff* farming practice, an increase in active labour family size is expected to reduce post-harvest losses. The findings of research indicated that when household size increases by one person the amount of post-harvest losses decreases by 3.76% (Zeller, Diagne et al. 1998; Gebreselassie 2006). Therefore, a positive relationship between economically active members of the household and *Teff* production is expected in this study.

Literacy of the head of the household:

This is indicating whether the household head is literate or not. Literacy increases the ability of farmers to gather and analyze relevant information for their products (Akalu 2007; Gessesse 2009). In this regard, households who are literate are expected to produce more *Teff* crops as compared to illiterates.

Educational status of the head of the household:

Education broadens farmers' skills and techniques of modern farming which enables them to perform farming activities wisely and efficiently. This is because a farmer with good knowledge can adopt better practices than illiterates (Gebrehiwot 2009; Endale, Mengesha et al. 2014). Education is a factor which is thought to influence the agricultural production status of households. It could lead to the awareness of the possible advantages of modernizing agriculture using technological inputs; enable them to read instructions on fertilizer packs and diversification of household incomes which in turn, would enhance households' food supply. In a study conducted by Abrha (2015), education was found to have a significant and positive relationship in promoting agricultural production. This indicates that relatively better-educated household heads are likely to produce more as compared to those uneducated household heads. Similarly, other researchers indicated that educated households are expected to have better exposure to information that enhances agricultural production and thus they are also expected to be innovators in accepting new ways of doing things (Spielman 2008). Education is measured by years of formal schooling of the household. In this study, it is hypothesized that education affects *Teff* production positively.

Ownership of oxen:

It refers to the number of oxen the producers owned. Oxen ownership is a determinant factor in the agricultural production status of households (Alemu 2015). Oxen serve as a source of traction in many developing countries and thereby significantly affect households' crop production. Animal traction power enables households to cultivate greater areas of land and execute agricultural operations timely (Van der Veen and Gebrehiwot 2011). According to Alemu (2015), households with a high number of oxen may be engaged in more *Teff* production that increases the quantity of *Teff* crops. Producers who own oxen are more likely to till in time than those producers who do not own oxen. Therefore, a positive relationship between ox ownership and *Teff* production is expected in this study.

Livestock ownership:

A household's wealth status forms the other important source of livelihood for farming households. Livestock contributes to households' economy in different ways, e.g. as a source of pulling power, source of cash income, source of supplementary food, and means of transport (Kidane, Alemu et al. 2005). Besides, livestock is considered as a means of security and a means of coping strategies during crop failure. Livestock provides not only food for the producers, but also a range of other products that could be sold or consumed by the livestock owner to provide nutrition, income, traction, and fuel (Belay, Beyene et al. 2005). The major products of livestock include draught power, meat, milk, eggs, manure which is used as fertilizer or fuel, feathers, hides, and horns. In addition to these products, livestock serves as an asset and may provide a reserve that can be converted to cash in times of need. A study made by Belay, Beyene et al. (2015) stated that households who own livestock have good food security status as well as sustainable farming. Particularly in Ethiopia, where crop failure is frequent due to poor rainfall, the level of a household's resources is a critical factor in combating such disasters (Belay, Beyene et al. 2005). Thus, in this study, households with better livestock ownership tend to produce more *Teff* crops as compared to others.

Farm equipment ownership:

The existence of farm equipment (tools) like generator, treadle pump, ploughing set (*Maresha*), hoe (*Mekoferia),* ax (*Metrebia, Gojemo*), sickle (*Machid*) and hammer (*Medosha)* are important for the cultivation of *Teff* crops (Dixon, Gibbon et al. 2001; Rigg 2006; Haileselassie, Araya et al. 2016). In this study, we expect a positive relationship between access to farm equipment and *Teff* production.

Total land holding:

Agriculture is the means of livelihood in rural areas where farming activities predominate and where land is the critical resource (Rigg 2006). Land in Ethiopia is a public property that has been administered by the government for more than three decades (Gebreselassie 2006). The major types of tenure systems of agricultural land include own-holding resulting from inheritance and/or official land allocation, cash renting and sharecropping. Food production can be increased extensively through the expansion of areas under cultivation (Hiironen and Riekkinen 2016).

According to CSA, in Ethiopia, agriculture is predominantly smallholder where over 85% of farmers cultivate farms less than 2 hectares. In the 2000 cropping season, more than 87% of rural households operated farms less than 2 hectares; 64.5% of the total rural households operated in less than one hectare; while 40.6% operated farms of 0.5 hectares and less. Such small sizes of farms are fragmented on average into 2.3 plots. About 1% of farmers were reported to be landless in 2002 (Geda, Shimeles et al. 2009; CSA 2011). Under subsistence agriculture, landholding size is expected to play a significant role in influencing farm households' food security. The size of farmland owned by a household was determined by summing the fragmented plots and converting it to hectares using a conversion factor. In this study, farmland size is expected to affect the *Teff* production status of households positively.

***Teff* cultivated land:**

In agriculture, the land is one of the major factors of production. It is measured in terms of the number of hectares of land allocated for *Teff* production by the household and it is expected to affect the household level of *Teff* production positively. The cultivation of more *Teff* land enables the owner to earn more *Teff* output. Thus, *Teff* cultivated areas are expected to have a direct and positive relationship with *Teff* production (Asrat, Belay et al. 2004; Stavi and Lal 2015).

Soil fertility:

Inappropriate land use planning combined with overgrazing and population pressure has led Ethiopia to experience one of the highest rates of soil nutrient depletion in sub-Saharan Africa (Taddese 2001; Chanyalew, Adenew et al. 2010; Mussaa, Obare et al. 2011). Frequent tillage of the land by the farmers also decreases the soil fertility of the land (Oicha, Cornelis et al. 2010). Most scholars argue that farmers with better soil fertility produce more crops as compared to low soil fertility (Haileselassie, Stomph et al. 2011). The soil fertility of the land is assessed by requesting the views of the farmers towards the fertility of their farmland and it is assumed to have a positive and direct relationship with *Teff* production.

Availability of rainfall:

The potential to improve yields depends strongly on rainfall patterns (Sen 1981). Agriculture in Ethiopia is heavily dependent on rainfall, which is highly variable, both spatially and temporally. In many parts of Ethiopia, agricultural development is hampered by recurrent droughts, which over the years have increased both in frequency and severity in many parts of the country (Haile 2008). The average annual rainfall for the country is 848 millimetres (mm), varying from less than 100 mm over the Afar Lowlands in the northeast to 2,000 mm in the southwest highlands. Rainfall in many areas of Ethiopia is highly erratic and most rain falls intensively, often as convective storms, with very high rainfall intensity and extreme spatial and temporal variability (Haile 2008). Furthermore, rainwater harvesting often has double or triple benefits: not only does it provide more water for the crop but it also adds to the recharging of groundwater and helps reduce soil erosion (Wiebe, Soule et al. 2001). Considering the literature, in this study, we expect a positive relationship between the availability of rainfall (suitable weather conditions) and *Teff* production.

Application of irrigation schemes:

In addition to rainfall pattern, capturing and directing external water from the catchment areas to the field in which crops are grown (flood irrigation) and collecting external water from the catchments area and storing it in reservoirs, ponds and other structures for use during dry periods (storage for supplementary irrigation) can boost agricultural production (Sen 1981). An assessment made by Nata and Bheemalingeswara (2010) has shown that rainwater harvesting can increase yields two to three times as compared with conventional dryland farming. Also, the use of motorized water pumps and treadle pumps as part of water lifting technology have increased agricultural production (Nata and Bheemalingeswara 2010). In this study, it is hypothesized that the application of irrigation technologies influences *Teff* production positively.

Application of agricultural inputs:

Inspired by the high-yielding seed/fertilizer technologies credited for bringing about the Asian Green Revolution, many African governments have been promoting increased use of similar agricultural inputs in their own countries for more than three decades (Crawford, Kelly et al. 2003). The government of Ethiopia has considered fertilizer as a strategic input to ensure national food security and consequently, has taken policy measures to ensure its wider use (MoFED 2010). It subsidized fertilizer until 1997 when it abandoned subsidies. However, in Ethiopia, the adoption of modern and intensive agricultural practices such as the use of chemical fertilizer and improved seeds are quite low (Chanyalew, Adenew et al. 2010).

Fertilizer use is used by most studies as a proxy for technology (Funk and Brown 2009). According to the literature, subsistence farming, by its nature, is production for direct consumption. Any farm input that augments agricultural production is expected to boost the overall production. This contributes to attaining household food security (Funk and Brown 2009). Some researchers such as Roseberg, Norberg et al. (2005) and Funk and Brown (2009) found that fertilization of farmland can boost agricultural production and influence the food security status of a household.

The improved seed is supplied to Ethiopian smallholders primarily through regional, state-run extension and input supply systems that operate with the guidance from the Federal Ministry of Agriculture and Rural Development (Gebremedhin, Hoekstra et al. 2006). The regional system is made up of regional bureaus of agriculture and rural development (BoARDs), their *Woreda* (district) offices, and extension agents (termed ''development agents" in Ethiopia) working at the *Kebele* (peasant association) level. These organizations collaborate closely with farmers' cooperatives and regional credit and savings institutions in both supplying inputs and disbursing credit (Spielman, Kelemwork et al. 2012). Thus, in this study, investment in inputs (fertilizer, seed, pesticides, etc) and *Teff* production are expected to have a direct and positive relationship.

Contact with extension agents:

Given an irreversible trend of the declining size of cultivated land, the only feasible way to raise production is to increase productivity of land (Sen 1981; Takele 2010; Giziew 2019). Similarly, due to land shortage, cropping systems in Africa are in the transition from farm abundant to land constrained (Reardon, Delgado et al. 1992). One of the major programs in Ethiopian agriculture is the extension package that provides modern agricultural technologies and intensifies agriculture. The objective of the extension package is given the land tenure, institutional and commercial grounds, it is possible to provide and direct the farmers with the appropriate technology and skill so that the level of production will rise and bring more income (MoFED 2012). In this regard, farmers that have frequent contact with the development agent and other service providers do have better knowledge and skill of agricultural production.

Some scholars observed that visits by an extension agent had a significant and positive effect on the quantity of pepper supplied to the market (Mussema 2006). However, some researchers noted that extension in Ethiopia has been limited by its use of top-down approaches, the distraction of extension workers by their involvement in input supply, the limits of standardized packages, and the emphasis on input targets rather than affordability and profitability (Bekele, Anandajayasekeram et al. 2006; Belissa 2018; Petros, Nachimuthu et al. 2018). Similarly, a survey conducted by some authors identified that poor extension services were ranked as the top reason for non-adoption (Bonger, Ayele et al. 2004). Evidence suggests that extension agents are hampered by tasks other than the provision of technical advice, namely input and credit distribution. In fact, according to the survey of MoFED, most extension workers view their role primarily as distributing fertilizer and credit (MOFED 2006; Byerlee, Spielman et al. 2007; Curtis, Entsminger et al. 2008). In this study, contact with extension workers is expected to have a positive effect on *Teff* production and productivity.

Access to training:

Farmers need to possess agriculture-related knowledge and information to increase agricultural production. Becoming a farmer generally does not require formal training or credentials (Yihdego, Gebru et al. 2015). However, knowledge and expertise in agricultural production are essential to success for prospective farmers. The traditional method for acquiring such knowledge is through growing up on a farm. But even with a farming background, a person considering farming would benefit from the training offered by development agents and different development partners (Sah, Kumar et al. 2007). Work experience in the different aspects of farm operations enhances knowledge and develops decision-making skills. Whether gained through experience or formal education, farmers need enough technical knowledge of crops, growing conditions and plant diseases to make sound decisions (Abrha 2015; Yihdego, Gebru et al. 2015). Therefore, a direct and positive relationship is expected between access to training and *Teff* production.

Access to credit:

Rural financing activities in Ethiopia have mainly concentrated on short-term fertilizer credit and to some extent to petty trade and consumption smoothing purposes, mainly through microfinance institutions (Haile, Tesfaye et al. 2004). Credit is one of the policy factors that affect *Teff* production and have been the dominant set of policy instruments. There is a need for money to adopt new technologies such as the purchase of inputs. In line with this, some authors stated that input delivery should be combined with credit providers to reduce the working capital constraints to adopting new inputs for farm households (Ayaz and Hussain 2011; Ferede, Mekbib et al. 2018). Some scholars concluded that access and fee of the credit system influence the costs of farm inputs.

Since 1997, when the subsidized fertilizer was abandoned, the government has expanded its fertilizer credit substantially to encourage its use and minimize the negative effect of subsidy withdrawal. Some authors indicate that over 80% of farmers buy fertilizer on credit (Haile, Tesfaye et al. 2004). But low levels of production and land shortage coupled with marketing problems constrain a sustained profitable use of farm credit. According to Carswell et al. (2002), inflexible credit repayment procedures are also widely reported as hindering smallholders' interest in farm credit. This variable is measured in terms of access to credit in the form of the Ethiopian currency

(Birr) that the household took in the production year. In this study, it is hypothesized that the availability of rural credit leads to increased *Teff* production.

Cooperative membership:

Farmers' ability to improve farm productivity is constrained by limited access to better technologies and information. Access to information regarding high-yielding technologies and best management practices are commonly provided through farmers organizations such as agricultural cooperatives (Hailu, Weersink et al. 2015). Farmer organizations link farmers to inputs, outputs, and credit markets and are occasionally cited as making a crucial contribution to the provision and enhancement of extension services (Francesconi and Heerink 2010; Bernard and Taffesse 2012; Abebaw and Haile 2013). Considering the importance of cooperatives, some scholars recommended that strengthening farmers' cooperatives breaks the self-centered mentality and creates awareness towards established supply chains characterized by win-win cooperation among chain actors. Social organizations (cooperative) are essential to take crop development as their part of the focus, because their potential for diversification and higher economic returns to households may be high (Bernard, Taffesse et al. 2008; Mussema, Kassa et al. 2015; Woldu and Tadesse 2015). In this study, it is hypothesized that being a member of cooperatives leads to increased *Teff* production.

Government policy (access to utilities):

Government programs and policies affect agricultural production. For example, Fulginiti and Perrin (1993) and other scholars argue that prices are affected by government policies like tax or subsidies to agriculture. Public investments in infrastructure such as roads, utilities and communications can increase agricultural production as well, by lowering the cost of inputs at the farm level and increasing farmers' access to marketing opportunities (Fulginiti and Perrin 1993; Wiebe, Soule et al. 2001).

Public policy and budgetary decisions regarding infrastructure also have a profound effect on agricultural production. The financing aspects of public research and development and human capital development and both physical and institutional infrastructure affects the development and transfer of technology. For example, irrigation systems and roads may be required to make technology profitable to implement (Beyera 2004; Nata and Bheemalingeswara 2010; Shiferaw, Söderbom et al. 2015).

Another aspect of the policy that can influence or hinder agricultural production is the political situation. In a study of the production growth of 83 industrial and developing countries between 1960 and 1990, some authors found that the economies that perform the worst are those involved in wars (particularly civil wars) and those that have the most price distorting policies. They explore a variety of policy variables and find that apart from political stability and the initial endowments of a county; virtually no other policy variable is associated with growth (Nehru and Dhareshwar 1994; Scully 2003). In this study, the perception towards government policy is assessed and it is hypothesized that the favourable government policy leads to increased *Teff* production of the respondents.

3.5.3. Identifying explanatory variables that affect *Teff* distribution differentials

Marketing is not simply an extension of the production process, but as mentioned by Glahe referring the work of Adam Smith in his text The Wealth of Nations (1776), said that: "consumption is the sole end purpose of all production, and the interest of the producer ought to be attended to only so far as it may be necessary for promoting that of the consumer" (Glahe 1978). It refers to the series of services involved in moving a product (or commodity) from the point of production to the point of consumption (Enibe, Chidebelu et al. 2008; Abdullah and Hossain 2013). Other scholars define agricultural marketing as the performance of all business activities involved in the flow of food products and services from the point of initial agricultural production until they are in the hands of consumers (Meulenberg 1997; Siskos, Matsatsinis et al. 2001).

Some authors such as Crittenden and Crittenden (2014) suggest that as countries experience economic growth, their rate of urbanization tends to increase substantially. Whereas the rate of population growth, in developing countries, averages around 3% per annum, their cities and towns are increasing their populations at about 4% per annum. In essence, this means that the number of people, in urban areas, needed to be fed by rural people, will double within sixteen years. This has clear implications for agricultural production and the marketing systems that direct that production and distribution of the output to the point of consumption (Crittenden and Crittenden 2014). In this regard, Africa markets are characterized by widespread competition and free entry (Baye 2014).

As cash crops amongst other cereals in growing areas, *Teff* is the first choice of the farmers. As rational economic agents, farmers consider different factors in making production and marketing decisions (Getnet 2007; Urgessa 2011). According to the literature and theories, the major factors affecting the *Teff* distribution (supply of *Teff* crops to the market) are described hereunder.

Sex of the head of the household:

According to some authors, men are likely to sell more due to their natural ability to bargain, negotiate and enforce contracts (Cunningham, McGinnis et al. 2008). Similarly, other scholars such as Martey, Al-Hassan *et al* (2012) argued that males tend to be more aware of marketing channels because they are more networked socially and undertake most agricultural activities. Similar to the above researchers, this study hypothesized that males tend to supply more *Teff* crops to the market as compared to women counterparts.

Age of the head of the household:

Contrasting impacts of age were found in various works of literature. Some authors such as Tshiunza, Lemchi et al. (2001) found that younger farmers tend to produce and sell more cooking bananas for the market as compared to older farmers. In this regard, as age increases the production capacity of the household decreases and thereby the amount of agricultural produce and market participation decreases. In other studies, such as Hofferth (2003), aged households were believed to be wise in resource use and a positive effect of age on cereal production and market participation. In this regard, Hofferth (2003) argued that older people have relatively greater experience of farming activities and better access to land than younger heads. On the other hand, researchers such as Gebremedhin and Hoekstra (2007) indicated that a U-shaped relation between the age of household head and market orientation of households in the cereal crops. Hence, a direct or inverse relationship between the age of the head of the household and supply of *Teff* crops to the market is expected in this study.

Household family size:

A larger family size requires larger amounts of cereals for food consumption and as a result it reduces marketed supply. A study conducted by some scholars such as Atinkut, Bedri et al. (2017) and Petros, Nachimuthu et al. (2018) showed that family size had a negative impact on the volume of durum wheat marketed. On the other hand, Gani and Adeoti (2011) observed that family sizes have a positive relationship to the probability of market participation decision. In this study, family size is expected to have a negative or positive impact on the supply of *Teff* crops to the market.

Number of dependents:

A study made by Singh & Rai (1998) revealed that marketed surplus of buffalo milk to be negatively related with number of dependents. It may be the case that larger households require larger amounts of food for consumption which reduces marketable surplus. In this regard, the findings of Singh & Rai (1998) that are that the state-marketed surplus of buffalo milk is be negatively related with the number of dependents in the home. In this study, the number of dependents in the households expected to have a negative impact on the supply of *Teff* crops to the market.

Educational status of the head of the household:

According to Triomphe and Rajalahti (2013), the majority of the farmers, particularly smallholders, need to expand their understanding of markets and economic opportunities if they are to achieve success in running their farms as sustainable and profitable businesses. Ton, de Grip et al. (2013) also argued that to create a viable livelihood from farming, farmers need to move from a sole focus on production for home consumption and occasional marketing of surpluses to producing also for the market, responding to the continuously changing market demands. Literacy increases the ability of farmers to gather and analyze relevant market information for their products and choose the market outlet which offers better price (Anand and Sisay 2011). In this regard, households who are literate are expected to supply more *Teff* crops to the market as compared to illiterates. Thus, in this study, a positive relationship is expected between the status of education of the head of the household and supply of *Teff* crops to the market.

***Teff* consumption**:

Food consumption in SSA has recently been supported by imported food. Population has been growing at a faster rate compared to food production in developing countries. In this regard, Nicolas et al. (2012) found that the average growth rate of imported food to be 5% while average growth rate in food production and food export to be 2% and 1%, respectively. This is because, the population has been growing at a faster rate compared to food production. In this regard, *Teff* consumption is expected to have a negative impact on *Teff* supplied to the market.

Membership in cooperatives marketing:

Improving market access for smallholder farmers by reducing transaction costs and information asymmetries has been long recognized to be a priority policy (Gelo, Muchapondwa et al. 2017). One of key mechanisms through which these could be achieved is by organizing smallholder farmers in the form of farmers organizations or by building the marketing capacity of existing farmers organizations to increase farmers' bargaining power, reduce transaction costs and render economies of scale (Gelo, Muchapondwa et al. 2017; Gelo, Muchapondwa et al. 2019). Thus, in this study, being a member of marketing cooperatives is expected to have a positive and significant role in supplying more *Teff* crops to the market.

Distance to the market:

With reference to market distance, some scholars prescribed rural-urban infrastructure (main and feeder roads) needs due attention on its improvement (Tesfaye, Tesfaye et al. 2016; Mamo, Getahun et al. 2017). According to Geremewe, Tegegne et al. (2019) when producers have access to the market, they allocate more farmland to produce more and consequently to supply more to the market. However, if the farmer is located in a village or distant from the market, he/she is poorly accessible to the market. The closer to the market, the lesser would be the transportation cost and time spent. In the study conducted by some authors such as Alemu (2015) and Yihdego, Gebru et al. (2015), distance to market significantly affected cabbage marketable surplus negatively. According to the study done by some authors, the portion of land allocated for *Teff* increases when there is a nearby market. Some scholars such as Minten, Tamru et al. (2013) concluded that for those farmers who live close to major towns; the majority of the commercial surplus is sold to traders who ship to major towns. This means the closer the residence of the household to the market center, the more likely is the farmer to be involved in *Teff* marketing as it reduces transportation cost and time spent. Distance can be measured in walking time (minute) which farmers spend time to sell their product to the market. The assumption here is that the closer a household is to the market; the household is motivated to produce *Teff* and supply it to the market. Thus, in this study, it is hypothesized that distance negatively affects *Teff* supply to the market.

The marketing chains of *Teff* are long involving too many operators who rarely provide marketing services beyond transport and storage (Tura, Goshub et al. 2016). The means of transportation used by farmers are human labour, donkey, animal cart, and hand cart. Research results of Tura, Goshub et al. (2016) indicate that donkeys play a significant role as means of *Teff* transportation. Next to donkeys, human labour is used to transport a higher proportion of *Teff*. Animal cart and hand carts were also reported as means of *Teff* transport but an insignificant proportion of *Teff* was transported by these means (Chaka, Kenea et al. 2016; Tura, Goshub et al. 2016). In this study, farmers who have access to transport facilities have the highest chance for supplying more *Teff* crops to the market than others who do not have access to transport facilities.

Cost of transport:

Transportation costs and remoteness matter a lot in agricultural markets in developing countries. To understand how distance travelled is related to transport charges in these settings, transport charges per quintal are regressed on different explanatory variables (Minten, Tamru et al. 2016; Stifel and Minten 2017). Transaction costs are generally found to be high on agricultural markets in poor countries and have a considerable influence on farmers' marketing decisions. Studies made by Husmann (2015) show that transaction costs are closely related to distance and that distance from markets negatively influences market participation and thus incomes. In this study, it is hypothesized that transportation costs negatively affect supply of *Teff* crops to the market.

Price of *Teff* crops:

According to Alemu, Ayele et al. (2012), managing cereal price instability continues to receive policy attention in many developing countries. Ethiopia is such a country where price volatility is high, and both food aid and food-based intervention programs are large. Monthly cereal price variability in the country is not only among the highest in the world but has even worsened since 2000 (Gabre-Madhin and Mezgebou 2006; Gebreselassie and Sharp 2007). Policy relevance on the relationship between producer prices of a product in a local market and wholesale price analysis includes the generation of information useful for targeting government intervention to raise and stabilize producer prices (Getnet 2008). Food price movements are scrutinized by consumers and governments, as food expenditures continue to represent an important share of household budgets, especially in developing countries. The food crisis at the end of the last decade put food prices, food price volatility and food security at the top of the global policy agenda (Rashid 2011). Since then, there has been continued global concern about the level of food prices and how prices are formed and transmitted along the food chain (OECD/Food and Nations 2015).

When farmers feel threatened by low producer prices for their product, they tend to reduce the amount of land cultivated and commercial fertilizer used as risk management strategies to avert or minimize such price risks. In fact, these strategies may have negative effects on the productivity of farmers and, eventually, on their food self-sufficiency and food security status (Getnet 2007). In Ethiopia, price volatility and, more recently, food price inflation remain the overriding national concerns (Finance and Development 2006; Dercon and Hill 2009). The major implication that arises from the analysis is that speculative behaviour is an important determinant of Ethiopian grain price formation. It leads to temporal market integration in the long run, with temporary breaks to adjust for critical thresholds. The huge government-sponsored cooperatives' grain purchase during the 2006 harvest created unusual increases in the harvest time price, and that shock might have been carried through to the overall market via traders' expectations (Tadesse and Guttormsen 2011).

Farmers' perceptions and expectations about price movements for their products play an important role in influencing their production and marketing decisions. In the majority of cases, such perceptions and expectations seem appropriate and rational. In determining the relationship between the price received by the farmers for their vegetable products and their involvement in the market, some scholars such as Zivenge and Karavina (2012) found these to be positively correlated. The assumption here is that if a farmer gets a better price for his/her product in the market, his/her involvement in the market increases and his/her capacity to generate revenue increases. Similarly, in this study, it is expected that farmers choose a market channel that offers a better price. A positive relationship between the price of *Teff* crops and the amount of *Teff* crops supplied to the market is expected from the study.

Access to market information:

Tollens (2006) highlighted that Market Information Systems (MIS) are services used in gathering, analyzing and disseminating information about agricultural prices, quantities and other relevant information of widely traded products from rural assembly, retail and wholesale markets. To guarantee a well-functioning service, market information should be collected and disseminated regularly, with the highest possible frequency (at least weekly) and should be channelled through various means to reach different types of audience (Lefebo, Haji et al. 2016). Market information provides more bargaining power to farmers and information to government officials to monitor markets and be able to intervene when needed. However, according to Amha (2002), in Ethiopia, lack of regular and accurate market information is one of the major constraints in the grain trade. Farmers know very little about prices prevailing for their grain in markets other than the nearby market. In a survey undertaken by scholars, only 31% of the sample farmers were aware of the prices in the nearby assembly markets (Tefera 2014).

Up-to-date information, including different market prices of both commodities and inputs, and their intra-seasonal variation, allows farmers to make more profitable decisions on production activities. Farmers can better plan planting and storage decisions, find appropriate markets for their produce, and gain from profitable trade deals (Antonaci, Demeke et al. 2015; Andersson, Bezabih et al. 2017). Farmers marketing decisions are based on market price information, and poorly integrated markets may convey inaccurate price information, leading to inefficient product movement. On the other hand, market information reduces the farmers' risk aversion behaviour of getting a market and decreases marketing costs of farmers that affects the marketed surplus (Kiiza, Pederson et al. 2013; Girma and Endrias 2015). In this regard, farmers who have access to market information are expected to supply more *Teff* crops to the market as compared to those producers with no market information.

Availability of storage facilities:

Grain commodities are stored for a range of periods. Whereas short-term storages are meant to overcome the fixed costs of transacting, long-term storages are intended to earn profits from future price speculation, which is sometimes referred to as temporal arbitrage (Atinkut, Bedri et al. 2017). *Teff* is endemic and can be stored for a long period of time without being attacked by the storage pests (Benin, Smale et al. 2004). On the other side, due to its high value and fluctuating prices, storage of *Teff* implicates substantial financial risk (Minten, Tamru et al. 2013). However, in this study, a positive relationship is expected between the capacity of storage facilities of the farmers and supply of *Teff* crops to the market.

Timing of selling *Teff* crops:

Farmers have the right perceptions about the seasonal behaviours of the prices for their products. They have expectations about annual price movements, with the expectations based on rational justifications (Tadesse and Guttormsen 2011). However, Getnet (2007) argued that despite their perception of low producer prices in December, January, and February, the majority of farmers sell their marketable *Teff* during these months, mainly for cash income generation to settle annual land use tax bills and outstanding loans on commercial fertilizer. It is also found that most farmers sell their products in unorganized local town markets, mainly to consumers and traders, where prices are discovered through the mechanism of individual negotiations (Getnet 2007). Prices are usually lower during harvest and hence, traders buy during this time with the expectation that the price will rise during lean seasons. If the price remains the same, they keep the grain for the next year (Tadesse and Guttormsen 2011). In this study, most of the farmers sell their *Teff* crops immediately after the harvest period (December, January, and February) at lower prices.

Government policy:

Agriculture in Africa has seen some fundamental changes during the last decades. According to Wongtschowski, Belt et al. (2013) agriculture has become more dynamic. State involvement in food markets has declined, giving way to the market as the mechanism to coordinate supply and demand. That has left farmers without a guaranteed buyer, and in doubt about the price they received (Wongtschowski, Belt et al. 2013; Mutayoba and Ngaruko 2015). According to Getnet (2007) the government could play a useful role in a liberalized market by providing the necessary public goods for market development. Government programs and policies affect agricultural production and marketing. For example, Fulginiti and Perrin (1993) argued that prices are affected by government policies like tax or subsidize agriculture. Public investments in infrastructure such as roads, utilities, and communications can increase agricultural production as well, by lowering the cost of inputs at the farm level and increasing farmers' access to marketing opportunities (Fulginiti and Perrin 1993). Another aspect of the policy that can influence or hinder agricultural production is the political situation. Nehru and Dhareshwar (1994) explore a variety of policy variables and found that apart from political stability and the initial endowments of a county; virtually no other policy variable is associated with growth.

Different studies indicate that rural communities in remote areas suffer from a lack of transportation facilities (Gessesse 2009; Mussema, Kassa et al. 2015). There have been important changes in the last decade in the provision of road and communication infrastructure in Ethiopia (MoFED 2012). Households who have access to road and communication facilities do have a better chance for market participation than others who do not have access to infrastructure services. Therefore, a direct relationship is predicted among farmers who have access to infrastructure facilities (government policy) in supplying *Teff* crops to the market as compared to farmers who do not have access to infrastructure facilities. Improved infrastructure has led to a significant decline in transport costs and better connectivity of rural to urban areas. Therefore, a direct relationship is expected between favourable government policy and supply of *Teff* crops to the market.

***Teff* production:**

Teff is an important crop in the agricultural and food economy of Ethiopia. It is the major staple crop for Ethiopian farmers, but national yield levels are low. According to Getu Hailu et al. (2016), *Teff* was grown by 43 per cent of all Ethiopian farmers. Fikadu et al. (2019) also that state Oromia region is the most important *Teff* producing area in the country; and its share in total national production is estimated to be as high as 48% while the second highest region is Amhara region with 39%. In this regard, in this study farmers who produce more *Teff* crops (farmers of Oromia and Amhara regional states) are expected to supply more *Teff* crop to the market.

3.5.4. Effect of local and global *Teff* production and distribution to the livelihood

3.5.4.1. Effects of local *Teff* production and distribution to the livelihood of farmers

Agriculture in Ethiopia is dominated by smallholder farming households that cultivated 94 percent of the national cropped area in 2013/14 (Fantu Nisrane et al. 2015). The vast majority of households in Ethiopia live in rural areas and agriculture is still the main economic activity and they earn their livelihoods primarily from agriculture. The agricultural sector, which is stunned by subsistence smallholder farmers, is the primary source of livelihood for the majority of the population and the basis of the national economy (Azeb et al. 2017). Farmers rarely produce for the market and are highly dependent on climate for their subsistence (Efa et al. 2016).

Agriculture is a risky but important source of income in developing countries. Economic studies of some researchers suggest that agricultural income is particularly important for the world's poor, most of whom are rural (Bezemer and Headey 2008; Loening, Rijkers et al. 2008). Agricultural incomes fluctuate with the weather and commodity prices (Kazianga and Udry 2006). In this regard, Ethiopia's poverty and vulnerability to food insecurity make it a country of recurrent emergency food aid needs. According to Annette (2015), an estimated 5-6 million people are considered chronically food insecure and require some type of resource transfer, usually in the form of food aid, to meet their minimal food requirements every year.

In order to improve the performance of the agricultural sector in Ethiopia, different strategies have been adopted since the 1970s. According to Desalegn et al. (1998) most strategies have focused on increasing agricultural productivity at the farm level through the dissemination of improved production technologies, while the marketing aspect of agriculture was relatively neglected. It is only recently that the country adopted a market reform policy with the objective of improving agricultural market performance and reducing food insecurity through enhancing market efficiency (Desalegn et al. 1998).

The findings of Seneshaw (2013) indicates that grain marketing in Ethiopia is important for the agricultural sector for two reasons: (1) It is the largest of all the agricultural markets, based on volume of output and the geographical area covered; and (2) it involves a large number of participants in production, trade, transportation, storage, and retail. In this regard, agricultural growth can promote growth in food production that can raise real incomes for the poor by reducing food prices (Diao, Hazell et al. 2010). On the other hand, agricultural production is often greatly constrained by volatility (especially rain-fed farming) and could yield limited benefits to the poor, especially if land inequality is high (Headey 2013).

Some researchers indicate that cereal production and marketing is the single largest sub-sector within Ethiopia's agriculture. It dominates in terms of its share in rural employment, agricultural land use, and calorie intake, as well as its contribution to national income. As per the report of Shahidur Rashid and Asfaw Negassa (2013), cereal production and marketing accounts for roughly 60% of rural employments, about 73% of total cultivated land, more than 40% of a typical household's food expenditure, and more than 60% of total caloric intake of a typical household in the country. The contribution of cereals to the national income is also large and cereals' contribution to agricultural value-added is 65%, which translates to about 30 percent of gross domestic product (GDP) (Shahidur Rashid and Asfaw Negassa 2013). According to The World Bank (2007), cereal production in Ethiopia accounted for 30% of the national income with a large share in rural employment (60%) and households' total food expenditure (40%). CSA (2012) also reported that cereals comprise half of consumer food expenditures in Ethiopia and about 75% of the land area under cultivation.

Teff is a cereal crop cultivated, as a source of food, primarily in Ethiopia. The crop has both its origin and diversity in Ethiopia, and plays a vital role in the country's overall food security (Kebebew Assefa et al. 2011). It is a major source of dietary iron which explains the low incidence of anemia among Ethiopians. *Teff* is considered to have higher iron content than cereals. What makes *Teff* grain even more attractive is the fact that it is a gluten free food. Gluten is a protein that causes allergic reactions to some people (Seid 2011). The straw is also an important cattle feed source and the high market prices of both its grains and the straw make it a highly valued cash crop for *Teff* growing smallholder farmers (Asres Elias et al. 2014). *Teff* is one of the most important preferred cereal crops of Ethiopia, both in terms of food and nutrition security and its high price in the market makes it an attractive cash crop for farmers (Crymes 2015; FAO 2015).

As one of the staples in the country, *Teff* is traded from producers to consumers through different channels that involve a large number of producers, local assemblers, wholesalers, retailers, and consumers as the main actors. The exchange takes many forms including producers to consumers, producers to retailers, producers to wholesalers, and producers to local assemblers. Girma (2015) also noted that there are different entities involved in *Teff* marketing such as farmers, local and regional collectors, regional assemblers, regional retailers, regional wholesalers, urban wholesalers and urban retailers. The majority of farmers sell to traders at local wholesale markets or to traders with a fixed shop, often in regional markets. Farmers travelled on average 1.5 hours to get to the place of sales, thus farms or sales in the village are therefore relatively less important, in contrast with other countries in Africa (Bart Minten 2015).

The marketing system in which the actors participate and operate influences the incentives of the participants with different implications on the performance of the sector. The marketing system is important for producers, traders, and consumers it's necessary to study the marketing system of the crop both for economic and political reasons (Getnet 2007; Minten, Tamru et al. 2013;

Abraham 2015). Considering its market value which is often two or three times higher than maize (the grain with the largest volume of production), *Teff* covers the largest share of the total value of cereal production. This higher and relatively more stable price is one of the main reasons that *Teff* is grown by a total of 6.2 million farmers, primarily as the source of cash crops (Habtegebrial and Singh 2006).

Teff bread, locally known as *Injera*, is a major staple food for many Ethiopians. Most prefer *Teff* to other grains but is in general more widely consumed by the economically better off urban residents than by rural households (Berhane et al. 2011). In this regard, *Teff* contributes about 600 kcal/ day in urban areas as compared to the contribution of 200 kcal /day in rural areas (FAO 2015). According to Kebebew et al. (2011), *Teff* is the main Ethiopian cereal serving as a staple food grain for more than 50 million people. However, Berhane et al. (2011) argued that *Teff* is more of a luxury food for rural households and the urban poor, while maize and wheat are necessity food grains. Cereal consumption in rural areas is dominated by less expensive grains such as maize and sorghum (FAO 2015). As *Teff* prices have gone up, many urban households tend to mix *Teff* flour with cheaper cereals such as sorghum, maize or rice in preparing *Injera* (Berhane et al. 2011).

Marketing channels are the sets of interdependent organizations involved in the process of making a product or services available for use or consumption. It is the type of channel used to sell products by the farm household from alternative outlets such as brokers, traders, marketing cooperatives and consumers. Some authors such as Matthew and Todd (2009) noted that the growing demand for local foods is presenting new opportunities for smallholder agricultural producers, but understanding the relative costs and benefits of different local channels is important to maximize farm performance (Matthew and Todd 2009). Brokers fulfil a purely intermediary role of matching geographically dispersed buyers and sellers and, in return, receive a fixed commission. The presence of brokers in the economy implies that each trader's optimal choice of the search effort must influence whether other traders have decided to use a broker or to search themselves (Gabre-Madhin 2001). Farmers choose a market channel which offers a better price. Farmers who have better access to market channels do have a better chance of participating in the market as compared to others who do not have access to market channels.

Market participation refers to the extent to which a household participates in the market as a seller (Jagwe et al. 2010). Participation means any situation which involves the exchange of goods for money, regardless of location. According to Jagwe et al. (2010), household market participation in crop output to markets is determined by household market orientation, the level of crop production, household and household head characteristics, ownership of livestock, market access and institutional services. Since market participation is directly related to generating a marketable surplus, which in turn depends on productivity, the production of surplus *Teff* crops has an important impact on the revenue of the farmers (Barrett 2008). Other researchers also argue that the higher farmers produce, the more likely the household would supply to the market. Producers who produce more output are expected to supply more crops to the market than those who produce less (Wolelaw 2005).

Teff is a major staple food crop in Ethiopia, but smallholder *Teff* production is characterized by persistently low average yield. Due to smallholder farming, large buyers face the challenges of procuring a uniform and consistent supply of quality *Teff* (Rashid and Dorosh 2009; Rashid and Negassa 2011). Despite having significantly lower yields than most cereal crops, *Teff* has been dedicated to its production by smallholder producers (Roseberg, Norberg et al. 2005; CSA 2011). *Teff* can also be stored for many years without being seriously damaged by common storage insect pests (FAO 2015). As a cash crop, *Teff* is the first choice of the farmers and the production of surplus *Teff* crops has an important impact on the revenue of the farmers (Barrett 2008; Getnet 2007; Urgessa 2011). The average marketable surplus of *Teff* ranges between 26 to 75 percent of the harvested crop (Fufa, Behute et al. 2011; Assefa 2015; Amentae 2016). Azeb et al. (2017) also highlighted that 82.27% farmers used *Teff* as the source of income in addition to home consumption.

Considering the significant share of cereals in food expenditures of households in low-income countries, Shahidur Rashid and Asfaw Negassa (2011) recommended that efficient functioning of cereal markets is important for low-income counties. Efa et al. (2016) also highlighted that market participation of smallholder farmers was significantly affected by access to credit, perception of farmers to market price of *Teff*, family size, agro-ecology, farm size, distance to the nearest market, reliable market information, good transport facilities, ownership of transport equipment, infrastructure, strong extension intervention and giving training to farmers on marketing. Azeb and Tadele (2019) also highlighted the opportunities for *Teff* production and market as high demand of *Teff* in the market, nearness to market, availability of suitable climate and soil and high support and encouragements by the government. They also identified the main challenges like lack of finance to invest, lack of improved farm tools, practicing very poor harvesting methods, shortage of land, high cost of production and low productivity. The World Bank (2018) also recommends that improving the capacity of cooperatives to become effective aggregators and increasing smallholder market participation is essential to achieving agricultural transformation and commercialization.

3.5.4.2. Effects of global *Teff* production and distribution to the livelihood of farmers

Teff contains high and unique nutritional values, which meet the need of health-conscious consumers (Bart Minten et al. 2013). With the growing interest in both a naturally gluten-free alternative to wheat flour and a nutrient-rich ingredient in the baby food industry, *Teff* is set to be the world's next 'super-food' and it is getting international attention (The Guardian, 2014). In this regard, Bart Minten et al. (2013) concluded that *Teff* is one of the most important crops for farm income and food security in Ethiopia, and it is Ethiopia's the second most important cash crop (after coffee), generating almost 500 million USD income per year for local farmers. According to Fikadu et al. (2019), *Teff* is an untouched cereal crop worldwide than other cereal crops like maize, wheat, sorghum and barley. It is a staple food grain in Ethiopia mainly used to make *Injera* as a traditional fermented Ethiopian pancake.

In January 2006, a policy that banned the export of *Teff* grain and *Teff* flour was enacted. Crymes (2015) argued that the reason behind the ban was to increase *Teff* production in order to address domestic food security and to ensure that this highly nutritious grain continued to meet domestic demand. According to Abraham (2015), the rationale behind the ban is to bring the domestic price of *Teff* to an affordable level, and improve food security. A low domestic price of *Teff* benefits consumers, especially the rural and urban poor. Removing the export ban would likely increase the local price of *Teff* to a higher international level and it would hurt domestic consumers. Similarly, Crymes (2015) highlighted that while interpretations of the motivations behind the ban vary, consensus largely shows that the primary goal of the *Teff* export ban was to increase *Teff* production in order to address domestic food security and to meet domestic demand.

Although the government has put a ban on the export of *Teff* grain and *Teff* flour in an effort to protect local markets, *Injera* is still being exported to the international community to meet global niche market demands and the local farmers are not directly benefiting from this market and food and nutrition insecurity remain chronic issues facing the country (Crymes 2015). In this regard, Hyejin Lee (2018) argued that over the last several years, many local companies entered the *Injera* business to benefit from the growing market.

As per the report of Kebebew et al. (2013), in 2005, there were about 30 thousand tons of *Teff* flour exported, earning the country about 13.7 million USD. Due to the ban on *Teff* exports in 2006, the export volumes of *Teff* have sharply declined from 16,605 tonnes in 2002 to 15 tonnes in 2012. Due to policy reasons, *Teff* flour export dropped in 2006, and only 3 million of USD was earned (Kebebew et al. 2013). According to the data from the customs authority, starting from 2008, Ethiopia has been exporting processed *Teff* especially in the form of fresh *Injera* and dry *Injera* ('dirkosh'), and the export of such products is steadily increasing (Kebebew et al. 2013). However, due to the high demand for *Teff* crops in the local market, the increasing trend for *Injera* export; smuggling to neighbouring countries and urbanization, the price for *Teff* crops remains high for local consumers (FAO 2015). As per the argument of Crymes (2015), the export ban on *Teff* has effectively prevented Ethiopian farmers from fully participating in the growing global trade of *Teff*, while allowing Ethiopian bakers to fully benefit from the increasing international *Teff* product trade.

While Ethiopia is the world's largest producer of *Teff* by volume, because of the export ban, it cannot currently benefit from this trade by exporting its indigenous crop. However, according to Fikadu et al. (2019) in the future; the demand for *Injera* might be exponentially increased due to its high nutritional values and gluten free grain crop. The existing increasing demand for *Teff* and its products on the international market ensures the future benefits of Ethiopia export. According to Kebebew Assefa et al. (2013), *Teff* can be considered as an important future export commodity, if the current efforts to increase production of *Teff* are successful. The existing increasing demand for *Teff* and its products on the international market will ensure Ethiopian benefits. We also need to recognize the existence of huge demand in the domestic market that would be adversely affected by exports if productivity is not increased first.

3.6. Conceptual framework

Based on the above theoretical / conceptual foundations, Figure 3.1, Figure 3.2 and Figure 3.3 are illustrated as the pathways for the analysis of *Teff* production and distribution and its implications for the livelihood of smallholder farmers in this thesis. In this study, CARE sustainable livelihood approach as indicated in Fig. 3.3 below is used for analysis. This is because CARE includes some DFID initiatives in its strategies, but also it considers activities for home maintenance as means to arrive at an end result. As such, the approach also seeks a greater focus on capacities of the people at the micro-level, personal empowerment and commonality among groups (Krantz, 2001; Lindenberg, 2002). This greater focus on the personal level is perhaps the most individualistic of all the strategies and is probably more appropriate for application to small groups in poverty situations. In this regard, as we have a limited number of survey respondents and FGD and KII participants, the CARE sustainable livelihood approach is used as analysis of some of the assets at household level in relation to *Teff* production, distribution (supply of *Teff* to the market) and livelihoods. Some of the assets used in the analysis include the following.

Natural capital: land ownership, land allocated to *Teff* production in ha, soil fertility, availability of rainfall.

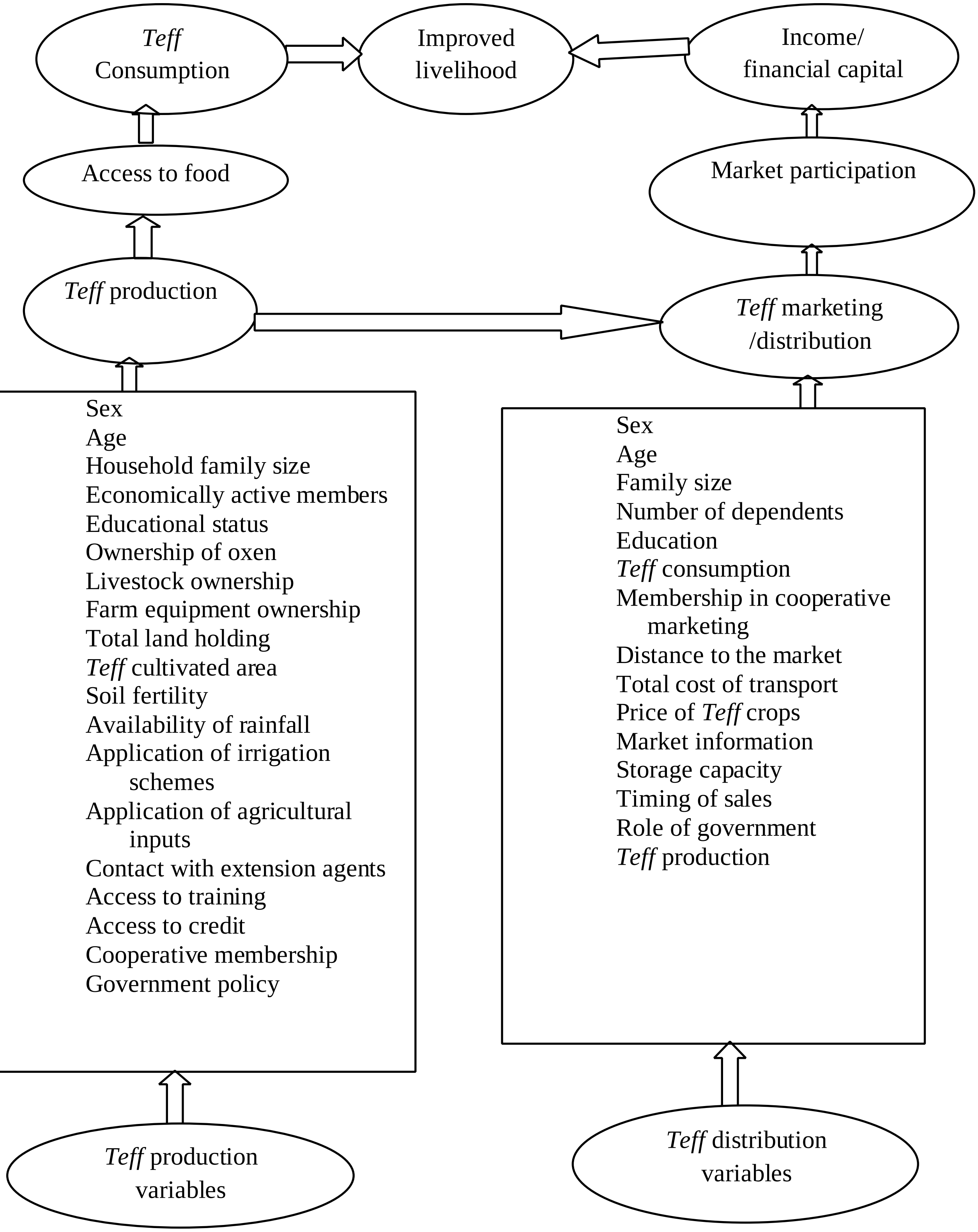
Physical capital: Access to production equipment (oxen and farming tools), access to agricultural technologies (fertilizers and seed), access to roads and transport facilities, access to utilities (power and water supply) and communication facilities (mobiles).

Financial /Economic capital: Access to credit, total household revenue and expenditure, expenditure for *Teff* production, amount of *Teff* supplied to the market per household and income from *Teff* marketing.

Human capital: family size, number of active labour force, number of dependents, formal education, training days attended, access to extension service, consumption of *Teff* and other cereal crops.

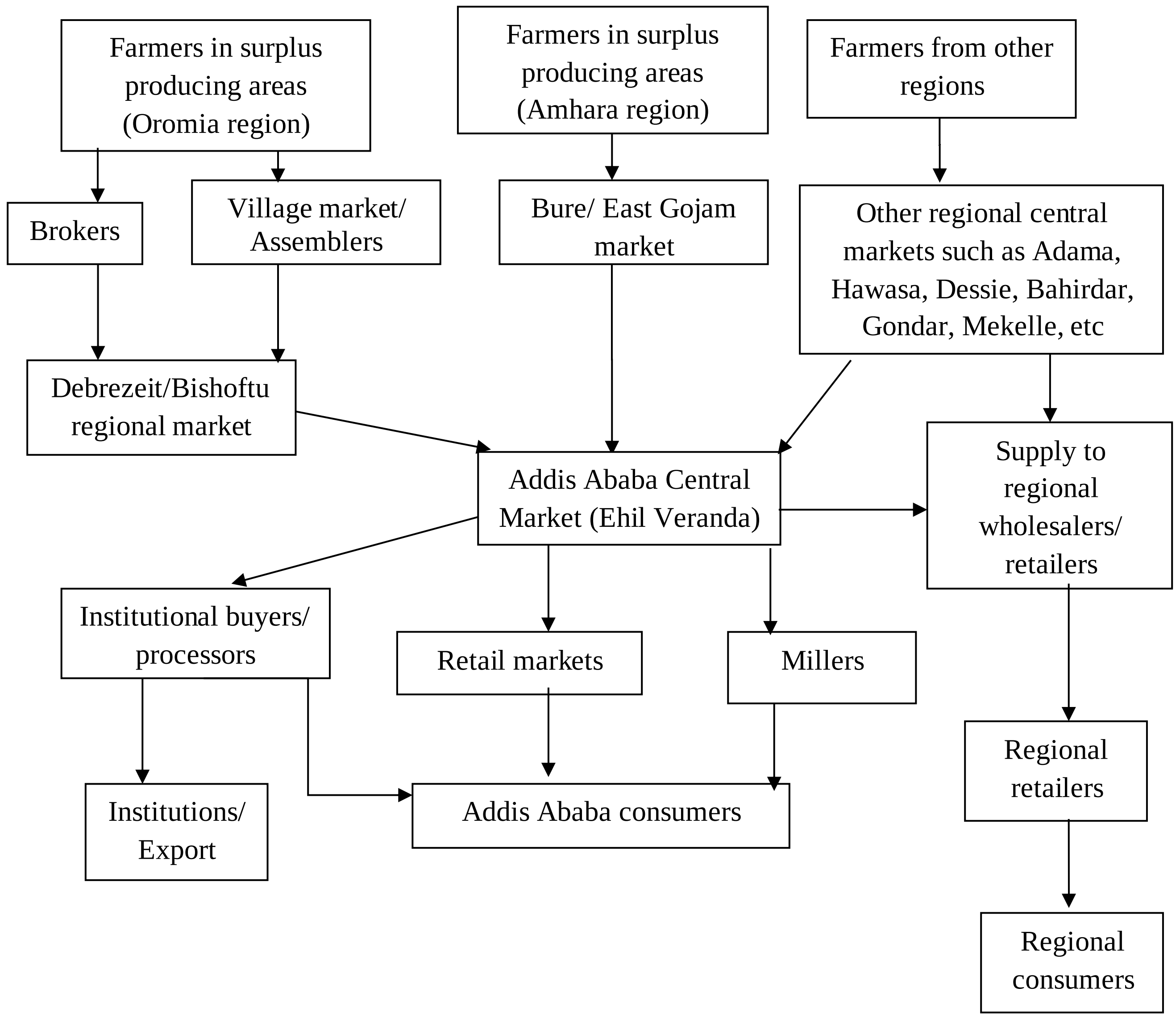
Social capital: relations to cooperative membership and number of years in cooperative membership.

Figure 3.1: Conceptual framework for *Teff* production



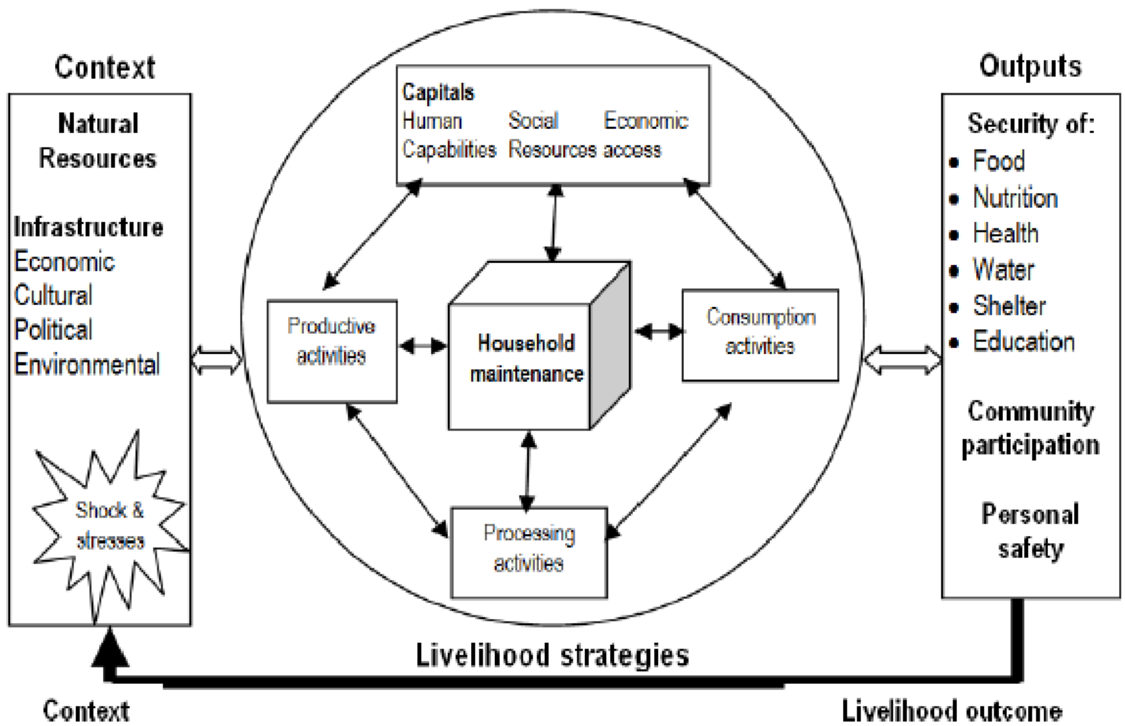
Source: Own compilation from different sources

Figure 3.2: ***Teff*** **value chain (distribution) in Ethiopia**



Source: Fufa, Behute et al. (2011) (Modified)

Figure 3.3: Action model for CARE regarding sustainable livelihoods



Source: Krantz (2001)

CHAPTER FOUR: RESEARCH DESIGN AND METHODS

4.1. Introduction

This chapter presents the research design and methods. In this regard, it includes the research design, sampling and sample size, data collection instruments, data analysis, approach to the study and issues related to validity, reliability and ethics. In assessing the factors affecting *Teff* production, distribution and its contribution to the livelihood of producers in the study areas, a mixed-method research approach was adopted. Both qualitative and quantitative research techniques were used. The dependent and independent variables of the models used in the study are properly explained and operationalised. The measures that have been taken to address the issues of validity, reliability, and ethics are also part of this chapter.

4.2. The 'how' and 'why' of the research methods

4.2.1. Research design

Research design provides a logical structure for research data gathering and analysis (Bryman 2008). The thesis adopted a cross-sectional research design to guide the data collection of both quantitative and qualitative data. According to Bryman (2008), a cross-sectional research design represents the collection of data at a single point in time. In cross-sectional research design, researchers investigate the situation in a population at a certain point in time (Bethlehem 1999).

From a methodological point of view, this study used mixed methods as an approach for data collection and analysis in this thesis. Studies which use mixed research methods employ philosophical and methodological pragmatism (Onwuegbuzie & Johnson, 2006). For pragmatism, all human inquiry was related to experience and experience was active rather than passive and science opened new areas of experience for investigation (Heelan, & Schulkin 1998). Heelan & Schulkin (1998) also indicate that mixed methods research is a research design with philosophical assumptions. As a ''methodology,'' it involves philosophical assumptions that guide the direction of the collection and analysis of data and the mixture of qualitative and quantitative approaches in many phases in the research process. It is important to distinguish between multimethod and mixed methods. According to Heelan & Schulkin (1998), multimethod research refers to the use of either multiple quantitative methods or multiple qualitative methods in a single study. However, mixed methods research, as noted previously, includes both quantitative and qualitative methods in the same study. The mixed methods were used because these provide opportunities to meaningfully engage with difference through the possibility of mixing at multiple levels (methods, methodologies, and paradigms) (Heelan & Schulkin 1998).

According to Judith (2018), mixed methodology comes into being whenever a researcher combines two or more research strands, each belonging to a different methodology, within one study. There are different stakeholders in *Teff* production, distribution, and livelihood (such as farmers, development agents, cooperatives, traders, government organs, etc). The mixed methods approach is appropriate for development issues that require not only quantitative and qualitative aspects but also the participation of local stakeholders and thus the mixed methods were used in this thesis (Caracelli and Greene 1993). Miller and Cameron (2011) stated that mixed-method research is a growing area of methodological choice for being utilized and reported within business and management fields. Other scholars such as Greene, Willis et al. (2007) also stated that in marketing, mixed methods research is the most used label. Similarly, other scholars used a mixed-method approach to study agricultural good practices and factors related to the potential adoption of on-farm food safety programs among niche-market producers (Green, Willis et al. 2007; Miller and Cameron 2011; Rajić, Young et al. 2013). Creswell and Plano (2011) also documented that mixed methods research is a methodological approach that focuses on collecting, analyzing, and mixing both quantitative and qualitative data in a single study. It is the type of research in which a researcher combines elements of qualitative and quantitative research approaches for the broad purpose of breadth and depth of understanding (Yvonne Feilzer 2010). According to Franz et al. (2013), the mixed methods research design creates a wider picture by enhancing the depth and insight given by the study participants through the inclusion of dialogue and narratives.

The blending of quantitative and qualitative methods allows us for a more holistic approach necessary to delineate the relationship between a broad range of actors and influences in the area. The purpose of using a mixed method in this thesis is to gather data that could not be obtained by adopting a single methodology and for triangulation so that the findings with a single approach can be substantiated with others. The rationales for using both quantitative and qualitative methods in this thesis are to enhance the participant enrichment and to ensure the instrument for validity and reliability (Munyua and Stilwell 2010). Moreover, it is particularly useful in helping mitigate the influences of biases of a particular method and improving the overall validity of our findings (Campbell and Fiske 1959). In this regard, the researcher used FDGs and KII as data collection tools for qualitative issues and a questionnaire for quantitative issues.

In this research, a concurrent procedure was used as a strategy in which the researcher converged quantitative and qualitative data in order to provide a comprehensive analysis of the research problem. In the concurrent procedure, the investigator collects both forms of data at the same time during the study and then integrates the information in the interpretation of the overall results (Creswell & Plano 2011). In concurrent procedures, the researcher nests one form of data within another to analyze different questions.

In examining the transformation of the Ethiopian staple of *Teff* into the global economy, some authors adopted a combination of both qualitative and quantitative data retrieved from relative literature (Crymes 2015). To identify factors affecting smallholder farmers in producing and supplying *Teff* to the market, some authors such as Habtewold, Challa et al. (2017) used both qualitative and quantitative methods. Similarly, others utilized a mixed-method approach to investigate barriers to technology adoption and the context of farmer decision on technology, particularly concerning extension services (Chepng'eno, Koech et al. 2012; Wisdom, Cavaleri et al. 2012). Quantitative and qualitative data analysis methods were also used to analyze the data on the socioeconomic factors affecting the adoption of improved agricultural technologies among women in Kenya (Munyua and Stilwell 2010). Other scholars also used qualitative techniques to study the agricultural knowledge and information systems (AKIS) of small-scale farmers and their information behaviour (Zechmeister, Zechmeister et al. 2001; Zechmeister and Posavac 2003; Chepng'eno, Koech et al. 2012).

4.2.2. Sampling and sample size

a. Sampling procedure

The purpose of this study is to study how *Teff* production and distribution are practiced at the national levels and analyze its implications for the livelihood of the smallholder farmers in Ethiopia. *Teff* is the major food crop for about 50 million of the population in Ethiopia (Berhane, Paulos et al. 2011). The *Teff* value chain is long and involves too many small operators. It involves input suppliers, producers, traders (local assemblers and wholesalers), retailers, processors, and consumers. This indicates that the marketing chains of *Teff* are long involving too many operators who rarely provide marketing services beyond transport and storage (Berihun 2014; Hassen, Regassa et al. 2018). This study, however, focuses on the production and distribution of *Teff* crops in the market among smallholder producers.

The sampling procedure used was multistage sampling because it aligned with the mixed methods approach. Specifically, this study used both purposive (non-probability sampling) and probability sampling (random sampling) methods. Purposive sampling method involves the deliberate selection of units for study. In this study purposive sampling was used to identify the top *Teff* producing regions and districts whereby previous research and judgment of the researcher is used for selecting items which the researcher considers as representative of the population (Kothari 2004). The random sampling method which is used for identification of survey respondents refers to that method of sample selection which gives each possible sample combination of the equal probability of being picked up and each item in the entire population to have an equal chance of being included in the sample. It gives each element in the population an equal probability of getting into the sample; and all choices are independent of one another (Kothari 2004; Malik, Hnatkova et al. 2004). However, due to the limited time and resources, the researcher was unable to include all *Teff* growing areas and stakeholders which would provide further information. Thus, the samples may not fully represent the population of farmers and other stakeholders throughout the *Teff* growing parts of Ethiopia.

The unit of analysis of this study is rural heads of household who are engaged in *Teff* production and distribution in 2010 E.C (2017/18). In the selection of rural household respondents, a multistage sampling technique was used. The regional states, districts, *Kebeles,* and sub-*Kebeles* are purposively selected as compared to other regions for the following reasons. Firstly, Oromia and Amhara regional states are among the top *Teff* producers and suppliers to the local and global markets (CSA 2015). SNNPR and Tigrai regional states are selected as there is potential for *Teff* production but remaining less productive as compared to other regional states such as Oromia and Amhara regional states which need further attention of researchers in identifying the potential problems in the study areas (Gideon 2016).

To show the potential *Teff* production of the regions at national level, information in relation to the average *Teff* cultivated area, *Teff* production by regions, average production per hectare and percentage of regional contribution to national *Teff* production is presented in Table 4.1 below.

Table 4.1: Cultivated area and *Teff* production by regions in 2016/17 (2009 E.C)

Regional states	Cultivated area in ha	*Teff* production in quintal	Average *Teff* production in quintal per ha	Percentage contribution to national production	Ranking at national level
Oromia	1,441,029.78	24,737,963.79	17.17	49.27%	1st
Amhara	1,137,844.18	19,328,573.65	16.99	38.50%	2nd
SNNPR	246,099.24	3,412,547.66	13.87	6.80%	3rd
Tigrai	167,584.33	2,410,116.77	14.38	4.80%	4th
Benishangul-Gumuz	24,432.50	303,184.32	12.41	0.60%	5th
Afar	899.54	11,815.97	13.14	0.02%	6th
Gambela	24.79	198.3	7.99	0.00	7th
Dire Dawa	0	0	0	0.00	
Harari	0	0	0	0.00	
Somali	0	0	0	0.00	
Addis Ababa	0	0	0	0.00	
Ethiopia (national level)	**3,017,914.36**	**50,204,400.46**	**16.63546227**	**100.00**	

Source: Compiled from area production of major crops, CSA 2016/17

At the second stage, districts are purposively selected. Lomie district is purposively selected from the East Showa zone of Oromia regional state as it is having the 1st rank in *Teff* production at Oromia regional state as well as at the national level. Shenkora na Minjar district is purposively selected from the North Shewa zone of Amhara regional state as it is having the 4th rank in *Teff* production from the Amhara region and 7th rank in *Teff* production at the national level. These two districts are among the seven top *Teff* producing districts at the national level (Warner, Stehulak et al. 2019). For the same study, Halaba zone from SNNPR regional state and Tahtai Maichew district from Tigrai regional state were purposively selected as they are the top *Teff* producer districts in their respective regions (CSA 2015). From Addis Ababa regional state, *Ehil* veranda was purposively selected as it is the central market for *Teff* crop for the country in general and it is the place for the major wholesalers of the *Teff* crops.

Thirdly, two *Teff* producing *Kebele*s were purposively selected in consultation with the Office of Agriculture and Rural Development at the district level in all the study areas. A total of eight *Kebeles* were purposively selected for the study at hand. The main criteria for selecting the two *Kebeles* from each district were potentially *Teff* producing area, geographically convenient to conduct surveys, easy to find representative people from *Teff* producers and easy access to transport facilities.

The purposively sampling technique was also employed to select participants for focus group discussion and key informant interviews. In this regard, purposive sampling helps to find those informants who have knowledge and experience about the *Teff* production and distribution, are capable of providing reflection and are willing to take part in the research/ investigation. The focus group is undertaken at *Kebele* level with purposively selected individuals such as *Teff* producers, *Kebele* administrators and development agents who are expected to be knowledgeable about *Teff* production and its value chain. For the key informant interview, the purposively selected informants are from government experts such as regional and district level experts, senior experts from Ministry of Agriculture and Rural Development and Ministry of Trade and Industry, and individual wholesalers who engaged in *Teff* marketing as they are supposed to be a better source of information about the issue at hand. At fourth stage, eight sub-*Kebeles* were purposively selected from among 3 to 5 sub-*Kebeles* found within each *Kebele*. The researcher used qualitative and descriptive approaches and methods with non-random sampling, which may have some influence on their representativeness and generalisation of the findings.

b. Sample size

The target population of the study is household heads involved in *Teff* production from four districts. As per the projection of CSA and statistical reports of the districts, the total population of the four *Teff* producing districts is estimated to be 752,251 with 122,151 heads of households. In the four districts, there are about 157 *Kebeles* and 510 sub-*Kebeles*. The total number of heads of households in the eight *Kebekes* is about 3,768 as indicated in Table 4.2 below.

Table 4.2: Population and sample frame

Region	Woreda (district)	Number of *Kebeles* per district	Number of sub *Kebeles* per district	Total population at district level	Number of heads of household at district level (Target population)	Number of heads of household per *Kebele* (Source population)
SNNPR	Halaba	79	237	325,245	45,675	578
Oromia	Lomie	35	101	152,331	29,869	853
Amhara	Shenkora na Minjar	27	108	164,248	22,601	837
Tigrai	Tahtai Maichew	16	64	110,427	24,006	1,500
Total		**157**	**510**	**752,251**	**122,151**	**3,768**

Source: Compiled from CSA and statistical reports of the districts

In determining the number of sample respondents, reference is made to Tongco (2007) whereby 223 household respondents were used for a survey of evaluation of a subsistence farming system. Likewise, in research undertaken by some scholars such as Gizaw, Zerihun Tsegay et al. (2018), about 172 farmers were sampled for the adoption of improved *Teff* in northern and western Shewa zones of Ethiopia. Additionally, about 43 people were used as key informant interviews for buyers or sellers of market tree products (Te Velde, Rushton et al. 2006).

Determining proper sample size for a survey mainly hinges on factors like the level of precision required, the level of risk allowed and the degree of variability in the attributes being measured. Furthermore, customary to a social science survey, a 95% confidence level and ±5% precision was applied by Cochran in determining the size of the sample (Cochran 2007). For large populations, he developed a mathematical equation that yields a representative sample for proportions. The equation is:

$$n = \left(\frac{t}{d}\right)^2 p(1-p)$$

Where, n = sample size

t = values of standard variant at 95% confidence interval (t = 1.96)

p=the estimated proportion of an attribute that is present in the population (e.g., 20%).

d = acceptable margin of error for proportion being estimated =0.05

This is considered as the most conservative estimate because it is associated with the largest sample size. Besides, factors such as the purpose of the study, budget and time considerations are considered. To this end, by applying a sample size determination equation of Cochran (1977) mentioned above and including a 7.5% reserve for non-response rate, a total of 264 sample households were chosen using simple random sampling from the eight sub *Kebeles* as indicated below. A list of potential *Teff* producer respondents within the sub-*Kebeles* was found from respective extension agents.

$$n = \left[\frac{1.96}{0.05}\right]^2 0.2(1 - 0.2) \times 1.075$$

$$n = 264.3$$

4.2.3. Data collection instruments

Both qualitative and quantitative types of data were collected as primary and secondary data sources. Data collection was undertaken in three successive stages. First, review of literature, data on the population size of the study areas, lists of *Kebele* administration, amounts of *Teff* production at regional and district levels were collected from scientific journals, Central Statistical Agency and district level Office of Agriculture and Rural Development. Based on the information obtained from secondary data, a questionnaire and checklist were prepared. Second, before launching the full survey, testing of the study instruments was done to ensure the quality and relevance of the questionnaire and as a result, the necessary amendments were undertaken. Third, a formal survey was conducted using focus group discussion, key informant interviews and structured questionnaires, with the objective of collecting quantitative and qualitative data from *Teff* producers' survey respondents, FGD participants and key informants. The primary data was collected from sample *Teff* producers. Apart from conducting a survey from *Teff* producers, open-ended questions were used for an in-depth interview and focus group discussion.

In general, the thesis relies on the data collected from 84 FGD participants, 25 in-depth interviews and 248 survey respondents from eight *Kebeles* and sub *Kebeles* found in four *Teff* producing districts and *Ehil* veranda from Addis Ababa. The data collection instruments employed in this thesis include the following.

a. Document review

Document review is one of the data collection tools /methods largely used for reviewing literature on the subject. In this regard, Hefferman (2013) describes document analysis as analyzing data from the examination of documents from secondary sources like journal articles, textbooks, magazines, reports, etc relevant to a particular study. It involves reading an extensive amount of text data to understand and shed more light on a particular field of study. In this study, document review was used as a tool of data collection with the objective of assessing the prevailing *Teff* production and distribution situation at national level and thereby to develop the theoretical, empirical, and conceptual framework of the study.

The search words we used to get the journal articles and other materials include Ethiopia, *Teff*, production, distribution, livelihood, smallholder farmers, marketing, revenue, and cost of *Teff* production. The inclusion criteria for the research words are its significance to the title of the study at hand, its relevance to the areas of cereal production and marketing, possibilities to access to peer reviewed journals from google.scholar, and access to updated data or information. In this regard, production and marketing of other agricultural commodities such as vegetables, fruits, spices, etc is not the subject of the study and thus excluded. Moreover, the research words focused on smallholder farmers and thus, medium and large scale *Teff* producers are excluded from the study.

To access national policy and regional documents focusing on *Teff* production and distribution, published and grey literature that include strategic plan, annual plan, reports, and guidelines were used from MoFED, MoARD, ATA websites, regional bureaus and district level offices. Moreover, the national and regional data on trends of *Teff* production were obtained from CSA. During the interviews with key informants at federal level, more documents that were not in the public domain were retrieved.

Relevant documents such as guidelines and progress reports related to *Teff* production and distribution were collected from the Ministry of Agriculture and Rural Development, Ministry of Trade and Industry, Agricultural Transformation Agency, related regional offices and Office of Agriculture and Rural Development of the study areas. Government related strategic plans and performance report documents such as Plan for Accelerated and Sustained Development to End Poverty (PASDEP), Growth and Transformation Plan (GTP I and II), Poverty reduction strategy paper (PRSP), Policy and Investment Framework (PIF) and other relevant documents such as FAO and UN reports were reviewed. Scholarly articles and previous worldwide studies were also assessed and reviewed. In addition, statistics of *Teff* production at national level were drawn from Ethiopian Central Statistics Agency which helped to analyze the trends of *Teff* production at national and regional levels for the past 12 years.

The documents were reviewed to determine the national level and regional level data in relation to the involvement of smallholder farmers, farmland allocated for *Teff* production in ha and average *Teff* production per year by regions. These documents were analyzed to assess the potential areas for *Teff* production, issues related to *Teff* consumption, marketing, and problems of *Teff* production and *Teff* value chain. The findings from these documents illustrated the existing problems and concerns of *Teff* production and marketing in Ethiopia as well as possible ways to improve the situation. Such document review was also important in developing the theoretical, empirical, and conceptual frameworks for the study. However, lack of organized and adequate historical data specially on distribution and consumption of *Teff* crops at the regional levels was one of the limiting factors in this study. This emanates from the poor record handling. In addition, the available *Teff* production related data at region level was highly exaggerated compared to the sources at national level. Moreover, the CSA and the regional bureaus do not have compiled data on *Teff* distribution and consumption at region levels. As a result, the data on *Teff* distribution and consumption at regional levels was not included in the thesis and the researcher relies only on the survey data.

b. Focus group discussion (qualitative data)

As per the argument of Kitzinger (1994), focus group discussions (FGDs) are important instruments in helping delineate social norms and facilitating discussion on topics generally viewed as taboo such as grievances. FGD allows the researcher to generate a substantial amount of information over a relatively short period of time (Mack 2005). A focus group is an open planned discussion with approximately eight to twelve participants guided by an experienced facilitator. The discussion is conducted in a neutral, non-judgmental and nonthreatening atmosphere which allows participants to reveal the motives they have and processes used when making decisions (Suh 2002). The reason for using FGD is that they allow the detailed observation of a range of opinions about the issue at hand from the participants.

Focus group discussions were conducted with the selected rural households (please refer to Appendix 3 for the details). The focus group participants were selected purposely based on their knowledge and experience on the topic. This session included participants at the *Kebele* level such as *Kebele* administrators, *Teff* producers, development agents and women's association leaders. FGD participants were invited to the focus group discussions following meetings with *Kebele* administrators and development agents where the purpose of the study was explained. Once the *Kebele* administrators had granted permission to conduct the study, the development agents assisted in identifying and informing the farmers about the focus groups and the eligibility criteria. The eligibility criteria were that the participants should be resident of the *Kebele,* they should be involved in *Teff* production in 2010 E.C, they should be voluntary to take part in FGD and allow for recording and be aged 18 years and above.

FGD participants who arrived at the FTC (Farmers' training center) were taken through the study information in line with ethical principles. Their acceptance to participate in the discussion and recording of FGDs was required, and only those participants who consented and signed the consent form have participated in FGDs. Once the study participants accepted and signed the consent form, discussions with FGD participants commenced. To ensure confidentiality and protection of study participants, each discussant was allocated a pseudonym that was used to address them throughout the discussion (Ndinda et al. 2016).

The study was designed to conduct 8 FGDs (2 FGDs from each district) at *Kebele* level with a total of 88 FGD participants. However, a total of 8 FGDs (4 women groups and 4 male groups) with a total participant of 84 participants were conducted from the eight *Kebeles*. Out of the 84 participants 42 were males while the remaining 42 were female. There were 21 participants (11 female and 10 male) from Halaba zone, 21 participants (10 female and 11 male) from Lomie district, 21 participants (12 female and 9 male) from Shenkora na Minjar district and 21 participants (9 female and 12 male) were from Tahtai Maichew district. Ordinary people involved in the cultivation of *Teff,* development agents, and *Kebele* administrators were the target group for the focus group discussions. To maintain the confidentiality of the FGD participants and the information, each FGD participant was given a unique identification number ranging from 1 up to 84.

The FGDs were moderated by the researcher and facilitators who posed open ended questions and probed the participants, and a note-taker ensured that the electronic recorder was functioning. The notes also helped in identifying participants by their pseudonyms when transcription took place. The FGD recordings were transcribed verbatim in the local language (Tigrigna and Amharic) and translated into English (Ndinda et al. 2016).

The issues covered in the focus group discussion include: history of *Teff* crops, identifying the influencing factors for *Teff* production in their areas, when and how they produce *Teff*, the role of women and men in *Teff* production, the full range of farm level activities which are required to bring *Teff* product from conception through the different phases of production and delivery to final consumers focusing on producers, importance of *Teff* crops to the economy and livelihoods, the major problems in *Teff* production, views to address the problems of *Teff* production, the main actors in the value chain of *Teff* marketing in their area, potential of exporting *Teff*, problems in *Teff* marketing, the role of the government in promoting *Teff* production and marketing, views in relation to the government services including extension work, provision of agricultural input, access to market information, access to credit, trade policy, infrastructure, and similar issues.

The reflections of FGD participants were tape recorded and notes were taken for as a back-up for the recordings. The study used purposive sampling for FGD participants, which may have some influence on their representativeness and generalisation of the findings. Moreover, for some participants of the FGDs in the Halaba zone, where Sidamigna is the dominant language, the researcher hired a translator. To ensure meaning was not lost in translation, the researcher also checked the translation with a language expert from Hawassa University.

The textual data were subjected to thematic analysis which entailed the researchers getting immersed in the data to ensure sensitivity. Inductive coding was used to explore the attitudes identified in greater detail. Textual data analysis that took place can be broadly characterized as coding, categorization, and theme identification. The codes were categorized according to emerging dominant ideas from the textual data, and interpreter reliability helped in comparing the themes identified. What emerged were themes that were similar, while differences in analysis of the data were accounted for by the emphasis placed on some themes and selection of extracts to support the dominant themes (Ndinda et al. 2016).

c. Key informant interviews (Qualitative data)

In-depth interviews were chosen as one data collection method in this thesis as it provides the opportunity to explore issues in more depth and seek explanations of concepts that are unclear (Curry, Nembhard et al. 2009). In this regard, in-depth interviews were conducted in Sri Lanka by Bandula, Jayaweera et al. (2016) with selected value chain representatives to determine the role of underutilized crop value chains in rural food and income security. Moreover, interviews with key informants were also used by Hailu, Weersink et al. (2015) in the value chain to understand how the *Teff* value chain is transforming. The purposively identification and selection of appropriate individuals within agriculture and trade sectors and actors in the *Teff* value chain were done. In this thesis, an in-depth interview was undertaken to collect information in relation to trends of *Teff* production and distribution, consumption, *Teff* marketing, and opportunities and challenges related to *Teff* production and distribution.

The in-depth interviews were conducted with purposively selected key informant interviewees from development agents at *Kebele* level, wholesalers and experts at district, region and federal levels such as the Office of Agriculture and Rural Development of the four regions and districts, Ministry of Agriculture and Rural Development and Ministry of Trade and Industry. Like FGD, the key informants were informed about the purpose of the study and ethical principles. It was planned to undertake an interview with 30 key informants. However, about 25 key informants were involved in the study as the required information was collected: and repetitive and similar nature of the responses. In line with ethical standards and to ensure anonymity, the study participants were identified by numbers 1-25. Guided by the key research questions, thematic analysis was used to code both documents and transcripts, and results were reported thematically (Ndinda et al. 2018).

The key informant interviews were electronically recorded, but in cases where individuals declined being recorded, the study team took notes. The interviews were conducted at mutually agreed times and at venues that were free from distractions. The interviewers explained the purpose of the study, benefits of participating, and the right to withdraw at anytime without penalty, and confidentiality, while participants provided verbal or written documentation of consent to participate (Ndinda et al. 2018). Recorded interviews were transcribed, edited to remove typographical and grammatical errors and real names of study participants.

d. Household survey

A questionnaire is defined as a list of research questions posed to respondents to obtain specific information. Mertens (2014) defined questionnaires as research tools through which people are asked to respond to the same set of questions in a predetermined order (Mertens 2014). Household survey is chosen as one of the data collection methods in this thesis as it is one of the most popular and convenient methods of conducting scholarly research (Walonick 1993). Surveys and interviews with key informants were used by some scholars in the value chain to understand how the *Teff* value chain is transforming (Amentae 2016; Amentae 2018). Similarly, in exploring *Teff* value chain and postharvest-losses in Ethiopia, semi-structured survey questionnaires and interviews of key informants were used by scholars (Amentae 2016). In examining the commercialization of smallholder agriculture in selected *Teff* growing areas, a structured household questionnaire was also used by Boka (2017) to collect quantitative data on production, consumption, and marketing of farm produce, as well as demographics, resource ownership, and off-farm activities.

In this thesis, questionnaires were developed to collect data and information from *Teff* producers in study areas (please refer to Appendix 4 for the details). The questionnaire was prepared in English based on the specific objectives of the study as a theme and was translated into the local language (Amharic and Tigrigna) before the survey. The questionnaire was designed based on themes and issues related to variables affecting *Teff* production, distribution (amount of *Teff* supplied to the market and channels of distribution used by farmers) and the contribution of *Teff* to the livelihoods of smallholder producers. It focuses on household characteristics, family economic conditions, land use, technology adoption, *Teff* production and supply of *Teff* crops to the market, revenue generated from marketing of *Teff* crops (as source of income to the farmers), costs of *Teff* production, profitability (cost benefit) analysis of *Teff* farming, consumption of *Teff* crops as compared to other cereal crops and other variables relevant to the objectives. The structured survey questionnaires were administered with the support of experienced research assistants. Each of the questions in the questionnaire was discussed with the research assistants before the commencement of the field survey.

Based on the planned sample size, a total of 264 sample respondents (24.6% of the sampling frame or the list of potential subjects from which the sample is drawn) were chosen from the sampling frame of 1073 *Teff* producers residing in the eight sub-*Kebeles.* A total of 264 sample respondents (33 respondents from each sub-*Kebele*) were randomly selected by using systematic random sampling methods. Therefore, data was collected from 264 respondents. However, 16 questionnaires were found to be incomplete and thus rejected indicating a 94% success rate in data collection for the survey and thus a total of 248 respondents randomly selected were considered for the study at hand. This thesis considers the data from 31 female-headed households and 217 male-headed households (a total of 248 survey respondents) with the same sample size of 62 respondents from each of the four districts as indicated in Table 4.3 below. The researcher identified experimental districts from among the four districts with the objective of making comparisons among districts and test hypotheses across different variables affecting *Teff* production, distribution, and livelihoods.

Table 4.3: Sample size by sub-Kebele and sex

District name	**Name of purposively selected two *Kebeles***	**Number of households per sub-*Kebele* (Sampling frame)**			**Number of respondents involved in the survey (Study units)**		
		Female	**Male**	**Total**	**Female**	**Male**	**Total**
Halaba	Andegna Ansha and Guba	41	152	193	7	55	62
Lomie	Deka Bora and Tulu Re'ee	28	268	296	5	57	62
Shenkora na Minjar	Agirat and Bollo Selassie	17	192	209	6	56	62
Tahtai Maichew	Kewanit and May Brazio *Kebeles*	123	252	375	16	46	62
Total		**209**	**864**	**1073**	**34**	**214**	**248**

Source: Compiled from the statistical reports of the *Kebeles*

4.2.4. Data analysis

The methods of data analysis used in the study at hand are presented hereunder.

a. Qualitative data analysis

Qualitative content analysis has been used in this thesis for the analysis of qualitative data. It is used as a research method for the subjective interpretation of the content of text data through the systematic classification process of coding and identifying themes or patterns (Hashemnezhad

2015). It is one of the numerous research methods used to analyze text data. Other methods include ethnography, grounded theory, phenomenology and historical research (McTavish and Pirro 1990). Research using qualitative content analysis focuses on the characteristics of language as communication with attention to the content or contextual meaning of the text (Budd, Thorp et al. 1967; Lindkvist 1981). Thematic content analysis is a well-established and widely used technique in qualitative research, particularly in case study methodology (Attride-Stirling 2001; Hsieh and Shannon 2005). This technique is used to analyze written and visual data and is a significant help in summarizing data related to particular themes and contents (Elo and Kyngäs 2008). It involves the extraction of themes or categories from the data and then using these to explain phenomena under investigation (Hsieh and Shannon 2005).

In this study, thematic content analysis was applied to qualitative data collected from focus group discussions and in-depth interviews. Content analysis is chosen as one of data analysis in this thesis as it is widely used qualitative research technique and it is a flexible method for analyzing text data (Cavanagh 1997). The conceptual analysis begins with identifying research questions. In this regard, five to six sub-questions were developed for each research objective that helped in developing manageable content categories. By reducing the text to categories consisting of a word, set of words or phrases, the researcher can focus on, and code for, specific words or patterns that are indicative of the research question.

The raw qualitative data (recordings) from the focus group discussions and in-depth interviews with extension agents, regional experts and senior experts at the federal level were captured on audio recordings in local languages such as Tigrigna and Amharic. Hence, the first step was transcribing the recordings verbatim and translating the raw data into English before commencing the data analysis. These transcribed data along with field notes were organized and prepared for analysis according to different categories of participants. The data were carefully examined for the correction of mistakes arising out of transcription and organization.

Then the raw data were transformed into concepts. Concepts are words that stand for groups or classes of objects, events, and actions that share some major common properties. For this purpose, the transcribed data were thoroughly read many times to understand the true contextual meanings so that concepts were properly derived from the textual data. These derived concepts were categorized into different categories based on the research questions that allow the creation of several concepts and themes from the data. In this regard, important themes relating to *Teff* production and distribution among FGD participants and key informants were extracted. These themes were important in understanding the underlying situation of *Teff* production and the participation of smallholder producers in *Teff* marketing at each *Kebele*.

In formulating the research objectives, the author used a conceptual framework (key themes), which provides various dimensions related to the content analysis of *Teff* production and distribution. This framework was also helpful in categorizing the information and discussions held with FGD and key informants. The unit and method of analysis are contextualized in the form of descriptive, conceptual, and theoretical perspectives of *Teff* production and distribution. The content of the study is classified into different units (categories of information). To be clear, such units emerge in different forms of presentation in the thesis as such qualitative and quantitative data were presented in an integrated fashion. An attempt was made to integrate the views of FGD and KII participants with data gathered using survey on the one hand and comparing the findings of this research with previously conducted research (document review) is especially worth underscoring here. For each study objective, some of the questions analysed are presented Table 26 in the annex.

The above table sets out the context questions asked and analysed per study objective. These questions were drawn from the FGDs and KIIs. Using content analysis, the key themes related to the study topic were drawn and these are presented in the next chapters on findings. In general, to fulfil the desired outcome of development at household level, this study argues for a people-centred approach whereby *Teff* producers should be prioritised as they produce an important crop for the country and the globe at large.

b. Quantitative data analysis

i. Descriptive analysis

Descriptive analysis is used as one of data analysis tool in the thesis. It is a useful method in social science fields of study in quantifying and assessing the relationship among different variables. In this regard, it was used by some scholars such as Habtewold, Challa et al. (2017) for analyzing the market chain of *Teff* and wheat crops. Analysis of descriptive information was also used by other researchers to determine the trend of *Teff* production, market orientation, markets and market channels used by smallholders (Gebremedhin and Hoekstra 2007; Berhane, Paulos et al. 2011). Also, descriptive methods including measures of average and a one-way ANOVA (analysis of variance) were employed by some authors such as Boka (2017) and Joerin, Assefa et al. (2018) to disclose the scale of commercialization of agriculture and to test the existence of any statistically verifiable difference among farmers operating at different levels of commercialization. Descriptive analysis such as percentages, means, chi-square, t-test, and standard deviations was used in the study. The chi-square (the degree of association) and t-test (mean difference) were mainly used to see whether there is difference among the four districts in relation to the variables affecting *Teff* production, amount of *Teff* supplied to the market, consumption of *Teff* at household level, costs of *Teff* production, revenue of the households, income from *Teff* marketing and profitability (cost benefit analysis) of *Teff* production. The researcher identified experimental and control units at district level to make comparisons among districts and test hypotheses among districts. In the process of examining and describing factors affecting *Teff* production and distribution functions and farm household characteristics of the respondents SPSS 20 and STATA 13 software were used to analyze the quantitative data.

ii. Likert scale

The Likert scale was used in this thesis as method of data analysis as it allows the ranking of people's beliefs about certain phenomena. It is a widely used scaling approach used in surveys examining respondents' attitudes or beliefs. Usually, it is a five-point bipolar response scale that ranks a group of categories, least to most, asking people to indicate how much they agree or disagree, approve or disapprove, believe to be true or false (Allen and Seaman 2007). According to Amentae (2016), questionnaire-based estimations through Likert scale were applied to identify the post-harvest losses of selected food commodities in Ethiopia. In this regard, five-point scales were used to evaluate the beliefs about factors that affect *Teff* production, distribution, and livelihoods. As a result, potential factors that influence *Teff* production and distribution are ranked by the respondents using the Likert scale.

iii. Econometric models

a. ***Teff*** **production function**

In the analysis of household level factors affecting *Teff* production and the amount of *Teff* supplied to the market, multiple linear regressions is used. In modelling the multiple regression and see the major variables affecting *Teff* production, we use the district dummies by taking the district Tahtai Maichew as the base. To account for district, we create three dummies as indicated below:

- A dummy that takes on a value =1 if district is Lomie, and 0 otherwise.
- A dummy that takes on a value =1 if district is Shenkora na Minjar, and 0 otherwise.
- A dummy that takes on a value =1 if district is Halaba zone, and 0 otherwise.

With this coding scheme, we regressed the above three dummies against *Teff* production in kg per household. To identify the household level independent variables affecting *Teff* production, a multiple regression model was used. Multiple regression helps in adding factors to the analysis separately so that the effect of each independent variable can be estimated. It is valuable for quantifying the impact of various independent variables upon a single dependent variable, the *Teff* production. In this regard, the combined effect of a group of independent variables on promoting *Teff* production per household was studied by framing the multiple regression equation of the variable "Y" on the other independent variables "X". For example, Getu Hailu et al. (2016) used ordinary least squares (OLS) to identify the factors affecting *Teff* production. Similarly, in this study, the production function with 21 independent variables is used in the model specification.

Regression analysis generates an equation to describe the statistical relationship between one or more predictor variables and the response variable. It generates an equation that describes the relationship between one or more predictor variables and the response variable. In the classical regression model, each estimate gives the partial effect of a coefficient with the effects of other X variables being controlled (Gebrehiwot, Azadi et al. 2018).

The joint effect of a group of independent variables on *Teff* production is studied by framing the multiple regression equation of the variable "Y" on the other independent variables. In this regard, there are quite a variety of independent variables that can affect *Teff* production both positively and negatively. It is very difficult to enumerate and discuss all the factors that affect *Teff* production. However, from similar research results and previous experience, the major factors that affect *Teff* production in the study area are considered for analysis. The framework assumes that *Teff* production (dependent variable) is the result of the positive and negative effects exerted by all the explanatory variables (independent variables) on the dependent variables. The model specification of *Teff* production function is presented in matrix notation as described hereunder.

$$
\begin{aligned}
Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + + \beta_9 X_9 + \beta_{10} X_{10} \\
+ \beta_{11} X_{11} + \beta_{12} X_{12} + \beta_{13} X_{13} + \beta_{14} X_{14} + \beta_{15} X_{15} + \beta_{16} X_{16} + \beta_{17} X_{17} \\
+ \beta_{18} X_{18} + \beta_{19} X_{19} + \beta_{20} X_{20} + \beta_{21} X_{21}
\end{aligned}
$$

Where: Y= Total number of *Teff* production in kg per farmer (dependent variable)

$\beta_{1\text{-}21}$= a vector of estimated coefficient of the explanatory variables

$X_{1\text{-}21}$= a vector of explanatory variables (independent variables)

u = disturbance term

X_1 = Shenkora na Minjar district (SM)

X_2 = Lomie district (LOM)

X_3 = Halaba zone (HALA)

X_4 = Male (GENDER)

X_5 = Age (AGE)

X_6 = Marital status (MARITAL)

X_7 = Number of active labour force in the household (LABOUR)

X_8= Highest level of education (SCHOOL)

X_9= Oxen ownership (OX)

X_{10} = Labour cost for *Teff* production (LABCOST)

X_{11} = Contact with extension agent (EXT)

X_{12} = Total training days attended (TRAIN)

X_{13} = Amount of loan allocated to *Teff* production (TEFFLOAN)

X_{14} = Experience of membership in cooperatives by years (COOP)

X_{15}= Total farm asset value in Birr in 2010 E.C (FARMASSET)

X_{16}= Total investment for utilities (UTILITY)

X_{17}= Owned land in ha for cultivation (OWNEDLAND)

X_{18}= Rented land in ha per household (RENTEDLAND)

X_{19}= Share crop land in ha per household (SHARELAND)

X_{20} = Inherited land in ha per household (INHERETEDLAND)

X_{21} = Adequacy of rainfall in 2010 E.C (RAI)

Regression coefficients also represent the percentage change in the response variable for one unit of change in the predictor variable while holding other predictors in the model constant. This statistical regression method isolates the role of one variable from all the others in the model. The coefficient indicates that for every additional change of one unit of the independent variable, the percentage change over the dependent variable.

The p-value for each item tests the null hypothesis that the coefficient is equal to zero (no effect). A low p-value ($p < 0.05$) indicates that you can reject the null hypothesis. In other words, a predictor that has a low p-value is likely to be a meaningful addition to your model because changes in the predictor's value are related to changes in the response variable (Zar 1999). Conversely, a larger (insignificant) p-value suggests that changes in the predictor are not associated with changes in the response. The data was checked against normality and multicollinearity tests.

Normality test: The concept of normality is central to statistics. For data to be normal, they must have the form of a bell curve, or Gaussian distribution, with values dropping off in a particular fashion as they increase or decrease from the mean. Specifically, a normal distribution contains 68.26% of the data within ±1 standard deviation from the mean. A Shapiro-Wilk W test was used to a test the normality for the proposed model; accordingly, the Shapiro-Wilks (W) test is considered by some authors such as Zar (1999) to be the best test of normality. It is statistics that differentiate normally from non-normally distribution. If significant, then it tells us that the data is not normally distributed (less than 0.05 indicates that the data are non-normal). Our data was not normally distributed and thus transformation of the data (square root of *Teff* production) was undertaken, and the Shapiro-Wilks W test result becomes greater than 0.05 that shows the normality of the data. The test result is insignificant to reject the null hypothesis that the distribution is normal (Manly 2006).

Multicollinearity: The selected independent variables were also checked for potential multicollinearity problems using the Variance Inflation Factor (VIF) tests. The result showed that the VIF for all predictors is less than 10 indicating that there were no multicollinearity problems in the data (for the details, refer Table 22 in the annex).

Based on the economic theory and results of previous empirical studies, each variable is defined and its relationship with the dependent variable is explained by its measurement calibrations as indicated below. The independent variables together with their hypothesized influence to the *Teff* production in either positively (+), negatively (-), or positively and/or negatively (+/-) is presented in table 4:4 below.

Table 4.4: Variables' measurement calibration for *Teff* production

Variables' name	Measurement units description
Dependent variables	
Teff production	Amount of *Teff* produced in kg per respondent (sqrt)
Independent variables	
Shenkora na Minjar district	1 if district is Shenkora na Minjar district, and 0 otherwise
Lomie district	1 if district is Lomie district, and 0 otherwise
Halaba zone	1 if district is Halaba zone, and 0 otherwise
Sex	1 if household head is male, 0 otherwise (+)
Age	Number of years (+/-)
Marital status	Marital status of the respondent (+/-)
Economically active members	Human labour, which is calculated as members of the household between the ages of 15 and 65, and serves as a proxy for available labour for farming (+).
Highest level of education	The highest level of education attended by the head of the household (+)
Oxen ownership	1 if household head own ox, 0 otherwise (+)
Frequency of contact with extension agents	Number of contact days with extension workers in 2010 (2017/18) (+).
Total training days	Total training days attended in 2010 (2017/18) (+)
Teff loan	Amount of loan allocated for *Teff* production (+)
Cooperative membership	Number of years in cooperative membership (+)
Farm equipment valuation	Monetary value of farm equipment owned (+)
Investment in utilities	Amount of Birr invested to get utility services (+)
Owned land	Amount of owned land in ha (+)
Rented land	Amount of rented land in ha (+)

Share cropped land	Amount of share cropped land in ha (+)
Inherited land	Amount of inherited land in ha (+)
Perception of the respondents towards the availability of enough rainfall	1 if perception of the respondent is “rain is enough”, 0 otherwise (+)

Source: compiled from different sources

b. *Teff* supplied to the market

In analyzing the supplied *Teff* to the market, the Ordinary Least Squares (OLS) was used by some authors such as Martey, Al-Hassan et al. (2012). The amount of *Teff* supplied to the market has a direct and positive relationship to the livelihood improvement of the producers. Accordingly, to estimate the amount of *Teff* supplied to the market, the econometric model specification of Ordinary Least Squares (OLS) is used in this thesis. The justification for using OLS model is that the amount of *Teff* supplied to the market is a continuous dependent variable and they are expected to take a non-zero value for all farm households (Endale, Mengesha et al. 2014).

The variables used to explain *Teff* supply are related to the different forms of socioeconomic, institutional and farm characteristics. Despite the versatility of the variables, the list of the variables (though not exhaustive) believed to influence the dependent variables and the variables' measurement calibration for the supply of *Teff* to the market are presented in Table 4.5 below. The following model with 21 independent variables was used for model specification. In the classical regression model, each estimate gives the partial effect of a coefficient with the effects of other X variables being controlled (Gebrehiwot, Azadi et al. 2018).

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + +\beta_9 X_9 + \beta_{10} X_{10} + \beta_{11} X_{11} + \beta_{12} X_{12} + \beta_{13} X_{13} + \beta_{14} X_{14} + \beta_{15} X_{15} + \beta_{16} X_{16} + \beta_{17} X_{17} + \beta_{18} X_{18} + \beta_{19} X_{19} + \beta_{20} X_{20} + \beta_{21} X_{21}$$

Where:

Y= Amount of *Teff* supplied to the market in kg (dependent variable)

$\beta_{1\text{-}21}$= a vector of estimated coefficient of the explanatory variables

$X_{1\text{-}21}$ = a vector of explanatory variables (independent variables)

u = disturbance term

X_1 = Shenkora na Minjar district (SM)

X_2 = Lomie district (LOM)

X_3 = Halaba zone (HALA)

X_4 = Male (GENDER)

X_5 = Age (AGE)

X_6 = Family size (FAMI)

X_7 = Number of dependents (DEPEND)

X_8 = Not attending school (NOSCHO)

X_9 = Elementary school (ELEM)

X_{10} = High School (HS)

X_{11} =*Teff* consumption (TCONSU)

X_{12} = Membership in marketing cooperatives (MARCOOP)

X_{13} = Distance to Market (DIST)

X_{14} = Travel time (TRATIME)

X_{15} = Total cost of transport (TRANS)

X_{16} = Average price of *Teff* crops per kg (PRICE)

X_{17} = Market information (MINFO)

X_{18} = Storage capacity (STOR)

X_{19} = Selling time (SALETIME)

X_{20} = Role of the government (GOV)

X_{21} = *Teff* production (TPROD)

Table 4.5: Variables' measurement calibration for *Teff* supplied to the market

Dependent variable	
Teff supply	Amount of *Teff* supplied to the market in kg
Independent variables	
Shenkora na Minjar district	1 if district is Shenkora na Minjar district, and 0 otherwise
Lomie district	1 if district is Lomie district, and 0 otherwise
Halaba zone	1 if district is Halaba zone, and 0 otherwise
Sex	Gender of the respondent (+/-)
Age	Number of years (+/-)
Family size	Number of household members including adults and children (+/-)
Number of dependents	Number of dependents within the household (-)
Not attending	1 if the respondent didn't attend school, and 0 otherwise (+/-)

Elementary school	1 if the respondent attended elementary school, and 0 otherwise (+)
High School	1 if the respondent attended high school, and 0 otherwise (+)
Teff consumption	*Teff* crops consumed by the household (-)
Membership in cooperative marketing	Membership in cooperative marketing (+)
Distance to the market	Travelled distance in kilometres between the residence of the head of the household and the nearest market (-)
Total cost of transport	The price paid to travel to the nearest market (-)
Market information	Access to market information (+)
Market price	The price for of *Teff* crop per kg (+)
Storage capacity	The capacity of storage facility (+)
Timing of *Teff* marketing	The season of *Teff* marketing (+)
Government policy	Service of the government (-/+)
Teff production	Production of *Teff* crops in kg by household (+)

Source: compiled from different sources

Like that of *Teff* production data, the data for *Teff* supplied to the market was not normally distributed and thus transformation of the data (square root of the amount of *Teff* supplied to the market) was undertaken and the Shapiro-Wilks W test result becomes greater than 0.05 that shows the normality of the data. Similarly, the selected independent variables were checked for potential multicollinearity problems using the Variance Inflation Factor (VIF) tests. The result showed that the VIF for all predictors is less than 10 indicating that there were no multicollinearity problems in the data (for the details, refer Table 24 in the annex).

4.3. Approach to the study

4.3.1. Mixed methods

A mixed method research design was used in this thesis as a procedure for collecting, analyzing, and mixing both quantitative and qualitative data to understand a research problem. As *Teff* production and distribution is vast and complex involving many stakeholders, to get more information and insight to the subject the researcher utilizes both quantitative and qualitative data collection methodologies. This method was selected on the assumption that it helps to gather enough information and data both in qualitative and quantitative aspects of the topic.

Mixed method is used when one type of research (qualitative or quantitative) is not enough to address the research problem or answer the research questions (Creswell 2012). Therefore, the purpose of using a mixed method in this thesis is to gather data that could not be obtained by adopting a single methodology and for triangulation so that the findings with a single approach can be substantiated with others. Quantitative research involves gathering numeric and close-ended information through instruments or a structured form of interviewing and observing, while qualitative research involves collecting text (e.g., interview data, field notes of the researcher) or visual information from participants at a site or setting (Creswell, 1999; 1994).

According to Henning, Van Rensburg & Smit (2004), in a quantitative study, the focus is on the representation of subjects and the relationships between the different variables under consideration. Structured questionnaire surveys are one of the popular instruments used to collect data in a coherent manner. The quantitative aspect of this thesis was useful in deciding what to study, asking specific, narrow questions, collecting quantifiable data from 248 participants; analyze these numbers using statistics, and conducting the inquiry in an unbiased, objective manner. In this regard, efforts were made to quantify and to make measurable the variables related to *Teff* production, distribution and livelihoods. Mainly, it focuses on collecting numerical data through questionnaires that can be subjected to statistical analysis.

On the other hand, to know the “how” aspect of the topic at hand, the qualitative method of data collection was used in the thesis. The focus of qualitative research is not the issue of representation and quantification. In the processes of data collection and analysis, qualitative study gives due attention to words rather than quantification (Bryman 2004; Bryman 2008). FGDs and in-depth interviews were the two data collection tools used for qualitative data. Using a qualitative method, the researcher relies on the views of participants; asks broad, general questions; collects data consisting largely in words from participants; describes and analyzes these words in themes; and conducts the inquiry in a subjective manner. It involves listening to the participants’ voice and subjecting the data to analytic induction (e.g., finding common themes) and it is more exploratory in nature (Creswell 2012).

A concurrent procedure was used as a strategy in this research in which the researcher converges quantitative and qualitative data to provide a comprehensive analysis of the research problem. In this regard, the researcher collects both forms of data at the same time during the study and then integrates the information in the interpretation of the overall results. Also, in this design, the researcher nests one form of data within another to analyze different questions.

4.3.2. Study sites

An overview of the socio-economic characteristics of the purposely selected four districts and eight sample *Kebeles* is presented below.

4.3.2.1. Halaba zone of SNNP regional state

The Halaba zone is located about 315 km south of Addis Ababa and it is about 85 km southwest of the Southern Nations Nationalities and Peoples Regional (SNNPR) States' capital of Hawassa. It is bordered by Oromia regional state on the west, by Hadiya (Sike) on the north, by Kembata Tembaro on the east and by Silte and Hadiya zones on the southeast. It is a zone and has a special status where the administration directly reports to the regional state (Kocho, Abebe et al. 2011).

According to the recent report of the Office of Agriculture and Rural Development of the zone, the total population of the district is estimated to be 325,245 (male 156,113 and female 169,132), which makes it one of the most populous zones in the region. There are about 45,675 heads of households with 37,576 (82.27%) male-headed households and the remaining 8,099 (17.73%) female-headed households (WoARD, 2010). In the zone, there are about 79 *Kebeles* and 237 sub *Kebeles*. Ethnically, Halaba and Guraghe ethnic groups are the dominant groups constituting about 81% and 10% of the total population, respectively (Kocho, Abebe et al. 2011).

The total land area of the zone is about 64,116.25 ha out of which 48,337 ha (75.39%) are considered to be suitable for agriculture. The types of soils of the area are relatively fertile and during good rains, farmers can harvest good yield even without the application of fertilizer (WoARD, 2010). Attitudinally, the zone ranges from 1,554 to 2,149 meters above sea level (masl), but most of the zone is found at about 1,800 masl. Except for a few hills, the zone is suitable for agriculture in terms of soil and topography. Rainfall during the main rain seasons is erratic. Most of the time crops fail due to the uneven and unreliable distribution of rainfall (WoARD, 2010; Kocho, Abebe et al. 2011).

Mixed agriculture (farming and livestock development) is the main activity and plays an important role in the livelihood of the rural farmers. At Halaba zone, maize, *Teff*, pepper, sorghum, wheat, haricot bean, finger millet and barley are the major annual crops grown by the majority of farmers. Pepper, *Teff*, haricot bean, and wheat are also marketable crops (WoFED, 2010; Urgessa 2011). According to the report of Office of Agriculture and Rural Development of the zone, about 24,685 ha was allocated for *Teff* production in 2010 E.C (2017/18) by farmers and a total of 35,793,250 kg of *Teff* crops were produced which indicates an average production of 1,450 kg per ha in 2017/18 harvest period at the zone level.

In consultation with the Office of Agriculture and Rural Development of the zone, Guba and Andegna Ansha *Kebeles* were purposively selected for the study. Mixed agriculture is the main activity and source of livelihood for both *Kebeles*. The total population of Guba *Kebele* is 6,207 (647 households out of which 187 are female-headed households) while the population of Andegna Ansha *Kebele* is 3,080 (457 households out of which 47 are female-headed households). In 2010 E.C (2017/18) harvest period, a total of 510 ha (270 ha for Guba *Kebele* and 240 ha for Andegna Ansha *Kebele*) of land was allocated for *Teff* cultivation and a total of 805,700 kg of *Teff* crops (373,700 kg of *Teff* for Guba *Kebele* and 432,000 kg of *Teff* for Andegna Ansha *Kebele*) were produced (WoARD, 2018; WoFED, 2018). When we see the average *Teff* production for the two *Kebeles,* it is about 1,384.07 kg per ha for Guba *Kebele* and 1,800.00 kg per ha for Andegna Ansha *Kebele*.

4.3.2.2. Lomie (Lume) district of Oromia regional state

Lomie (Lume) is one of the districts in the Oromia regional state of Ethiopia. Part of the Misraq Shewa zone and located in the Great Rift Valley, Lomie is bordered by the Koka reservoir on the south, by Ada'a Chukala on the west, by Gimbichu on the northwest, by Amhara regional state on the north and by Adama on the east (WoFED, 2018). Modjo is the capital of the district. Except for a small portion of the northern part, the altitude of the district ranges from 1,500 to 2,300 meters above sea level. Based on the report of the District Office of Agriculture and Rural Development, a survey of the land in this district shows that 75% is arable or cultivable, 3% pasture, 2% forest and the remaining 20% considered degraded or unusable (WoARD, 2018).

Based on figures published by the Central Statistical Agency in 2013, this district is projected to have an estimated total population of 152,331 (77,594 men and 74,734 women) in 2017. About 95,282 (62.55%) of the residents are rural dwellers while the remaining 57,049 (37.45%) are urban dwellers (CSA 2013). Based on the information obtained from the Office of Agriculture and Rural Development of the district, there are 35 *Kebeles* and 101 sub *Kebeles*. A total of 14,577 households were involved in *Teff* production at the district level in 2010 E.C (2017/18) (WoARD, 2018). According to the district level information, about 16,949 ha of land was allocated for *Teff* production by farmers and a total of 48,304,650 kg of *Teff* crops was produced that shows an average production of 2,850 kg per ha in 2017/18 harvest period at the district level.

In consultation with the Office of Agriculture and Rural Development of the district, two study sites namely Tulu Re'ee and Deka Bora Kara were purposively selected for the study. The total population of Tulu Re'ee is 1,340 (294 households out of which 32 are female-headed households) while that of Deka Bora Kara is 4,192 (653 households out of which 52 are female-headed households). Mixed agriculture is the main activity and source of livelihood for both *Kebeles*.

In 2010 E.C (2017/18) harvest period, a total of 1,528 ha (520 ha for Tulu Re'ee and 1,008 ha for Deka Bora Kara) of land was allocated for *Teff* cultivation and a total of 3,780,000 kg of *Teff* (1,512,000 kg of *Teff* for Tulu Re'ee and 2,268,000 kg of *Teff* for Deka Bora Kara) were produced (WoARD, 2018). When we see the average *Teff* production for the two *Kebeles*, it is about 2,907.69 kg per ha for Tulu Re'ee *Kebele* and 2,250.00 kg per ha for Deka Bora Kara *Kebele*.

4.3.2.3. Shenkora na Minjar district of Amhara regional state

Shenkora na Minjar district is found in the central highlands of Ethiopia. Located at the southern end of the Semien Shewa Zone, Shenkora na Minjar district is bordered on the east, south, and west by the Oromia Regional State, on the northwest by Hagere Mariamna Kesem, and on the northeast by Berehet. The Germama (or Kesem) river forms the boundary between this district and Hagere Mariamna Kesem and Berehet. The administrative center of this district is Arerti. The altitude of the district ranges between 1,040 to 2,380 metres above sea level. It is also characterized by moderate to sub-humid temperature with a mean of 25ºC. It also gets its annual rainfalls ranging from 800 mm to 1,000 mm (WoFED, 2017).

Based on the information from the office of Finance and Economic Development of the district, the district has 27 *Kebeles* and108 sub *Kebeles* with a total population of 164,248 (male 84,538 and female 79710). A total of 22,601 heads of households are available at district level out of which 20,389 households are male-headed while the remaining 2,212 households are female-heads (WoFED, 2017). The agricultural production system is mixed (crop and livestock) whereby the smallholder farmers practice both crops and livestock production under the same management.

Shenkora na Minjar district represents one of the major cereals and legumes growing areas in the country. *Teff*, chickpea and wheat are the most important and major crops in terms of quantity grown in the study areas. According to the district level information, about 14,218.10 ha was allocated for *Teff* production and a total of 30,122,400 kg of *Teff* crops were produced in the 2017/18 harvest period. In this regard, the average *Teff* production is about 2,118.59 kg per ha at the district level (WoARD, 2018).

In consultation with the Office of Agriculture and Rural Development of the district, two study sites (Agirat and Bollo Silassie *Kebeles*) were purposively selected for the study at hand. The total population of Bolo Silassie is 6,735 (864 households out of which 58 are female-headed households) while that of Agirat is 5,177 (706 households out of which 68 are female-headed households). In 2010 E.C (2017/18) harvest period, a total of 1,535 ha (550 ha for Bolo Silassie and 985 ha for Agirat) of land was allocated for *Teff* cultivation by farmers and a total of 3,570,400 kg of *Teff* crops (913,000 kg of *Teff* for Bolo Silassie and 2,657,400 kg of *Teff* for Agirat) were produced (WoARD 2018). When we see the average *Teff* production for the two *Kebeles,* it is about 1,660.00 kg per ha for Bolo Silassie *Kebele* and 2,697.87 kg per ha for Agirat *Kebele*.

4.3.2.4. Tahtai Maichew district of Tigrai regional state

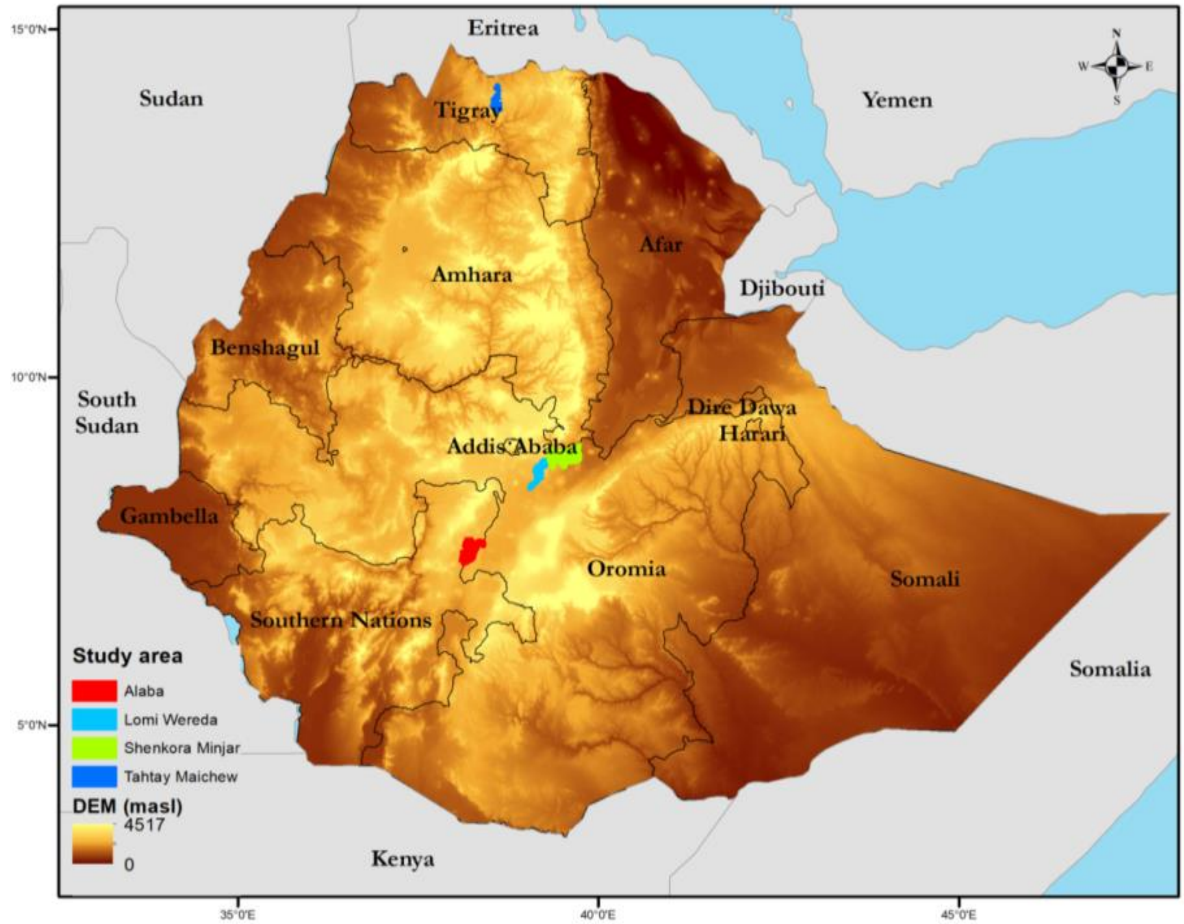
Tahtai Maichew is one of the districts of the central zone of Tigrai regional state. It is bordered by Naeder Adet on the south, by the North Western Zone on the west, by Mereb Leke on the north, and by Laelay Maichew on the east. The administrative center of this district is Wukro Marai. It is found about 230 kilometers far away from Mekelle, the capital of Tigrai regional state and about 1010 kilometers from Addis Ababa, the capital of Ethiopia (WoFED 2017).

Based on the information from the Office of Finance and Economic Development of the district, the total population of the district is about 110,427 (male= 52,820 and female= 57,607) with a total of 24,006 heads of households out of which 8,390 (34.95%) are female-headed households. When we see the land tenure of the district, about 89.99% of the heads of households have their own land, 9.66% are renting and 0.35% under other forms of tenure. The same report also indicates that about 74.91% of the land is used for planting cereals, 15.16% of the land is used for planting pulses, 1.02 % of the land is used for planting oilseeds, and 0.16% for planting vegetables. About 73.34% of the residents are engaged in mixed farming (planting and livestock), 25.06% of the households are involved in planting crops only and the remaining 1.6% of the households are engaged in raising livestock only (WoFED, 2017).

Based on the report of the Office of Agriculture and Rural Development, Tahtai Maichew is one of the ten potential districts identified for *Teff* production at region level. There are 16 *Kebeles* and 64 sub *Kebeles* in the district. Ten *Kebeles* are known for their potential for *Teff* crops at the district level and they are classified as the cluster for *Teff* production. A total of 14,637 households were involved in *Teff* production in 2010 E.C (2017/18) at the district level with total cultivated land of 5,178.2 ha and total production of 8,609,400 kg of *Teff* and average production of 1,662.62 kg per ha at district level (WoARD 2018).

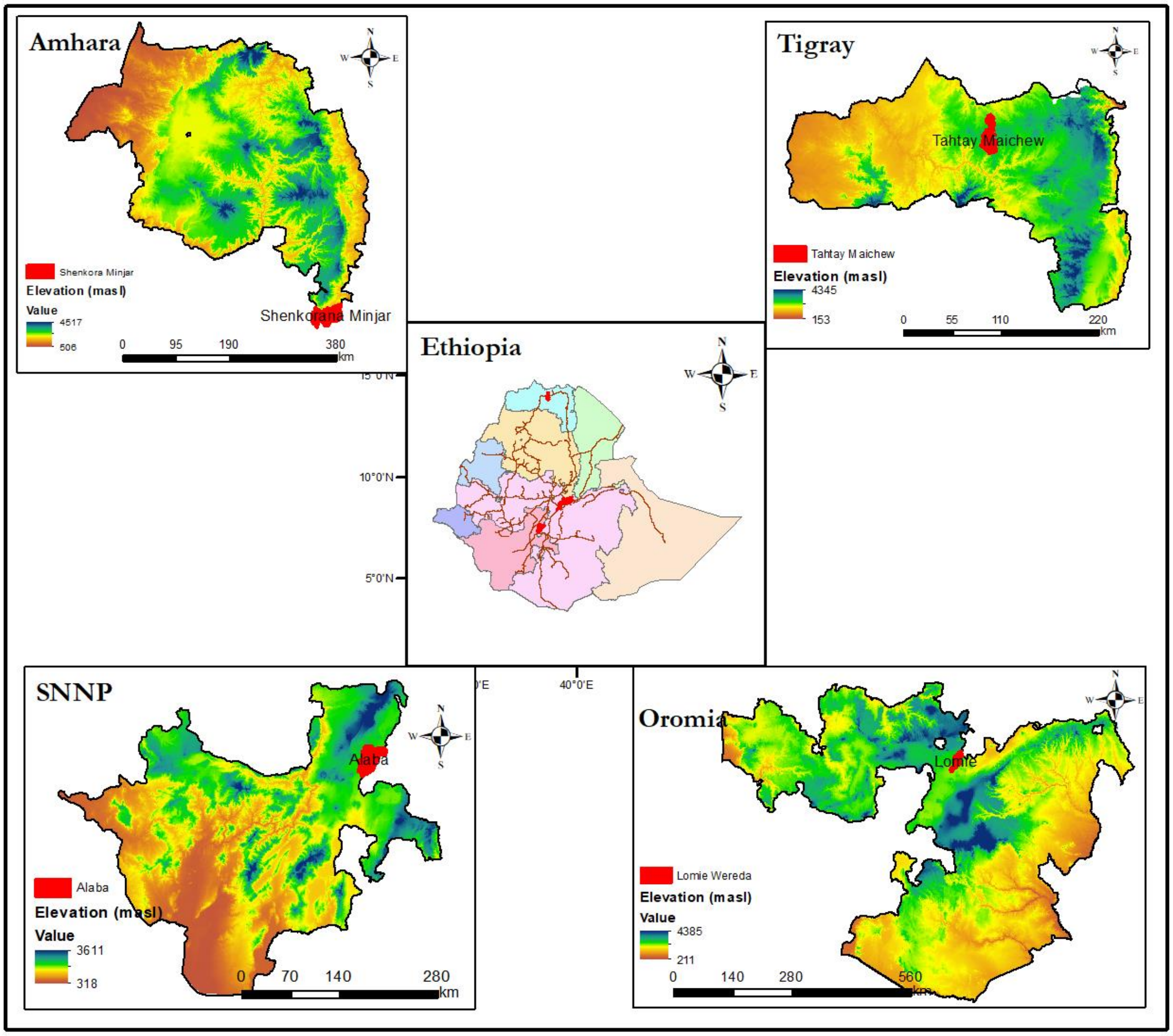
In consultation with the Office of Agriculture and Rural Development, two study sites namely Kewanit and May Brazio *Kebeles* were purposively selected for the study at hand. The total population of Kewanit is about 5,890 (1,273 households out of which 390 are female-headed households), while that of May Brazio is about 9,056 (1,705 households out of which 583 are female-headed households). In 2010 E.C (2017/18) harvest period, a total of 789 ha (493 ha for Kewanit and 296 ha for May Brazio) of land was allocated for *Teff* cultivation by farmers and a total of 1,446,900 kg of *Teff* (923,700 kg of *Teff* for Kewanit and 523,200 kg of *Teff* for May Brazio) were produced (WoARD 2018). When we see the average *Teff* production for the two *Kebeles,* it is about 1,873.63 kg per ha for Kewanit *Kebele* and 1,767.57 kg per ha for May Brazio *Kebele*.

Figure 4.1: Administrative map of Ethiopia



Source: Mekelle University, GIS section, 2019

Figure 4.2: Administrative map of Ethiopia, regions, and study sites



Source: Mekelle University, GIS section, 2019

4.3.3. Sampling and sample size

To understand the subject (*Teff* production, distribution, and livelihoods) a survey of 248 *Teff* producers, eight focus group discussions involving 84 participants and 25 in-depth interviews with experts in the area and *Teff* wholesalers were conducted. Overall, a total of 357 sample respondents were involved as indicated in the Table 4.6 below. The factors that were considered in deciding upon this sample include available time and financial resources, discussions with the academic staff and colleagues involved in the *Teff* industry in Ethiopia and the sample sizes involved in similar studies conducted earlier.

Table 4.6: Number of study respondents/participants by place

Composition of participants	Data collection method	Number of respondents/participants by place					Total respondents/participants
		Tahtai Maichew	Shenkora na Minjar	Lomie	Halaba zone	Addis Ababa	
Teff producers (farmers)	Survey	62	62	62	62	0	248
Teff producers (farmers)	FGD	16	17	17	18	0	68
Kebele administrators	FGD	2	2	2	1	0	7
Development agents	FGD	3	2	2	2	0	9
District experts	In-depth interview	3	3	2	2	0	10
Regional experts	In-depth interview	2	1	1	1	0	4
Federal experts	In-depth interview	0	0	0	0	4	4
Teff wholesalers	In-depth interview	0	0	0	0	6	6
Total	**Survey, FGD and KII**	**88**	**87**	**86**	**86**	**10**	**357**

Source: Own compilation, 2018

4.3.4. Data collection process using different instruments

The thesis employed a case study design and primary data were collected from case study participants (Catherine et al. 2018). However, secondary information such as government reports, relevant material available online and information shared by interview subjects was used to support the findings of primary data analysis. In this regard, a review of literature and policies focusing on *Teff* production, distribution and livelihoods was conducted. Such triangulation contributes to the internal validity and reliability of research findings.

The study employed different data collection techniques. Four primary sources of data were utilized: (1) a desk review of relevant documents, (2) focus group discussion with *Teff* producers and development agents (3) key informant interviews with key federal, regional, district officers and wholesalers in *Teff* markets and (4) a household survey of farmers who are involved in *Teff* production and distribution. Data collection took place from June 2018 to January 2019. The details of data collection tools used are described hereunder.

a. Desk review of relevant documents

A document review was undertaken to capture the policy context and content and identify existing policies and gaps therein. In this study, document review was used as a tool of data collection with the objective of assessing the prevailing *Teff* production and distribution situation at national level and thereby to develop the theoretical, empirical, and conceptual framework of the study. The research used policy documents focusing on three key factors (*Teff* production, distribution, and livelihoods). It involves reading an extensive amount of text data to understand and shed more light on a particular field of study. This consisted of published and grey literature that included annual and strategic reports, guidelines, and program materials. Unpublished dissertations and conference papers were also included. During the interviews with key informants, more documents that were not in the public domain were retrieved (Catherine et al. 2018).

A total of 625 documents were retrieved for screening (427 published and 198 grey literature), and 110 documents were excluded because they were not relevant to *Teff* production, distribution, and livelihoods. About 515 documents (206 academic journal articles, 64 research papers, 20 dissertations, 39 books, 45 plan and statistical documents, 54 reports, 19 policy, regulations, and directives, 41 working papers, 27 unpublished articles) were reviewed.

b. Focus Group Discussion

Eight focus group discussions were organised in eight *Kebeles* involving 84 participants (68 *Teff* producers, 7 *Kebele* administrators and 9 development agents) in four districts from June 2018 to January 2019. Four focus groups involved solely female participants. The main reason for organising homogeneous female focus groups was to ensure active discussions, as people from the same socio-economic backgrounds tend to freely express and share their ideas, perceptions, and experiences. Most of the participants in these focus groups also knew each other and this prompted a free participation in the discussions. These discussions aimed to gain insights into *Teff* production, distribution, and livelihoods including their concerns associated with *Teff* production and marketing. To select participants for the focus group discussions, a purposive sampling technique was used. It is a non-probability sampling technique and considered suitable for selection of focus group participants and exploratory studies.

Open-ended questions were prepared for the focus group discussions (see appendices 3) by scanning relevant literature, consulting colleagues and the supervisor. The discussions were held in FCT (Farmers' training center) using the local languages so that producers could give free expression to their thoughts and opinions. The researcher and trained facilitators acted as a moderator and facilitated the discussions. To ensure reliability, the same topic guide was used in all the discussions. After seeking informed consent, a voice recording was made of all the discussions. Socio-economic information was collected from the participants in each FGD and these were captured in Microsoft excel spreadsheets to provide basic statistics on age, gender, income, household size, and land size among other variables. Data collectors attended the discussions to take notes. Each discussion on average took about 90 minutes.

c. In-depth interview

An in-depth interview was used as it provides direct access to deep, reliable, and valid information related to research objectives, and it is helpful to the researcher in obtaining relevant information that cannot be collected by any other means (Creswell 2009). To seek relevant and rich information on *Teff* production, distribution and livelihoods, a semi-structured in-depth interview was employed in this study from KII participants. Separate topic guides were prepared for different stakeholders (experts and wholesalers) by reviewing relevant literature before conducting the interviews. These guides covered issues such as gender role in *Teff* production, consumption of *Teff* at household level, nutritional contribution of *Teff*, profitability of *Teff*, source of *Teff* for wholesalers, marketing problems, and possibility of *Teff* export. Additional issues were discussed, and data collected as the interviews progressed. After seeking prior consent, 23 of the interviews were electronically recorded but for 2 interviews notes were taken by the study team. Each interview on average took about 55 minutes.

d. Household survey

A survey of 248 *Teff* producers was conducted in four districts. The primary purpose of the survey was to collect specific information pertaining to *Teff* production, distribution, and consumption (livelihoods). A questionnaire used in the survey was developed in the light of the research questions and objectives of the study. The questionnaire had different components (please refer to annex 4). The first component contained closed-ended and open-ended questions to investigate demographic characteristics of the household such as sex, age, marital status, number of children, level of education, source and amount of income, type and amount of expenditure, livestock ownership and asset ownership. The second component contained questions to investigate *Teff* production and the questions are related to the availability of labour force, total available land, *Teff* allocated land, inputs utilized for *Teff* production, access to extension service, access to training, access to credit service, role of cooperatives, cost of *Teff* production, amount of *Teff* production and problems of *Teff* production. The third component included questions related to *Teff* distribution and consumption focusing on participation in *Teff* marketing, amount of *Teff* supplied to the market, availability of storage facilities, means of transport, timing of selling, major buyers of *Teff*, price of *Teff*, total income from *Teff* marketing, frequency, and level of *Teff* consumption by the households, information related to *Teff* export and problems of *Teff* marketing. In some cases, a five-point Likert Scale (where 5 = very important and 1 = not important at all) was used to measure the perceived importance of certain attributes.

Ethical clearance for the questionnaire was obtained from the University of South Africa. Pre-testing of the questionnaire was undertaken to ensure its validity and about 20 *Teff* producers were involved from Tahtai Maichew district. This process helped to further refine the questionnaire and make it more effective for data collection. After pre-testing, a survey was conducted first in Tahtai Maichew followed by Lomie, Shenkora na Minjar districts and Halaba zone. Due to the large sample size and time constraints, the survey was conducted with the help of trained enumerators. Five enumerators were selected, and they were trained and informed about the scope of the study and the importance of data collection before the survey. During data collection, the researcher accompanied the enumerators in the field to both supervise and take part in the survey process. The completed questionnaires were examined on the same day and those with incomplete responses or missing values were discarded. Only those questionnaires with all responses completed were retained for data analysis.

4.3.5. Data analysis

Thematic content analysis was used for data collected from focus group discussion and in-depth interviews. Descriptive statistics were employed to analyse survey data. These techniques are explained below.

a. Quantitative analysis

Descriptive statistical analysis is used to identify statistical facts and patterns in the data. This was applied to quantitative data collected in a survey and aimed to explore the basic facts and patterns related to sample characteristics, *Teff* production, consumption, and marketing. First, a data code sheet was developed, and data was transferred into IBM SPSS Statistics 20 computer software according to this sheet. Before analysis, data cleaning was performed to find outliers and remove any errors in the data feeding process. The data were then analysed using descriptive statistics such as frequency distribution, percentages, mean values, cross-tabulation, chi-square, t-test, and standard deviations. The data are being tested for any statistically verifiable difference among farmers operating at different case study areas. The descriptive statistics findings were then presented in the form of tables, charts, and graphs. In the analysis of household level factors affecting *Teff* production and the amount of *Teff* supplied to the market, a multiple linear regression is used.

b. Qualitative analysis

In this study, thematic content analysis as developed by Creswell (2009) (please refer Figure 1 in the annex) was applied to analyse the qualitative data collected from farmers' focus group discussions and in-depth interviews with participants. This technique was used as it is helpful in summarizing data related to themes and contents and it involves the extraction of themes or categories from the data which enable us to explain the phenomena under investigation. Important themes relating *Teff* production, distribution, and livelihoods were extracted. These themes were important in understanding the underlying related issues in *Teff* production, distribution, and livelihoods. These ultimately led to the development of options for improving the performance of *Teff* production, distribution, and livelihood for sustainable development in Ethiopia.

4.4. Validity, Reliability and Ethics

Validity refers to the trustworthiness, authenticity, effectiveness, and relevance of the phenomenon being studied to a real-world situation (Jonker and Pennink 2010; Wahyuni 2012). A widely advocated strategy for enhancing the validity of qualitative research is triangulation (Lune and Berg 2016). According to some authors such as Liu, Pan et al. (2013), triangulation reduces the risk of chance association and of systematic biases due to specific methods and allows a better assessment of the generality of the explanations that one develops.

Triangulation may take different forms, such as data and method triangulation (Azulai and Rankin 2012). In this study, the validity issue was addressed by using a mixed-methods approach. The study employed focus group discussions, in-depth interviews and surveys for data collection and analysis. Relevant journals were also scanned to cross-check the study's findings. To ensure the validity of the data, efforts were made to include topics and/or questions relevant to the scope of the study. In this regard, the existing literature, and discussions with peers at Mekelle University were major guiding sources. The topics were adjusted and underwent some transformation through a cross-checking process, to ensure the validity of data.

Ethical considerations:

Research ethics deals primarily with the interaction between researchers and the participants of the study. Whenever we conduct research on people, the well-being of the research participants must be our top priority (Kothari 2004; Mack 2005). According to Badar (2015) scientific inquiries should be conducted in a way that generates results that are both trustworthy and reliable. Sciences related to business and social issues deal primarily with human beings who are sensitive to various ethical and privacy-related matters (McKeown and Weed 2004). In business research, the sensitivity of respondents is relatively high because of competition and rivalry, so enhanced informed consent and confidentiality should be ensured (Kelley, Clark et al. 2003).

All these ethical sensitivities and requirements are part of the procedural background of this study. Social and business ethics were given the utmost consideration while approaching and seeking data from respondents. In the sampling procedure, only willing respondents were included, and they were taken into full confidence by disclosing the purpose and nature of the study. The confidentiality and privacy of their responses were assured. In this research, informed consent was applicable. Informed consent is a mechanism for ensuring that people understand what it means to participate in a particular research study so they can decide in a conscious and deliberate way whether they want to participate or not (Madey 1982). Hence, written permission was obtained from the individual participants in the FGD, key informant interview and survey before they provide the information (Gurmessa 2016). In this regard, prior to conducting field activities, the research participants were informed that: -

- The participation in the research is voluntary and withdrawal or refusing to provide information does not entail any unfavourable actions against them.
- The participant has the right to ask questions at any point before the interview, during the interview or after the interview is completed.
- Information collected for this study was kept strictly confidential.
- All interviewees are anonymous: In this regard, while presenting the information, efforts were made to avoid possibilities of tracing back to individuals and institutions participating in providing the information. The identity of the respondents or informants about the opinions they provided was not revealed, especially when it appeared sensitive.
- Similarly, during data collection, the data is used for research purposes; information that could identify the respondent was never publicly released in any research report or publication and was not shared with any other government or international institutions.

The reliability and validity of the outcome of this research is ensured as much as possible by taking the following precautions.

- Sample households were drawn randomly from *Teff* producers.
- Questionnaires were translated to local languages.
- Proper orientation and training were given to enumerators.
- Supervision activities were undertaken during data collection.
- Proper data cleaning and editing activities were undertaken to ensure the validity of the data and information. Besides, a statistician is hired for data analysis (Mack 2005; Abera 2008; Gurmessa 2016).

In this research, attention was given to meet basic ethical principles in social science research. The research ethics protocol and procedures which are appropriate for the cross-cultural context in Ethiopia settings were applied. In this regard, before conducting the field research, an ethical clearance with reference number 2017_DEVSTUD_Student_31 was obtained from the University of South Africa (UNISA), Department of Development Studies, Research Ethics Review Committee. Moreover, notifications of expedited approval with reference number 1107/2017 were obtained from Mekelle University, College of Health Science, Health Research Ethics Review Committee. Besides, the Tigrai Agricultural Marketing Promotion Agency gave written consent (with reference number 7994/09) to the researcher to conduct this research. In this regard, research participants were informed (informed consent) that they have the right to privacy, anonymity, confidentiality, voluntary participation, and the right to withdraw, informed consent and not to be harmed. Data collection took place from June 2018 to January 2019.

Summary

In this chapter, the research methodology for investigating the research problem was described. The methodological foundations of the study rested on a mixed approach. A multistage sampling procedure was used to identify the case study areas, FGD participants, KII, and survey respondents. Four potential districts were taken as a case study and *Teff* producers were selected from eight *Kebeles* as case participants for data collection and analysis and further eight sub *Kebeles* were selected purposively from the eight *Kebeles*. By using systematic random sampling, a constant number of respondents (33 respondents) from each sub *Kebele* (a total of 264 sample respondents) were randomly selected. However, 16 questionnaires were found to be incomplete and thus rejected indicating a 94% success rate in data collection for the survey. A total of randomly selected 248 respondents (217 male-headed households and 31 female-headed households) were considered for the survey.

From the start, the study planned to conduct 8 FGDs (2 FGDs from each district) with a total of 88 FGD participants. However, a total of 8 FGDs (4 women groups and 4 male groups) with a total participant of 84 persons were recruited from the four districts. About 42 (50%) participants of the FGD were males while the remaining 42 (50%) participants were female. In addition to the FGD and survey respondents, it was planned to undertake interviews with 30 key informants. However, about 25 key informants were involved in the study as the required information is collected and due to repetitive and similar responses. Data were collected through focus group discussions, in-depth interviews, surveys, and document reviews. Content analysis, descriptive statistics and econometrics were used to analyze the data and generate research findings. Adequate measures were also used to ensure the study’s validity, reliability, and ethical standards.

CHAPTER FIVE: EXAMINING *TEFF* PRODUCTION DIFFERENTIALS ACROSS A GROUP OF FARMERS

5.1. Introduction

This chapter addresses the first and second objectives of the research which deals with the socio-demographic characteristics of *Teff* producers in rural Ethiopia and *Teff* production differentials across groups of farmers. In this regard, the findings of both qualitative and quantitative data and facts are presented. The total number of survey respondents is 248 (31 female-headed households and 217 male-headed households) with the same sample size of 62 respondents from each of the four districts (Halaba zone from SNNP regional state, Lomie district from Oromia regional state, Shenkora na Minjar district from Amhara regional state and Tahtai Maichew district from Tigrai regional state). In addition to the survey respondents, a total of 84 participants were involved in eight focus group discussions (FDG). About 42 (50%) are female-headed participants while the remaining 42 (50 %) were male-headed participants. About 21 FGD participants were involved from each district. Additionally, 25 key informants are involved in the study.

The chapter also examines *Teff* production differentials across a group of farmers in the four case study areas. Whereas substantial literature was accessed during the research with reference to the findings, this chapter has a broader scope and place to present the results and findings from the fieldwork. The household level independent variables accounting for high productivity and low productivity of *Teff* production such as sex, family size, age, education level, landholding, soil fertility, weather condition, input utilization, access to credit, extension services, training, cooperative membership, livestock, and farm tools ownership are assessed. The relationship among the dependent and independent variables are analyzed by taking the four districts as case study areas and the results among the districts are compared and presented using frequencies, percentages, means, standard deviation and t-test statistical parameters.

5.2. Features of *Teff* producers and *Teff* production

5.2.1. Features of *Teff* producers

1. Demographic characteristics of FGD participants

This section presents summary statistics from the attributes of the focus group participants. While FGDs are a qualitative data collection technique and it follows that the data generated is qualitative, various studies also note that some of the data can be quantified (Bazeley, 2013). Thus, the quantitative data in this section presents the general attributes or characteristics of the study participants. The purpose of the statistics is to provide a general overview of the socio-economic profile of the study participants who were drawn from different study areas. Apart from the attribute information the rest of the FGD and key informant data in this thesis is textual and is presented in different chapters where it is relevant.

A total of 8 FGDs (4 women groups and 4 male groups) were conducted during the survey from the four districts. About 42 participants of the FGD were males while the remaining 42 participants were female. When we see the age structure of the FGD participants, it ranges from 23 to 71 years of age with an average age of 52.16. About 23 (27.38%) FGD participants are within the age group of 18 up to 35, about 60 (71.43%) FGD participants are within the range of 35 up to 65 years of age and the remaining one (1.19%) FGD participant is above 65 years of age. This implies that about 83 (98.81%) of the FGD participants are in their active productive age.

The marital status of the FGD participants indicate that about 65 (77.38%) participants are married, 3 (3.57%) participants are single, 4 (4.76%) participants are divorced and the remaining 12 (14.29%) are widowed. The average family size of the FGP participants is 5.57 with a standard deviation of 2.04. When we see the literacy status of the participants, about 47 (55.95%) of the FGD participants do not attend formal schools. About 14 (16.67%) FGD participants, 17 (20.24%) FGD participants and 6 (7.14%) FGD participants have been attending elementary school primary cycle (grade 1 up to grade 4), elementary school secondary cycle (grade 5 up to grade 8) and high schools (grade 9 up to grade 12), respectively.

When we see the land ownership of the FGD participants, about 23 (27.38%) of the FGD participants own less than 0.5 ha of land, 36 (42.86%) FGD participants own from 0.5 ha up to 1 ha of land, 20 (23.81%) participants own from 1 ha up to 1.5 ha of land, 4 (4.76%) participants own from 1.5 ha up to 2 ha of land and 1 (1.2%) participant own above 2 ha of land. The average size of the owned land is about 0.69 ha per household with a standard deviation of 0.49. The minimum land holding is 0.063 ha and the maximum is 3.5 ha per household.

From Table 5.1 below, we can see that the average size of land allocated for *Teff* production to be 0.69 ha with a standard deviation of 0.49. However, there are variations among the districts in terms of the land allocated for *Teff* production. The average size of land used for *Teff* production is observed to be high for Lomie district (0.96 ha per household). The size of land used for *Teff* production per FGD participant is observed to be the least for Tahtai Maichew district (0.26 ha per household) (for the details, please refer Table 5.1 below).

Table 5.1: Land allocated for *Teff* production by FGD participants and *Teff* production

Name of the district	Number of FGD participants	Mean and SD	Size of land used for *Teff* production in ha in 2010 (2017/18)
Lomie	21	Mean	0.96
		SD	0.66
Shenkora na Minjar	21	Mean	0.70
		SD	0.35
Halaba zone	21	Mean	0.82
		SD	0.33
Tahtai Maichew	21	Mean	0.26
		SD	0.18
Total	**84**	**Mean**	**0.69**
		SD	**0.49**

Source: Survey result, 2018

When we see the involvement of the FGD participants in the marketing of *Teff* crops in 2010 E.C (2017/18), about 74 (88.10%) of the FGD participants were involved while the remaining 10 (11.90 %) FGD participants were not involved in *Teff* marketing. On the other hand, no one FGD participant was involved in the purchase of *Teff* crops for household consumption in the same harvest period.

When we see the membership of the FGD participants in social organizations, about 56 (66.67%) FGD participants are active members of farmers associations in their localities, 55 (65.48%) are members of religious organizations, 53 (63.10%) are members of *Edir* (local association of self-help in neighbours) and 48 (57.14%) are members of multipurpose cooperatives. The details of the socio-economic and demographic characteristics of the FDG participants are presented in Table 1 of the annex.

2. Demographic characteristics of survey respondents

The total number of survey respondents is 248 heads of household with the same sample size of 62 respondents from each of the four districts. Comparisons were made among the four districts' respondents demographic characteristics of the survey respondents by district. The result of the comparison of the four groups of farmers indicates that there were significant variations among the farmers in terms of demographic characteristics as indicated in Table 5.2 and Table 5.3 below.

Out of these sample household members, 214 (86.29%) respondents constitute male-headed households, and the rest 34 (13.71%) respondents represent female-headed households. All the respondents are heads of household. Female respondents are high for Tahtai Maichew district as compared to other districts. The reason could be since the long-lasting civil war in Northern Ethiopia has resulted in a lot of women losing their husbands. A test of statistical association (Chi square) of sex across the districts was found to be statistically significant (P-value < 0.05) (for the details, please refer Table 5.2 below and Table 3 in the annex).

Comparisons of all the sampled respondents about marital status indicate that about 177 (71.37%) respondents are married with traditional / religious marriage and 31 (12.50%) respondents are married with civil marriage. About 22 (8.87%) respondents are widowed, 9 (3.63%) respondents are divorced or separated, 8 (3.23%) respondents are single, and one (0.4%) respondent is not married but living together. Traditional / religious marriage is observed more in Halaba zone as compared to other districts and this could be associated with religion whereby all the respondents are Muslims. A test of statistical association of the marital status across the districts was found to be statistically significant (P-value < 0.05) (for the details, please refer Table 5.2 below and Table 3 in the annex).

When we see the religion of the sample respondents, about 182 (73.39%) respondents are the followers of the Ethiopian Orthodox *Tewahido* church from the three districts, 62 (25%) respondents are Muslim (all the Muslims are from Halaba zone), 2 (0.81%) respondents are Catholic while the remaining 2 (0.81%) respondents are Protestants. Tests of statistical association of religion across the districts were found to be statistically significant (P-value < 0.05) (for the details, please refer Table 5.2 below and Table 3 in the annex).

Table 5.2: Comparison of categorical demographic variables by district

Categorical variables	District of the respondent				Chi square	df	Sig.
	Halaba zone	Lomie	Shenkora na Minjar	Tahtai Maichew			
Gender							
Female	7	5	6	16	10.498	3	0.015*
Male	55	57	56	46			
Marital status							
Married (Civil marriage)	0	3	7	21	57.781	15	0.000*
Married (Custom / traditional / church marriage)	53	51	43	30			
Living together (not married)	0	0	1	0			
Widow /Widower	2	6	6	8			
Divorced or Separated	5	0	1	3			
Single / Never Married	2	2	4	0			
Religion							
Orthodox Tewahido	0	60	60	62	258.725	9	0.000*
Catholic	0	0	2	0			
Protestant	0	2	0	0			
Muslim	62	0	0	0			

* The Chi-square statistic is significant at the 0.05 level.

Source: Survey result, 2018

Tests of statistical association of the demographic variables considered above across the districts were found to be statistically significant (P-value < 0.05).

The mean age of the respondents is 45.88 with a standard deviation of 12.5. The minimum age of the respondents is 19 years old while the maximum age is 83. About 58 (23.39%) of the respondents are from 18 up to 35 years of age, 174 (70.16%) participants are from 35 up to 65 years of age, and the remaining 16 (6.45%) are 65 and above years of age. Thus, we can say that about 93.55% of the respondents are in their active productive age. When we compare the average age of respondents by district, it is about 49.66 for Tahtai Maichew district and 48.35 for Lomie district. The least average age is observed for Halaba zone which is 40.42. The details of the socio-economic and demographic characteristics of the survey respondents are also presented in Table 2 of the annex.

The means of the socio-demographic characteristics were compared using ANOVA by district and all the variables considered were found to be statistically significant (P-value < 0.05). Furthermore, pairwise multiple comparisons using Bonferroni correction (t-test) were conducted and the results are presented in Table 5.3 below. The ANOVA test for the average age of the farmers across the four districts shows that the average age of farmers found in Tahtai Maichew, Shenkora na Minjar, and Halaba zone are statistically different (p-value < 0.05). Moreover, there is statistically significant variation in age for Lomie district and Halaba zone (p-value < 0.05) (for the details, please refer Table 5.3 below and Table 3 in the annex).

Household size of the respondents plays a significant role in rural agriculture. In this survey, the average household size of the respondents is 5.12 with a standard deviation of 1.91. The minimum family size is one and the maximum is 9. About 22 (8.87%) of the total respondents have a maximum of 2 family sizes whereas 166 (66.94%) of the household respondents have a family size that ranges from three to six. About 47 (18.95%) respondents have seven to eight family members and the remaining 13 (5.24%) have nine family members. The highest family size is observed to be in Halaba zone as compared to other districts and the least family size is observed for Shenkora na Minjar district. The ANOVA analysis indicates that the average family size of the farmers across Tahtai Maichew district, Shenkora na Minjar district and Halaba zone are statistically different (P-value < 0.05). Moreover, there is statistically significant variation in family size between Halaba zone and Lomie district (P-value < 0.05) (for the details, please refer Table 5.3 below and Table 3 in the annex).

When we see the educational status of the survey respondents, about 135 (54.44%) of the respondents do not attend schools. About 41 (16.53%) respondents, 50 (20.16%) respondents and 18 (7.26%) respondents have competed elementary school primary cycle (grade 1 up to grade 4), elementary school secondary cycle (grade 5 up to grade 8) and high schools (grade 9 up to grade 12) respectively. Only 4 (1.61%) of the respondents have a college diploma or university degree. When we see the education level of the respondents at the district level, more illiterate (42 respondents) are found in Shenkora na Minjar district followed by Lomie district (38 respondents). The ANOVA analysis of educational status of the farmers across the four districts shows that the average education of farmers found in Tahtai Maichew district was statistically different from Lomie and Shenkora na Minjar districts (P-value < 0.05). Moreover, there is statistically significant variation in educational status of Halaba zone with the Shenkora na Minjar district (P-value < 0.05) (for the details, please refer Table 5.3 below and Table 3 in the annex).

Table 5.3: Comparison of means of socio-demographic variables by district

Demographic variables	**Districts**					
	Tahtai Maichew	**Shenkora na Minjar**	**Lomie**	**Halaba zone**		
	Mean	**Mean**	**Mean**	**Mean**	**F**	**Sig**
Age	49.66_{a}	45.06_{b}	$48.35_{a,b}$	40.42_{c}	7.242	.000
Family size	5.27_{a}	4.31_{b}	$4.81_{a,b}$	6.10_{c}	11.002	.000
Education	4.19_{a}	1.55_{b}	$2.35_{b,c}$	$3.05_{a,c}$	5.963	.001

Note: Values in the same row and sub Table not sharing the same subscript are significantly different at p < 0.05 in the two-sided test of equality for column means. Tests assume equal variances.

Source: Survey result, 2018

5.2.2. Features of *Teff* production

1. Historical development of *Teff* crops

Focus group discussions (FGDs) and key informant interviews were undertaken with *Teff* producer farmers, development agents, district-level experts, *Kebele* administrators, senior experts in relation to the historical development of *Teff* crops. In the FGD, the participants were asked how and when *Teff* has come to be grown in their communities. FGD participants from Tahtai Maichew district stated the following about the origin of *Teff* crops.

> I'm not sure exactly when *Teff* came to our area. It has been passed to us through our ancestors. However, what I know is that, now, we produce *Teff* in a better way than our ancestors as we are using a better seed quality and fertilizer. The amount of *Teff* crops we get now is also much better than the old days (Study participant_20).

An FGD participant from Lomie district also stated the following about the origin of *Teff* crops.

> First, we used to plant *Teff* on fertile land only and then after the coming of fertilizer we used it in more places. Though *Teff* production was ancient to Ethiopia, mass *Teff* production was started around the 1950s. Around the 1950s, farmers started using agricultural inputs for *Teff* production which directly boosted their production and started supplying to the market (Study participant_41).

An FGD participant from the Halaba zone stated the following in relation to the origin of *Teff* in their localities.

> *Teff* crops came from around Megere and Kembata by Nanunete, the tribe leader of our community. He brought it inside his hair around the 1960s and before that period it was not grown in our area (Study participant_81).

The same question was raised to an expert from Tigrai regional state and the response was as follows.

> *Teff* is an ancient and indigenous cereal crop grown in Ethiopia. It has been grown for centuries because of its various merits; otherwise, it could have been extinct. However, the exact day of its origin is not known clearly. But there are different research shreds of evidence, which say that the history of *Teff* is estimated to go back to six thousands of years back. It is well known that Teff is an ancient, native and indigenous crop to Ethiopia. Thus, there is no dilemma about the origin of *Teff* (Tigrai expert_1).

As per the discussion above, the participants argued that *Teff* came from the ancient generation passing down to their generation. It is an indigenous crop to Ethiopia and has been produced for a very long time by the indigenous people. Though the study participants couldn't identify the starting date and place of *Teff* origins, they understand that *Teff* is known to have a very long history in Ethiopia. The study participants also assume that a little is known about the origin of *Teff* crops. On the other hand, by referring to research evidence in the field, an expert in the area stated that the history of *Teff* is estimated to go back to six thousand years. This result is similar to previous research findings which state Ethiopia is the native home of the *Teff* crop and it has been grown as a food crop in East Africa for thousands of years (Baye 2014). It is also like the research results of Simoons (1965) that state *Teff* originated and was domesticated in Ethiopia between 4,000 – 1,000 BC. However, in the Halaba zone, the study participants confirmed that *Teff* crops came from around Megere and Kembata. They assume that Nanunete, the tribe leader of their community, brought inside his hair around the 1960s. This indicates that although Ethiopia is the native home of *Teff* crops, it may not have been produced in all regions for thousands of years and as a result, in some areas especially in the southern region, it might have been introduced during the 1960s. *Teff* is a crop indigenous to Ethiopia. Whereas in a region like Tigrai, *Teff* is indigenous, and in the Halaba zone, the crop is thought to have been introduced in the 1960s. FGD participants reported that *Teff* has been handed down to the people from generation to generation. Some study participants noted that the crop might be more than 6,000 years old in the country where it is known to be indigenous. No other country in the region grows *Teff* to the extent that Ethiopia does.

On the other side, all the study participants argue that they produce *Teff* in a better way than their ancestors as they are using a better-quality seed, fertilizer, and chemicals. In this regard, what the study participants know is that now the productivity of *Teff* has increased after the introduction of inputs during the 1950s and it was the people of Oromia who commercialized the crop. This result is similar to the findings of Getnet (2008) that state *Teff* is a staple food crop in Ethiopia, and it is one of the major field crops cultivated in the country both as a food crop and as a source of income for farmers and the growth in agricultural output was mainly attributed to improved productivity supported by favourable and conducive agricultural development policies.

2. Overview of *Teff* production in the study areas

When we compare *Teff* production at the district level, about 60 (96.77%) respondents from Tahtai Maichew and 38 (61.29 %) respondents from Halaba zone produce less than 1000 kg. Only 2 (3.23%) respondents from Tahtai Maichew and 24 (38.71%) respondents from Halaba zone produce more than 1000 kg. On the other hand, about 56 (90.32%) respondents of Lomie district and 47 (75.81%) of Shenkora na Minjar district produce more than 1,000 kg. This indicates that respondents from Lomie and Shenkora na Minjar districts are producing more *Teff* crops as compared to Tahtai Maichew district and Halaba zone. To compare the *Teff* production among the four districts, Chi square was used. The result of the analysis indicates that the mean difference is significant (Chi square = 175.690 and $P < 0.001$) (please refer Table 5.4 below) and this indicates there is a significant difference of *Teff* production among the districts. This result is similar to the report of the Central Statistical Authority of Ethiopia which states that Oromia and Amhara regional states are the major *Teff* producer regional states (CSA 2017/18).

Table 5.4: Category of *Teff* production per household by district

Category of *Teff* production in kg per household	Name of districts				Total respondents	
	Halaba	Lomie	Shenkora na Minjar	Tahtai Maichew	N	%
No *Teff* production at all	1	1	0	0	**2**	**0.81**
Less than 1000 kg	37	5	15	60	**117**	**47.18**
From 1000 kg up to 2000 kg	22	26	45	2	**95**	**38.31**
From 2000 kg up to 3000 kg	1	19	1	0	**21**	**8.47**
3000 kg and above	1	11	1	0	**13**	**5.24**
Total respondents	**62**	**62**	**62**	**62**	**248**	**100.00**
Chi-square=175.690	**df =12**			**Sig. =0.001**		

Source: Survey result, 2018

Similarly, when we see the average *Teff* production per household by district, there is a big difference among the districts as indicated in Table 5.5 below. The average *Teff* production per household is the highest in Lomie district (Oromia regional state) which is 1,861 kg per household followed by Shenkora na Minjar district (Amhara regional state) which is 1,217 kg per household. The average *Teff* production for Halaba zone (SNNP regional state) is 911 kg per household while that of Tahtai Maichew district (Tigrai regional state) is the least among the district which is 427 kg per household. From the survey result, we can see that about 42.14%, 27.6% and 20.63% are the contributions from Lomie district (Oromia regional state), Shenkora na Minjar district (Amhara regional state) and the Halaba zone (SNNP regional state), respectively. The contribution of Tahtai Maichew district (Tigrai regional state) is only 9.67%.

Table 5.5: Comparison of average *Teff* production per household in kg by study sites

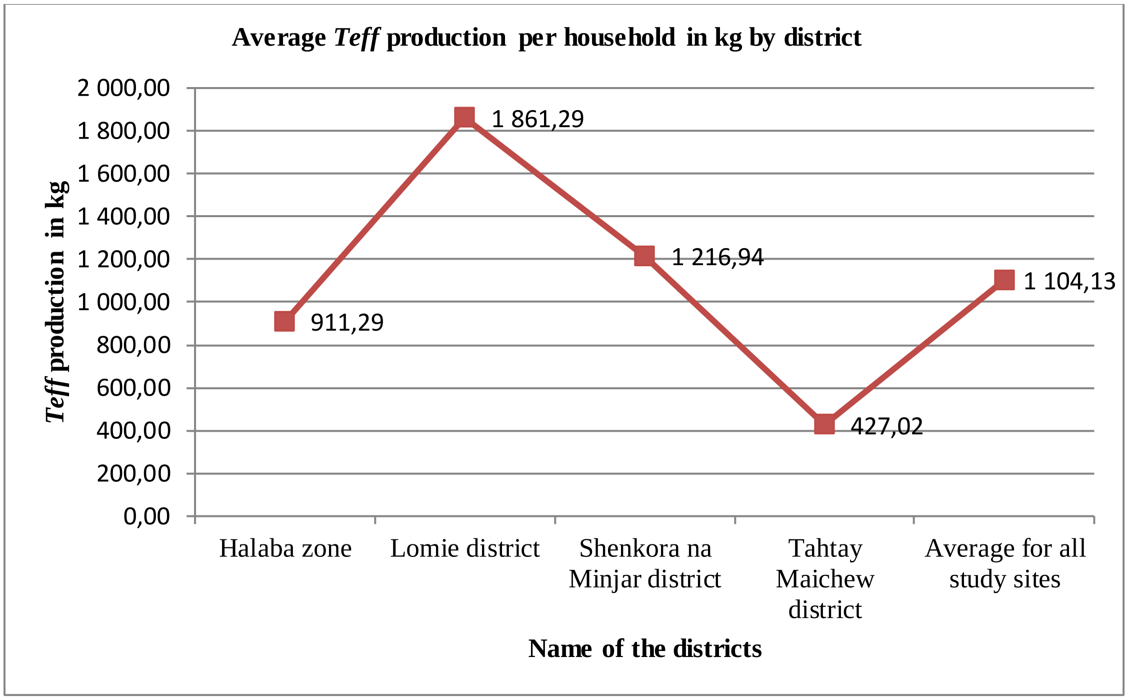
Teff production in kg	Name of districts				Total respondents	ANOVA	
	Tahtai Maichew	Shenkora na Minjar	Lomie	Halaba zone		F	Sig.
	Mean and SD	Mean and SD	Mean and SD	Mean and SD	Mean and SD		
Teff production in kg	$427.02_a \pm 243.11$	$1216.94_b \pm 474.85$	$1861.29_c \pm 794.11$	$911.29_d \pm 555.11$	1104.13 ± 757.39	73.094	.000
Percentage contribution by district	**9.67%**	**27.56%**	**42.14%**	**20.63%**	**100%**		

Source: Survey result, 2018

The means of the *Teff* production were also compared using ANOVA by district as presented in Table 5.5 above and as a result, the means of the *Teff* production for all districts were found to be statistically different (P-value < 0.05). Hence, the result of the survey is similar to the report of Central Statistical Authority of Ethiopia which states that Oromia and Amhara regional states are the major *Teff* producer regional states and major source of *Teff* crops as compared to other regions (CSA 2017/18). Also, our finding is like the research output of Fikadu et al. (2019) that state Oromia region is the most important *Teff* producing area in the country; and its share in total national production is estimated to be as high as 48% while the second highest region is Amhara region with 39%. The rest regions are relatively less important.

Comparison of average *Teff* production per ha by district was done as indicated in Table 5.6 below. The average *Teff* production per ha is the highest in Lomie district (Oromia regional state) which is 1,707.58 kg per ha followed by Shenkora na Minjar district (Amhara regional state) which is 1,530.74 kg per ha. The average *Teff* production for Halaba zone (SNNP regional state) is 1,247.95 kg per ha while that of Tahtai Maichew district (Tigrai regional state) is the least among the district which is 970.45 kg per ha (for the details, please refer Table 5.6 below). This indicates that the result of the survey is similar to the report of the Central Statistical Authority of Ethiopia which states that Oromia and Amhara regional states are the major *Teff* producer regional states (CSA 2017/18). However, though the production differs among regions, the result of Table 5.6 below indicates that all the districts are producing less than the average national *Teff* production (1748 kg per ha) estimated by Central Statistical Agency.

Figure 5.1: Average *Teff* production per household in kg by district



Source: Survey result, 2018

Table 5.6: Average *Teff* production per ha by district

Name of district	Average allocated land for *Teff* production in ha	Average *Teff* production per household	Average *Teff* production per ha by district
Tahtai Maichew	0.44	427.02	970.45
Shenkora na Minjar	0.795	1216.94	1,530.74
Lomie	1.09	1861.26	1,707.58
Halaba zone	0.73	911.29	1,247.95

Source: Survey result, 2018

3. Gender roles in *Teff* production

Discussions were held with FGD participants and key informants in relation to the different roles in *Teff* farming by taking gender as a variable. In identifying the different roles, one FGD participant from Tahiti Maichew district of Tigrai regional state highlighted the following.

> Land preparation including the application of fertilizers and chemicals is done by the men. Cleaning and uprooting the remains of the previous crop on the land is done by both men and women and women are highly engaged in breaking the bars of soil into finer pieces suitable for the seed to grow and removing stones. So, the females' role begins in preparing the land. Even if the men plough the land, the uprooted weeds have to be removed because *Teff* crop needs very fine land and thus the uprooted weed has got to be removed by the women. *Teff* is very sensitive to weed. As it is very small, it needs the patience to remove the weed. Before the seed is sown, it has to be cleaned from unnecessary seeds that bring weed to the farm and this is usually done by women. Therefore, women are involved in this weeding process as well. Normally, harvesting and threshing is done by men. Coming to the preparation of food for the families, everything is done by women. Thus, we can say that women participate in the production of *Teff* beginning from land preparation to the end of the production and consumption (Study participant_3).

In another focus group discussion at Shenkora na Minjar district, one FGD participant made the following remarks.

> When we generally see it, traditionally, there is a separation of roles between men and women, for instance men are the ones responsible for ploughing, harvesting and threshing while the woman's role is in weeding the field. At the time of harvest, the woman prepares food at home and takes it to the men who are harvesting in the field. The woman brews *Tella* (a beverage traditionally made of barley) and bakes Injera. While the man works on separating the hay from the grain, the women, on the other hand, work on milling the Teff crop and engage in the whole process of baking Injera to feed the family (Study participant_44).

In another FGD at Halaba zone, one participant stated the following concerning the roles of women and men in *Teff* production.

> The women mainly do the food preparation and participate in weeding activities but also participate in land preparation and collection of harvested crops. Men do all the field work including land preparation, weeding, harvesting, threshing and transporting the product to home (Study participant_74).

A key informant from Lomie district also described the following concerning the different roles of men and women in the whole process of *Teff* production.

> The women clean the *Teff* seed before sowing and prepare food for the men and the whole family. They are highly involved in the weeding activities. They also contribute in preparing the land for threshing and participate in transporting and threshing the product. Women also store the *Teff* crop at home, get the product milled by taking the product to milling plants and then bake it into Injera by mixing it with other crops. The main agricultural activities done by men include ploughing the land, sowing, partially participate in weeding, harvesting and threshing. (KII Lomie_2).

Based on the discussions, we can understand that almost in all farm activities both men and women are involved in *Teff* production with different roles. Though it is difficult to clearly show the roles of women and men, due to its difference in practice among the case study areas and some overlaps, as per the discussion with the respondents, we can summarize the gender roles as indicated in Table 5.7 below.

Table 5.7: Gender roles in *Teff* production by district

Name of district	Role of men	Role of women
Tahtai Maichew	• Land preparation including the application of fertilizers and chemicals. • Ploughing the land • Sowing • Participate in weeding • Harvesting the crop using sickles • Threshing	• Prepare the *Teff* seed to be planted by avoiding unnecessary garbage. • Cleaning and uprooting the remains of the previous crop on the land. • Highly engaged in breaking the bars of soil into finer pieces and removing stones to make the land suitable for the seed to grow. • Highly involved in weeding of *Teff* crops. • Preparation of food for the families.
Shenkora na Minjar district	• Ploughing: tiles the land over and over up to four to five times to make the land very fine • Harvesting • Threshing (separating the hay from the grain)	• Weeding in the field • At the time of harvest, the woman prepares food at home and takes it to the men who are harvesting in the field. The woman brews *Tella*. • Work on milling the *Teff* crop and engaged in the whole process of baking Injera to feed the family.
Lomie	• The main agricultural activities are done by men. These include ploughing the land, sowing, partially participate in	• Women clean the *Teff* seed before sawing • Highly involved in the weeding activities • Preparing the land for threshing and participate in transporting and threshing the product

	weeding, harvesting and threshing.	• Store the *Teff* crop at home, get the product milled by taking the product to milling plants and then bake it into Injera by mixing it with other crops
Halaba zone	• Men do all the field work activities including land preparation, weeding, harvesting, threshing and transporting the product to home.	• Women mainly do the food preparation and participate in weeding activities but also participate in land preparation and collection of harvested crops.

Sources: Compiled from FGD and KII, 2018

As indicated in Table 5.7 above, in all case study areas, the major agricultural activities such as ploughing the land, sowing, harvesting by using sickle, threshing by using oxen and transporting the products are done by men. The main role of women in all districts includes participating in land preparation, weeding and preparation of food for the family. However, there are unique roles of women for each district. For instance, in Tahtai Maichew and Lomie districts, women prepare the *Teff* seed to be planted by avoiding unnecessary garbage and make it clean the *Teff* seed before sawing. They are involved in breaking the bars of soil into finer pieces suitable for the seed to grow, removing stones and cleaning and uprooting the remains of the previous crop on the land. In Shenkora na Minjar district, the women prepare food at home and brew *Tella,* a local drink, and take it to the men who are harvesting in the field. The women also work on milling the *Teff* crop. In Lomie district, women prepare the land for threshing and participate in transporting and threshing the product. They also store the *Teff* crop. In the Halaba zone, women are involved in the collection of harvested crops.

In this regard, the responsibilities of men in *Teff* production include purchase of improved seed and chemical inputs, tilling the land over and over (four to five times) to make the land very fine, applying fertilizer to his land, planting *Teff* seeds by taking care of the moisture of the land, applying chemicals treatments to *Teff* crops to protect weeds and pests, participate in weeding, manually harvesting the crop using sickles, collecting the harvested product, transporting the harvested crops to the place where threshing is undertaken, threshing using oxen, transporting *Teff* crops to home though pack animals and partially taking the *Teff* crops to milling plants for grinding.

The responsibilities of women in *Teff* production include preparing the *Teff* seed to be planted by avoiding unnecessary garbage, removing uprooted weeds during ploughing, breaking the bars of soil into finer pieces suitable for the seed to grow, removing stones from the field, preparing food and *Tella* (beverage traditionally made of barley) at home and taking it to field where the man is planting, weeding of *Teff* crops, participate in collecting the harvested product to be piled all together before threshing, partially participate in harvesting, preparing the land for threshing, preparing a container to store *Teff* crops, taking good care of the product by storing it, taking the *Teff* crops to milling plant for grinding and engaged in the whole process of food preparations (making the dough and baking *Injera* economically for household consumption) and feeding their families. This finding is like previous research findings of Tegegne (2012) that state that women contribute about 46% of labour to agricultural activities and rural women spend their time in productive activities such as weeding, food processing, water and fuel wood collection, assisting family farms, marketing and labour exchange for community services.

4. Changes in *Teff* production

Discussions were undertaken concerning the changes occurring in *Teff* production in the last five years. A key informant from the Ministry of Agriculture and Rural Development gave the following remarks.

> When we look at the national level data, generally, *Teff* production has increased in the last 10 years. Currently, it is cultivated in more than 3.2 million hectares nationwide and the productivity is increasing from time to time. However, the production level is lower as compared to other cereal crops. But there is a fair increment in production due to the package services, fertilizer and improved seed that were being introduced in the last 10 years. There are more improved and varied *Teff* crop types that lead to better production levels. Flagot, Dagm, Kuncho and Kora are among the better-quality seeds introduced to the farmers, and they have a better probability of resisting lodging effect (resisting a stem fall problem) (Federal MoARD_1).

Similarly, the head of Tahtai Maichew district Office of Agriculture and Rural Development stated that:

> *Teff* production is showing an increasing trend, and this is since farmers are using fertilizers, better-improved seeds and technology as a means of boosting production. Moreover, farmers are working in an organized network (clusters) where they get supervision and support from the development agents and share experience among themselves for improving *Teff* production (KII Tahtai Maichew_1).

Additionally, a key informant from Lomie district raised the reasons for the increasing trend of *Teff* production as the result of increased use of fertilizer and improved seed varieties as indicated hereunder.

> In the past, farmers were pushed to take fertilizer, but this is not a problem nowadays. Fertilizer and improved seeds not only boost the crop production but also the hay that is found out of it to feed our animals. The fact that farmers do sell their product also boosts their economy and this is one of the changes that came recently. Thanks to fertilizer, these days no land is labelled to be bad. So, the farmers who use modern farming mechanisms are being more profitable than ever (KII Lomie_2).

In support of the above views, the FGD participant from Shenkora na Minjar district highlighted the following.

> There has been an improvement in the productivity of *Teff* in the last five years. The use of agricultural inputs has improved from time to time which wasn't the case in the past (Study participant_54).

Contrary to this idea, due to irregularity of rainfall, *Teff* production is showing a decreasing trend in the last three years at Halaba zone of SNNP regional state whereby farmers are forced to shift to other crops. Recognizing such a problem, the FGD participant stated the following.

> In the last five years, production of *Teff* has decreased. This is due to the fluctuation of rainfall, crop diseases and lack of improved seed (Study participant_67).

From the discussions of FGD and KII, farmers are changing their attitude towards the utilization of fertilizers and improved seeds. They know that if a farmer produces *Teff* using modern techniques of production (use of fertilizers and improved seeds, chemicals, line sowing, etc), she/he can get a better *Teff* production. In the last five years, the government has been investing in the supply of fertilizers, improved quality-seed and chemicals. The farmers also developed the skill of using agricultural inputs which directly contribute to *Teff* production and better livelihoods. This result is similar to previous findings of Gudeta (2002) which state the number of farmers involved in the input package and extension programs has increased and the productivity of *Teff* crop is increasing from time to time. However, due to fluctuation of rainfall, lack of improved seed and crop diseases, production of *Teff* crops decreased in Halaba zone of SNNP regional state. This also indicates that fluctuation of weather conditions and limited access to inputs resulting in low productivity of *Teff* in some regions, especially the south region.

5.3. Examining *Teff* production differentials across a group of farmers

When we see the data for *Teff* production among the survey respondents, the average *Teff* production is 1104.13 kg per household with a standard deviation of 757.39. About 117 (47.18%) of the survey respondents produce less than 1,000 kg of *Teff* crops, 95 (38.31%) survey respondents produce from 1000 kg up to 2,000 kg and 34 (13.71%) survey respondents produce more than 2,000 kg. Only 2 (0.81%) respondents didn't involve in *Teff* production in 2010 E.C as they shifted their land to other cereal crops to have the advantage of crop rotation. When we see the average *Teff* production by district, about 1,861.29 kg per household is for Lomie district, about 1,216.94 kg per household for Shenkora na Minjar district, about 911.29 kg per household for Halaba zone and about 427.02 kg per household for Tahtai Maichew district. The details of the variables accounting for *Teff* production differentials among farmers are discussed hereunder.

5.3.1. Sex of the respondents and *Teff* production

When we compare *Teff* production by taking sex as a variable, we can see that 22 (64.71%) of the female-headed respondents are producing less than 1000 kg while 95 (38.31%) of the male-headed respondents are producing less than 1000 kg. From the given data, we can also observe that no one female respondent is producing more than 3000 kg of *Teff* crops while 13 (6.07%) of male respondents are producing 3000 kg and above of *Teff* crops. This indicates that men-headed households are producing more *Teff* crops as compared to women-headed households (for the details, refer Table 5 in the annex).

A comparison was also made among male-headed and female-headed respondents concerning *Teff* production per household in 2010 E.C (2017/18 G.C). As indicated in Table 5.8 below, the average *Teff* production for female-headed respondents is 782.35 kg per household while that of male-headed respondents is 1155.26 kg per household. As a result, the average *Teff* production of female-headed respondents is 70.86% of the average of *Teff* production for all respondents (1104.13 kg per household). The average *Teff* production of male-headed respondents is about 4.63 % greater than the average *Teff* production of all respondents (1104.13 kg per household).

The Spearman's rho correlation indicates that the correlation coefficient of r = 0.180**, p= 0.005 (correlation is significant at the 0.01 level (2-tailed)) which indicates there is a small but significant difference in *Teff* production between female-headed respondents and male-headed respondents. Hence, female-headed respondents do not likely produce *Teff* crops like that of male-headed respondents. This result is like the results of Biénabe, Coronel et al. (2004) that state that gender disparities systematically disadvantaged women with regard to the overall economic status as well as access to basic services and as a result woman have been considered as one of the food insecure vulnerable groups. Similarly, a public document named Ethiopia's agricultural sector policy and investment framework identified that gender disparities significantly impede women's empowerment (Chanyalew, Adenew et al. 2010).

A comparison of *Teff* production was made among districts by taking sex of the respondents as a variable. If we compare the mean *Teff* production by taking sex as a variable, the highest *Teff* producer for both male-headed and female-headed respondents is found in Lomie district with the average production of 1870.18kg and 1760.00kg, respectively. The least average *Teff* production for both male-headed and female-headed respondents is found in Tahtai Maichew district with the average production of 479.89kg and 275kg per household, respectively. Except for the Halaba zone, male-headed respondents produce more *Teff* crops as compared to female-headed respondents. This clearly indicates that there is a significant difference among male-headed households and female-headed households in terms of *Teff* production in all districts. The ANOVA test among the four districts indicates that the mean *Teff* production for female-headed respondents of Tahtai Maichew district is statistically different from the other three districts. Moreover, the mean *Teff* production for female-headed respondents of Lomie district is statistically different from Shenkora na Minjar district and Halaba zone (P-value < 0.05). On the other hand, the mean *Teff* production for male-headed respondents shows that there are statistically significant variations among the four districts (P-value < 0.05) (for the details, please refer Table 5.8 below).

5.3.2. Age composition of the respondents and *Teff* production

The average age of survey respondents is 45.88 years of age with a standard deviation of 12.50. About 58 (23.39%) of the respondents are within the range of 18 up to 35 years of age, about 174 (70.16%) respondents are within the range of 35 up to 65 years of age and the remaining 16 (6.45%) respondents are 65 years of age and above. When we see the average age of respondents from the study districts point of view, Tahtai Maichew district respondents on average have 49.66

years of age, Lomie district respondents on average have 48.35 years of age and Shenkora na Minjar district respondents on average have 45.06 years of age. Younger respondents are observed in the Halaba zone with an average age of 40.42 years of age.

When we see the relationship of age structure with *Teff* production as indicated in Table 5.8 above, young farmers (within the range of 18 to 35 years of age) produce 983.62 kg per household and older farmers (within the range of 36 to 65 years of age) produce 1,136.06 kg per household. On the other side, the highest *Teff* production per household is observed for the age group of 65 and above which is 1193.75 kg per household.

When we compare *Teff* production by age category and districts, we can observe that all age category respondents for Lomie district produce more than 1812.5 kg per household while that of Tahtai Maichew district produce a maximum of 500 kg. In Shenkora na Minjar district young respondents (within the age category of 18 up to 35) produce the highest *Teff* (1226.67 kg per respondent) as compared to other age categories. In Lomie and Halaba districts, respondents with age category of 35 up to 65 years of age produce more *Teff* crops as compared to the other age categories (for the details, please refer Table 5.8 below).

The ANOVA test among the four districts indicates that the mean *Teff* production for the respondents with the age group of 18 up to 35 years and the respondents with the age group of 35 up to 65 years of Tahtai Maichew district is statistically different from the other three districts. Moreover, the mean *Teff* production for the respondents with the group of 18 up to 35 years for Halaba zone is statistically different from the mean *Teff* production of Lomie district (P-value < 0.05). On the other side, the mean *Teff* production for the respondents with the age group of 35 up to 65 years of age for Lomie district is statistically different from that of Shenkora na Minjar district and Halaba zone (P-value<0.05) (for the details, please refer Table 5.8 below).

When we measure the strength of the linear association (correlation coefficient) between age of the respondent and *Teff* production, the result indicates $r = 0.064$, $p = 0.319$. (Please refer to Table 21 in the annex for all *Teff* production related Pearson correlation results). This indicates that though it is very weak, there is a positive relationship between age structure of the respondents and *Teff* production. This means that as age increases, *Teff* production also shows an increasing trend though it is not significant. The result of the survey is like the research output of Hofferth

(2003) which states that the higher the age of the household head, the more stable the economy of the farm household as older people have relatively richer experiences of the social and physical environments as well as greater experience of farming activities.

5.3.3. Marital status of the respondents and *Teff* production

Comparisons of all the sampled population about the marital status indicate that about 31 (12.50%) respondents are married with civil marriage, about 177 (71.37%) respondents are married with customary / traditional / church marriage and 22 (8.87%) respondents are widow /widower. On the other side, 9 (3.63%) respondents are divorced or separated, 8 (3.23%) respondents are single and one respondent (0.4%) is living together but not married. The average *Teff* production for a single and married with customary /traditional/ church marriage are 1,438 kg and 1,186 kg per household, respectively which is above the average *Teff* production of the whole participants (1104.13 kg per household). The other respondents are producing less than the average. For instance, widow respondents are producing on average 970 kg per household, divorced or separated respondents are producing 767 kg per household and married with civil marriage respondents are producing 760 kg per household.

When we see the results of *Teff* production by taking marital status as a variable at district level, it is highest for singles from Lomie district (2,350 kg per respondent) followed by married (civil marriage) from Lomie district (2,000kg). In the Halaba zone, the highest *Teff* production is observed for divorced or separated respondents (1,080 kg) and the least *Teff* production for widow /widower (600 kg). In Shenkora na Minjar district, the highest *Teff* production is observed for married (civil marriage) respondents (1,407.14 kg) and the least *Teff* production for living together but not married (600.00 kg). In Tahtai Maichew district, the highest *Teff* production is observed for married (custom / traditional / church marriage) respondents (530.00kg) and the least average *Teff* production per household is observed for divorced/ separated respondents from (233.33 kg). This all indicates that there is variability in *Teff* production per household among the different marital status per district.

Table 5.8: Comparison of *Teff* production by demographic characteristic and districts

Explanatory variables	Name of districts and average *Teff* production per household				All respondents	ANOVA	
	Tahtai Maichew	Shenkora na Minjar	Lomie	Halaba zone			
	Mean and SD	Mean and SD	Mean and SD	Mean and SD	Mean and SD	F	Sig.
Sex of the respondent and *Teff* production							
Female (n= 34)	275.0_{a}±134.16	1133.33_{b}±393.28	1760.00_{c}±364.69	942.86_{b}±377.96	782.35±609.26	40.358	.000
Male (n= 214)	479.89_{a}±251.09	1225.89_{b}±484.95	1870.18_{c}±822.45	907.27_{d}±576.26	1155.26±767.17	52.587	.000
Age group and *Teff* production							
18 up to 35 years (n= 58)	311.11_{a}±302.88	$1226.67_{b, c}$±363.45	1841.67_{b}±687.33	885.71_{c}±513.86	983.62±617.25	14.374	.000
35 up to 65 years (n= 174)	439.89_{a}±235.25	1218.48_{b}±513.31	1871.87_{c}±833.21	942.42_{b}±600.02	1136.06±793.29	48.696	.000
Above 65 years (n=16)	500_{a}±181.66	1000±0	1812.5±701.91	600±0	1193.75±814.63	7.018	.006
Family size and *Teff* production							
Up to 3 family (n= 22)	190_{a}±89.44	$1260_{b, c}$±343.83	1780_{b}±788.67	$300_{a, c}$±424.26	1047.73±746.18	12.638	.000
From 3 up to 6 family (n= 120)	416.67_{a} ±240.99	1118.57_{b}±417.64	1658.57_{c}±715.53	$784.78_{a, b}$±398.13	1054.17±673.06	34.897	.000
From 6 up to 9 family (n= 94)	463.39_{a}±246.31	1353.33_{b}±634.56	2202.38_{c}±852.71	968.33_{b}±494.19	1155.05±848.56	39.514	.000
9 and above family (n= 12)	650_{a}±70.71	1700_{a}±141.42	2200±0	1257.14_{a}±999.76	1308.33±853.29	0.880	.491
Education and *Teff* production							
Not attending schools (n= 135)	381.58_{a}±234.05	1273.81_{b}±510.89	1900_{c}±786.03	1001.39_{b}±639.92	1251.85±779.94	29.152	.000
Elementary (Grade 1-8) (n= 91)	456.08_{a}±247.73	1144.12_{b}±382.38	1878.95_{c}±785.16	752.78_{b}±375.92	940.38±705.55	42.991	.000
High school (Grade 9-12) (n= 18)	410_{a}±283.73	833.33_{a}±152.75	1500_{a}±974.04	680_{a}±389.87	858.33±685.83	3.154	.058
Attend college or university (n=4)	300±0	0	0	1166.67±351.19	950.00±519.62	4.568	.166

Source: Survey result, 2018

5.3.4. Family size of the respondents and *Teff* production

The average family size of the respondents is 5.12 persons per household with a standard deviation of 1.91. The average family size per household is highest for Halaba zone (6.10 persons) followed by Tahtai Maichew district (5.27 person) and Lomie district (4.81 persons). The least average family size per household (4.31 persons) is observed for Shenkora na Minjar district. The availability of active labour force within the household is an important factor expected to influence agricultural production status of households. The average active labour force is 2.22 persons per household while that of the average dependent family members 2.90 persons per household (for the details, please refer Table 6 in the annex).

From the survey result, we can see that the pattern of *Teff* production among the different family size households ranges from 1,047.73 kg to 1,308.33 kg per household. When we see *Teff* production and households' family size as indicated in Table 5.8 above, the highest rate of production is observed in the family size of 9 and above with average *Teff* production of 1,308.33 kg per household. This is followed by 6 up to 9 family size respondents (1,155.05 kg per household) and then 3 up to 6 family size respondents (1,054.17 kg per household). The least *Teff* production (1,047.73 kg per household) is observed for family size of up to 3 (for the details, please refer Table 5.8 above). This indicates that as family size increases, *Teff* production increases. As a result, we can say that families with larger family sizes might contribute to the high demand of labour for *Teff* production.

When we see the results of *Teff* production by family size, it is highest for the age category from 6 up to 9 family size from Lomie district (2,202.38 kg) followed by 9 and above family size from Lomie district (2,200kg). Except for Lomie district, in all districts the highest producers are family size with 9 and above members. The least average *Teff* production per household is observed for family size up to 3 respondents from Tahtai Maichew (190 kg) (for the details please refer Table 5.8 above).

If we see the strength of the linear association of *Teff* production and family size of the respondents through Pearson correlation, it is positively correlated with correlation of coefficient $r = 0.077$ and $p = 0.225$ (refer Table 21 in the annex). This indicates that though it is small and insignificant, there is a positive relationship between *Teff* production and family size of the sample respondents.

This means that as family size increases, *Teff* production also shows an increasing trend though it is not significant. The result is against the study result of Paddy (2003) that states there is a negative correlation between household size and food security as food requirements increase with the number of persons in a household.

The ANOVA test among the four districts indicates that the mean *Teff* production for the respondents up to 3 family size for Tahtai Maichew district is statistically different from Lomie and Shenkora na Minjar districts (P value < 0.05). Moreover, the mean *Teff* production for the respondents up to 3 family sizes for Lomie district is statistically different from Halaba zone (P value < 0.05). When we see the mean *Teff* production for the respondents with the family size of 3 up to 6 for Tahtai Maichew, it is statistically different from Lomie and Shenkora na Minjar districts (P value < 0.05). Moreover, the mean *Teff* production for the respondents from 3 up to 6 family size for Lomie district is statistically different from Halaba zone (P value < 0.05). When we see the mean *Teff* production for the respondents with the family size of 6 up to 9 for Tahtai Maichew, it is statistically different from all districts (P value < 0.05). Moreover, the mean *Teff* production for the respondents from 6 up to 9 family size for Lomie district is statistically different from Halaba zone and Shenkora an Minjar district (P value < 0.05). However, there is no statistically significant difference in *Teff* production among the four districts for family size of 9 and above (P value > 0.05) (for the details, please refer Table 5.8 above).

5.3.5. Availability of labour and *Teff* production

a. Source of labour for *Teff* production

Teff production is the function of labour and availability of labour force within the household and in the market is assumed to have a positive relationship with the volume of production. By assuming the labour-intensive characteristics of *Teff* farming, in this study, it is expected that the availability of labour positively affects *Teff* production (Girma and Endrias 2015).

A focus group discussion (FGD) and key informant interview were undertaken to understand the availability of the labour force for *Teff* production. The participants believe that the cultivation of *Teff* crops demands more effort and more labour force as compared to other crops. In this regard, a study participant from Shenkora na Minjar district stated the following.

> Farming in Ethiopia is basically done by using family labour. However, *Teff* is very laborious starting from land preparation where farmers go through it up to six times as compared to other crop types that only need two to three times. It also needs more labour for weeding and threshing (Study participant_44).

In an FGD of Lomie district, a participant elaborated the problems of access to the labour force as indicated below.

> Even though family labour is contributing a lot in the cultivation and harvesting activities, nowadays, the youngsters don't want to do these activities. Alternatively, they are migrating to the cities, and thus, those farmers who afford to pay can hire labour from the market. In this regard, *Teff* production shows a decreasing trend from time to time due to lack of interest to work on such tedious farming activities of the youngsters and their migration to cities and other countries (Study participant 22).

Acknowledging the above problems of migration to towns of the youngsters, a study participant from Shenkora na Minjar district highlighted the problem of labour in the market as follows.

> Farmers are moving out to cities and thus labour is getting too expensive in the market. All our profit goes to labour, and it is our big challenge. The government should resolve this problem of labour through the provision of technology that simplifies the high demand of labour especially for weeding, harvesting and threshing activities (Study participant 55).

Shortage of labour force in the market is the main problem during weeding, harvesting, and threshing of *Teff* crops. In this regard, FGD participants from Lomie district highlighted the increasing trend of the cost labour in the market as follows.

> The cost of labour is high during weeding, harvesting, and threshing of *Teff* crops. We are forced to pay from Birr 3,500.00 up to Birr 4,000.00 cost of labour to harvest 0.25 ha of *Teff* crops. The cost of labour is increasing from time to time and during harvesting time it reaches Birr 200.00 for the daily labourer, and this is expensive for us. Before five years, this cost was from Birr 50.00 to Birr 70.00 per day (Study participant 27).

To describe the situation of demand for labour in *Teff* cultivation, a key informant from Lomie district elaborated the problem as follows.

> Cultivation of *Teff* crops demands lots of manpower, especially during weeding and harvesting activities. It takes more manpower in ploughing the land as well. Unless the land is ploughed five to six times, production might decrease (KII Lomie_1).

Contrary to the above idea, a key informant from the Halaba zone said the following.

> Most farming activities are done by family members. But if a farmer wants to employ manpower, the price is fair and there is enough access. So, there is not much shortage of labour in the market (KII Halaba_1).

From such discussions, we can understand that cultivation of *Teff* crops demands lots of manpower especially during weeding, harvesting and threshing activities and family labour is contributing a lot in *Teff* production. It takes more manpower in ploughing the land as well compared to the other crops. The farmers are requesting the government for intervention and introduction of technology that might help in simplifying the high demand of labour, especially for weeding, harvesting and threshing activities. The cost of labour is also increasing from time to time and during harvesting time and it reaches up to Birr 200.00 per day and this is expensive for the farmers. Lack of interest of the youngsters to work on such tedious farming activities, migration of the active labour force to towns and high cost of labour are the main problems of farmers. This result is like the research findings of some scholars that state the production of *Teff* is labour-intensive and with limited access to technology, there are no large-scale *Teff* producers in the country (Berhe 2009; FAO 2015). However, such access to labour is not a big problem in the Halaba zone and this could be due to the larger family size per household.

To determine the number of working days required by the respondents and source of labour for cultivation of *Teff* crops per 0.25 ha, a question was raised to survey participants. As indicated in Table 5.16 below, the average number of labour days required to do all the activities of *Teff* production for 0.25 ha is estimated to be 32.80 labour days (131.2 labour days per ha) with a standard deviation of 14.55 (for the details, please refer Table 5.9 below). This result is similar to the study of Getu Hailu et al. (2016) that states in total about 141 person-days are spent for the production of one hectare of *Teff*.

If we see the distribution of such labour days among the major *Teff* production activities, weeding takes the highest share which is 11.70 (35.67%) (46.8 labour days per ha) followed by harvesting that require 10.3 (31.40%) (41.2 labour days per ha).Threshing takes the next share of 4.5 (13.72%) (18 labour days per ha), ploughing takes 4.3 (13.11%) (17.2 labour days per ha) and lastly planting needs 2 (6.10%) (8 labour days per ha) from the allocated total labour days (for the details, please refer Table 5.9 below). This result is like the findings of Getu Hailu et al. (2016) that state the most labour-intensive activities are weeding (32 person-days), harvesting (28 person-days), and tilling

(21 person-days). Post-harvest activities (e.g. gathering and piling), threshing and winnowing each account for about 22 person-days.

When we see the source of the labour force for the different activities of *Teff* production, about 23.06 (70.3%) (92.24 labour days per ha) are from family labour followed by 7.94 (24.21%) (31.76 labour days per ha) from the hired labour force and the remaining 1.80 (5.49%) (7.2 labour days per ha) from labour pooling systems (for the details, please refer Table 5.9 below). This result is like the finding of Getu Hailu et al. (2016) that state family labour makes up 63% of the total labour used with hired labour accounting for 14%, and labour provided by someone(s) in exchange for the operator's labour at another time comprising the remaining 22%. This result is also like previous research findings that state family labour had a positive influence on adoption and intensity of improved *Teff* seed and supplying the required farm labour for different operations and family size has a significant positive effect on the quantity of *Teff* crops produced and marketed (Abera 2008; Rehima, Belay et al. 2013).

Table 5.9: Source of labour for the major activities of *Teff* farming

Major activities in *Teff* production	**Source of labour**				
	Family labour days	**Hired labour days**	**Pooling days**	**Total labour days required**	**Percent from total**
Ploughing	3.92	0.33	0.05	4.30	13.11
Planting	1.88	0.11	0.00	2.00	6.10
Weeding	8.88	2.48	0.34	11.70	35.67
Harvesting	5.00	4.36	0.94	10.30	31.40
Threshing	3.37	0.65	0.47	4.50	13.72
Total number of labour working days for 0.25 ha	**23.06**	**7.94**	**1.80**	**32.80**	**100.00**
Percent from total	**70.30**	**24.21**	**5.49**	**100**	

Source: Survey result, 2018

b. Family labour, labour cost, and *Teff* production

The average active labour force for all survey respondents is 2.22 per household. When we see the average number of the active labour force at household level by district, it is about 3.15 for Halaba zone, 2.26 for Lomie district, 1.79 for Shenkora na Minjar and 1.68 for Tahtai Maichew. Thus, from the findings, we can say that the Halaba zone has the highest average number of the active labour force at the household level (for the details, please refer to Table 6 in the annex).

The means of the household level independent variables affecting *Teff* productivity were also compared using ANOVA by district. Furthermore, pairwise multiple comparisons using Bonferroni correction (t-test) were conducted and the results are presented in Table 5.15 below. In this regard, the ANOVA test for the average number of active labour force in the household across the four districts shows that Halaba zone was statistically different from the other three districts (P-value < 0.05) (for the details, please refer Table 5.15 below).

On the other side, the average number of dependents for all survey respondents is 2.90 per household. When we see the average number of dependents at household level by district it is about 2.95 for Halaba zone, 2.55 for Lomie district, 2.52 for Shenkora na Minjar and 3.60 for Tahtai Maichew. Thus, from the findings, we can say that Tahtai Maichew district has the highest number of dependents at the household level (for the details, please refer Table 6 in the annex). The ANOVA analysis for the average number of dependents in the household across the four districts shows that Tahtai Maichew is statistically different from the other three districts (P-value < 0.05) (for the details, please refer Table 5.15 below).

The average labour cost for *Teff* production is estimated to be Birr 1863.16 per household. As indicated in Table 5.10 below, about 60 (24.19%) of the respondents do not have expenses for labour cost and thus they are assumed to do all the farming activities by family labour or pooling. About 88 (35.48%) respondents invest less than Birr 2000.00 for labour cost, 69 (27.82%) respondents invest from Birr 2000.00 up to Birr 4000.00 for labour cost, 22 (8.87%) respondents invest from Birr 4000.00 up to Birr 6000.00 for labour cost and the remaining 9 (3.63%) respondents invest Birr 6000.00 or more for labour cost.

If we compare labour cost by district, about 55 (88.71%) of the respondents from Halaba zone incur less than Birr 2000.00 for labour cost while 43 (69.35%) respondents from Shenkora na Minjar district incur less than Birr 2000.00 for labour cost. About 32 (51.61%) respondents from Lomie district incur less than Birr 2000.00 for labour cost and only 18 (29.03%) respondents of Tahtai Maichew district incur less than Birr 2000.00 for labour cost (for the details, please refer Table 5.10 below). The highest labour cost is observed for Tahtai Maichew district (Birr 2,694.71

per household) followed by Lomie district (2,419.06 per household) and Shenkora na Minjar district (Birr 1,344.35 per household). The least investment for labour cost is observed in the Halaba zone (Birr 807.66 per household).

Table 5.10: Comparison of labour cost by district

Category of labour cost	Number of respondents		Name of district			
	N	%	Halaba	Lomie	Shenkora na Minjar	Tahtai Maichew
No labour cost	60	24.19	23	10	27	0
Up to 2000.00 Birr	88	35.49	32	22	16	18
From Birr 2000.00 up to Birr 4000.00	69	27.82	7	14	12	36
From Birr 4000.00 up to Birr 6000.00	22	8.87	0	10	6	6
Birr 6000.00 and above	9	3.63	0	6	1	2
Total	**248**	**100**	**62**	**62**	**62**	**62**

Source: Survey result, 2018

When we see the strength of linear association of family labour with *Teff* production through Pearson's correlation, it is positively correlated with Pearson correlation r = 0.077 and p = 0.225 which shows a positive but weak relationship. When we see the strength of linear association of labour cost with *Teff* production through Pearson's correlation, it is positively correlated with Pearson correlation r = 0.198** and p = 0.002 which shows a positive and significant at the 0.01 level (2-tailed) relationship. Similarly, when we see the strength of linear association between the number of the active labour force in a household with *Teff* production, it is positively correlated with Pearson correlation r = 0.179**; p = 0.005 (correlation is significant at the 0.01 level). When we see the strength of linear association of the number of dependents with *Teff* production, it is negatively correlated with Pearson correlation r = -0.087 and p = 0.172 which shows the negative and weak relationship as expected. An active labour force in a household and investment in labour cost have a positive and statistically significant relationship with *Teff* production. This is like the previous result of Girma and Endrias (2015) and Getu Hailu et al. (2016) which states that *Teff* production is the function of labour and availability of labour force is assumed to have a positive relationship with the volume of *Teff* production. The ANOVA test for the average cost of labour incurred by the farmers across the four districts indicates that the mean cost of labour for Tahtai Maichew and Lomie districts are statistically different from that of Shenkora na Minjar district and Halaba zone farmers (P-value < 0.05) (for the details, please refer Table 5.15 below).

5.3.6. Education status of the respondents and *Teff* production

a. Literacy of the head of the household and Teff production

Literacy indicates whether the household head is literate or not. Households who are literate are expected to produce more *Teff* crops as compared to illiterates as literacy increases the ability of farmers to gather and analyze relevant information for their products. Thus, we expect a direct and positive relationship between literacy of the head of the household and *Teff* production. About 113 (45.56%) respondents attend formal schools and about 16 (6.45 %) respondents attend religious schools. The remaining 119 (47.98%) do not attend either formal schools or religious schools and thus they cannot read and write. The 135 (54.44%) respondents who did not attend formal schools are producing about 1,248.89 kg per household with a standard deviation of 776.29 while the 113 (45.56%) respondents who attend schools are producing 931.19 kg per household with a standard deviation of 757.39. On the other side, when we compare *Teff* production in terms of literacy status of the respondent, those respondents who can “read only” are producing more *Teff* crops (1,567 kg per household) as compared to illiterate (1,219 kg per household). Those respondents who are “able reading and writing” produce the least (985 kg per household) as compared to “read only” or illiterate respondents.

As indicated in Table 5.11 below, more illiterates are found in Shenkora na Minjar district with average *Teff* production of 1,297.22 kg per household followed by Halaba zone with average *Teff* production of 1,001.43 kg per household. On the other side, more literates are found in Tahtai Maichew district with average *Teff* production of 450.60 kg per household followed by Lomie district with average *Teff* production of 1,772.58 kg per household. Except for Tahtai Maichew district, in all districts, the illiterates are producing more *Teff* crops as compared to literates and this result is against our assumption and the findings of other researchers such as Hailu et al. (2016) that state education level increases steadily with *Teff* yield.

Table 5.11: Average *Teff* production in kilograms per household by literacy and district

Literacy status of the respondent	Average *Teff* production in kg per household by district							
	Halaba		Lomie		Shenkora na Minjar		Tahtai Maichew	
	N	Mean	N	Mean	N	Mean	N	Mean
Cannot read and write	35	1,001.4	29	1,939.66	36	1,297.22	19	371.05
Read only	0	0	2	2,100.00	0	0	1	500.00
Can read and write	27	794.44	31	1,772.58	26	1,105.77	42	450.60
Total	**62**	**911.29**	**62**	**1,861.29**	**62**	**1,216.94**	**62**	**427.02**

Source: Survey result, 2018

If we see the strength of the linear association (correlation coefficient) between *Teff* production and literacy status of the sample respondents with Spearman's rho coefficient correlation, it is negatively correlated of -0.165^{**}, $p = 0.009$, (correlation is significant at the 0.01 level (2-tailed)). This indicates that there is a negative and significant but weak relationship between literacy and *Teff* production. The result is against our assumption and the findings of Getu Hailu et al. (2016) that state education level increases steadily with the yield category. The reason could be illiterate respondents might have more resources such as land holding, *Teff* cultivated land and oxen ownership as compared to literate ones.

b. Educational status of the head of the household and Teff production

Education broadens farmers' skill and techniques of modern farming that enables them to perform the farming activities wisely and efficiently. Educational attainment by the household could lead to the awareness of the possible advantages of modernizing agriculture using technological inputs and enable them to read instructions on fertilizer packs (Girma and Endrias 2015).

When we see the results from Table 5.12 below, illiterate (not attending schools) respondents from Lomie and Shenkora na Minjar districts are producing more crops per household (1,900.00 kg and 1,273.81 kg), respectively as compared to literates. The highest *Teff* producers are illiterate respondents from Lomie district (1,900 kg per household) and surprisingly the least *Teff* producer is from Tahtai Maichew who attends college or university (300 kg). On the other hand, respondents who attend college or university from the Halaba zone are producing about 1,166.67 kg per household which is the highest from the district. This all indicates that there is variability in the average *Teff* production per household among the different categorical status of education.

Table 5.12: Average *Teff* production in kg per household by status of education

Status of Education	Average *Teff* production in kg per household by district							
	Halaba		Lomie		Shenkora na Minjar		Tahtai Maichew	
	N	Mean	N	Mean	N	Mean	N	Mean
Not attending schools	36	1001.39	38	1900.00	42	1273.81	19	381.58
Elementary school (Grade 1 to 8)	18	752.78	19	1878.95	17	1144.12	37	456.08
High school (Grade 9 to 12)	5	680.00	5	1500.00	3	833.33	5	410.00
Attend college or university	3	1166.67	0	0	0	0	1	300.00
Total	**62**	**911.29**	**62**	**1861.29**	**62**	**1216.94**	**62**	**427.02**

Source: Survey result, 2018

The strength of the linear association (correlation coefficient) between *Teff* production and highest level of education completed by the head of the household, is negatively correlated with Pearson coefficient correlation of $r = -0.195^{**}$, $p = 0.002$ (correlation is significant at the 0.01 level (2-tailed)). This indicates that there is a negative and significant but weak relationship between status of education and *Teff* production. The result negates our assumption and the findings of other researchers which suggest that education boosts agricultural production (Maxwell 2002; Abrha 2015; Girma and Endrias 2015). The ANOVA test indicates that the mean education for the farmers of Tahtai Maichew district is statistically different from that of Lomie and Shenkora na Minjar district farmers (P-value < 0.05) (for the details, please refer Table 5.15 below).

A comparison of *Teff* production by educational status of the respondents among the four study areas through ANOVA, shows that respondents not attending schools and elementary schools for Tahtai Maichew is statistically different from the other three districts (P-value < 0.05). Moreover, the mean *Teff* production for the respondents of Lomie district is statistically different from that of

Shenkora na Minjar district and Halaba zone (P-value < 0.05). However, there is no statistical difference of mean *Teff* production among the four districts for the respondents who are attending high school (P-value > 0.05) (for the details, please refer Table 5.8 above).

5.3.7. Ox ownership of the respondents and *Teff* production

Oxen serve as a source of traction in many developing countries and thereby significantly affect households' crop production. Households with high numbers of oxen may produce more of *Teff* and a positive relationship is expected between *Teff* production and ox ownership.

About 30 (12.1%) respondents (13 from Tahtai Maichew, 10 from Halaba zone, 5 from Shenkora na Minjar district and 2 from Lomie district) don't own oxen. About 50 (20.16%) respondents own only one ox. About 114 (45.97%) respondents own two oxen and 54 (21.78%) respondents own three or more oxen. As indicated in Table 5.16 below, the average *Teff* production for those respondents who do not have an ox is 700 kg per household. Similarly, the average *Teff* production for those respondents who do have only one ox is 672 kg which is lower than the respondents who own two and more oxen. From the same Table, we can see that total *Teff* production per household increases for each increase of ox ownership. As indicated in Table 5.15 below, we can see that for each ox increase, *Teff* production per household generally increases except in a few cases.

The average ox ownership per household is 1.97 with a standard deviation of 1.29. When we see ox ownership by district, the highest ox ownership (3.11 per household) is observed for Lomie district as compared to the other districts while all the remaining districts own less than 2 oxen per household. The least oxen ownership (1.21 per household) is observed for Tahtai Maichew district (for the details, please refer Table 5.14 below).

Table 5.13: Oxen ownership and *Teff* production

Quantity of oxen ownership per household	Number of respondents		*Teff* production in kilograms per household	
	Count	%	Mean	SD
0	30	12.10	700.00	516.79
1	50	20.16	672.00	481.41
2	114	45.97	977.85	541.46
3	18	7.26	1,500.00	566.72

4	30	12.10	2,111.67	690.79
5	2	0.81	3,100.00	141.42
6	3	1.21	2,700.00	781.02
8	1	0.40	3,100.00	0
Total	**248**	**100.00**	**1,104.13**	**757.39**

Source: Survey result, 2018

The ANOVA test for the average ox ownership of the farmers indicates that there are statistically significant variations among Tahtai Maichew, Shenkora na Minjar and Lomie districts (P-value < 0.05). Moreover, the average ox ownership of the farmers of Lomie district is statistically different from that of Shenkora na Minjar district and Halaba zone (P-value < 0.05) (for the details, please refer Table 5.15 below).

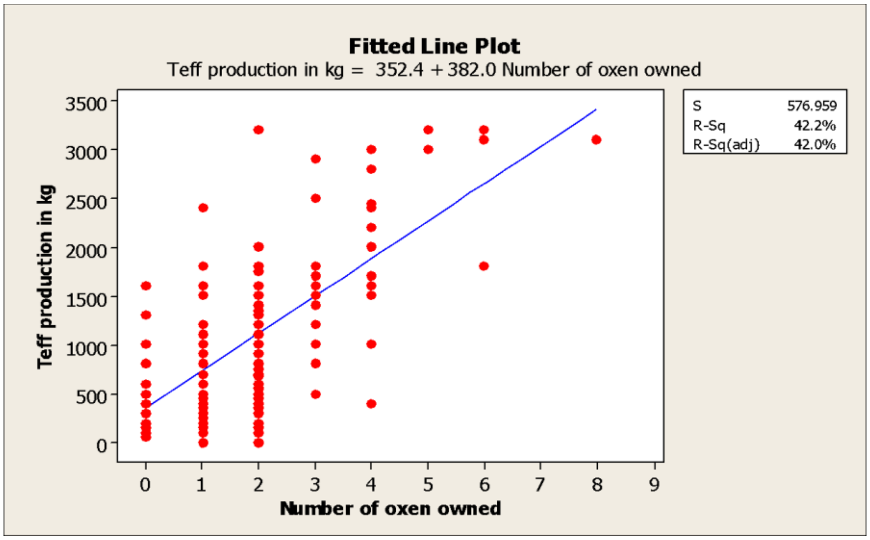
Table 5.14: Ox ownership and *Teff* production by district

Ownership of ox and *Teff* production	Ownership of oxen by district				Total	Average *Teff* production per household
	Halaba	Lomie	Shenkora na Minjar	Tahtai Maichew		
No, I don't have ox	10	2	5	13	**30**	**700.00**
Yes, I own ox	52	60	57	49	**218**	**1,159.75**
Average oxen ownership	1.68	3.11	1.87	1.21	**248**	**1.97**
Average *Teff* production	**911.29**	**1,861.29**	**1,216.94**	**427.02**	**248**	**1,104.13**

Source: Survey result, 2018

If we see the strength of the linear association (correlation coefficient) between *Teff* production and the number of oxen owned by respondents, it is positively and strongly correlated with Pearson coefficient correlation of $r = 0.650^{**}$ (P-value < 0.001) which supports our assumption. This indicates that there is a positive and strong relationship between the quantity of oxen ownership and *Teff* production and the correlation is statistically significant. From Figure 5.2 below, we can see that as the average oxen ownership increases by one ox, *Teff* production on average increases by 382 kg. Our research finding is like the previous research result of Jayne, Mather et al. (2010) which states animal traction power enables households to cultivate greater areas of land and to execute agricultural operations timely. It is also like the results of Getu Hailu et al. (2016) that state the number of oxen per household tends to have a statistically significant impact on yield.

Figure 5.2: Relationship of *Teff* production in kilograms and oxen ownership



Source: Survey result, 2018

5.3.8. Wealth (asset ownership) of the respondents and *Teff* production

a. Livestock ownership and *Teff* production

A household's wealth status forms the other important source of livelihood for farming households. Livestock contributes to households' economy in different ways, e.g. as a source of pulling power in farming, source of cash income, source of supplementary food and means of transport. In this study, a positive relationship between livestock ownership and *Teff* production is expected.

To this end, the sampled households were asked if they own livestock and household assets that are useful for agricultural production. As a result, the average livestock ownership per household is 1.98 for ox, 1 for a cow, 7.42 for chicken, 2.02 for sheep, 1.94 for goat and 1.34 for donkey (for the details, please refer Table 8 in the annex).

Table 5.15: Comparison of independent variables affecting *Teff* production by district (ANOVA)

Independent variables	Districts				Total respondents	ANOVA	
	Tahtai Maichew	Shenkora na Minjar	Lomie	Halaba zone			
	Mean and SD	Mean and SD	Mean and SD	Mean and SD	Mean and SD	F	Sig.
Active labour force	1.68_{a}±1.10	1.79_{a}±1.36	2.26_{a}±1.20	3.15_{b}±1.59	2.22±1.44	15.768	.000
Number of dependents	3.60_{a}±1.51	2.52_{b}±1.04	2.55_{b}±.94	2.95_{b}±1.17	2.90±1.25	11.238	.000
Total labour cost	2694.71_{a}±1141.53	1344.35_{b}±1614.39	2419.06_{a}±2003.30	807.66_{b}±913.24	1816.45±1660.9	22.421	.000
Education	4.19_{a}±3.62	1.55_{b}±2.87	2.35_{b}±3.35	$3.05_{a,\,b}$±4.43	2.79±3.72	5.963	.001
Oxen ownership	1.21_{a}±.77	1.87_{b}±.88	3.11_{c}±1.45	$1.68_{a,\,b}$±1.11	1.97±1.29	34.784	.000
Total livestock value in Birr	28048.55_{a}±22825.33	54205.65_{b}±27796.20	75646.53_{c}±32542.92	44136.13_{b}±27791.25	50509.21±32720.52	31.496	.000
Total farm asset value in Birr	1333.77_{a}±787.50	1209.60_{a}±397.96	1137.03_{a}±572.42	780.73_{b}±385.42	1115.28±593.55	11.137	.000
Total available land in ha	0.804_{a}±0.478	1.421_{b}±0.768	1.984_{c}±0.962	1.433_{b}±0.800	1.411±0.87	24.146	.000
Teff cultivated land in ha	0.438_{a}±0.269	0.795_{b}±0.367	1.087_{c}±0.437	0.732_{b}±0.355	0.77±0.43	33.534	.000
Total cost for inputs	1775.01_{a}±1165.39	2754.46_{b}±1496.02	5342.79_{c}±2098.27	$2201.35_{a,b}$±991.36	3018.40±2036.5	70.741	.000
Total training days attended	9.45_{a}±6.22	5.58_{b}±3.57	5.24_{b}±7.05	3.21_{b}±2.07	5.87±5.58	15.975	.000
Amount of loan allocated to *Teff*	90.32_{a}±310.19	1274.19_{b}±3086.99	126.61_{a}±668.11	77.42_{a}±441.09	392.14±1672.19	8.363	.000
Experience of membership in cooperatives in years	10.92_{a}±7.81	12.08_{a}±8.45	12.55_{a}±9.08	5.76_{b}±6.38	10.33±8.39	9.458	.000
Total investment for utilities	571.61_{a}±424.45	1379.52_{b}±970.71	1160.53_{b}±984.59	1141.13_{b}±948.92	1063.20±910.31	9.870	.000

Source: Survey result, 2018

In terms of the average market value (estimated price) of the livestock, respondents were categorized into seven groups (Table 5.160. About 6 (2.42%) respondents don't have access to livestock. About 37 (14.92%) of the respondents are the owners of livestock with the market value up to Birr 20,000.00. About 63 (25.40%) respondents and 62 (25%) respondents are the owners of livestock with the market value from Birr 20,000.00 up to Birr 40,000.00 and from Birr 40,000.00 up to Birr 60,000.00, respectively. The remaining 80 (32.26%) respondents were the owners of livestock with the market value of Birr 60,000.00 and above (Table 5.16).

The average monetary value of livestock ownership is Birr 50,509.22 per household. The average valuation of livestock per district, it is Birr 75,646.53 for Lomie district, Birr 54,205.65 for Shenkora na Minjar district, Birr 44,136.13 for Halaba zone and Birr 28,048.55 for Tahtai Maichew district. Lomie district has the highest value of livestock compared to other districts. Tahtai Maichew district own the least value of livestock as compared to other districts.

When we see the total *Teff* production per household in kg, we can observe that as the average market value of the livestock of a household increase, *Teff* production per household shows an increasing trend which supports our assumption. Farmers who do not have livestock produce 550 kg of *Teff* crops per household but farmers who own livestock with the market value of Birr 100,000.00 and above on average produce 2,269.83 kg of *Teff* crops per household (see Table 5.16).

Table 5.16: Category of total livestock valuation in Birr by district and *Teff* production

Category of total livestock valuation in Birr	**Name of districts**				**Average *Teff* production in kg**
	Halaba	**Lomie**	**Shenkora na Minjar**	**Tahtai Maichew**	
	N	N	N	N	
No livestock	0	0	2	4	550.00
Up to Birr 20,000	11	1	4	21	520.27
From Birr 20,000 up to Birr 40,000	20	8	12	23	816.67
From Birr 40,000 up to Birr 60,000	18	14	22	8	1,054.84
From Birr 60,000 up to Birr 80,000	4	12	11	4	1,177.42
From Birr 80,000 up to Birr 100,000	7	7	5	1	1,605.00
Birr 100,000 and above	2	20	6	1	2,269.83
Total	**62**	**62**	**62**	**62**	**1104.13**

Source: Survey result, 2018

When we measure the strength of the linear association between the market value of livestock ownership per household and *Teff* production through Pearson's correlation, it is positive with the correlation of $r = 0.663^{**}$ (correlation is significant at the 0.01 level (2-tailed)). This indicates that there is a positive and strong relationship between the monetary value of livestock ownership and *Teff* production which is like the research findings of Abrha (2015). The ANOVA test for the average monetary value of livestock for farmers indicates that there are statistically significant variations among Tahtai Maichew, Shenkora na Minjar and Lomie districts (P-value < 0.05). Moreover, the average monetary value of livestock of Halaba zone is statistically different from that of Tahtai Maichew and Lomie districts (P-value < 0.05) (See Table 5.15).

b. Access to farm equipment and *Teff* production

Farm equipment like tractor, generator, treadle pump, ploughing set (*Maresha*), hoe (*Mekoferia),* axe (*Metrebia, Gojemo*), sickle (*Machid*) and hammer (*Medosha)* are important farm tools for the cultivation of *Teff* crops. In this study, we expect a positive relationship between access to farm equipment and *Teff* production (Dixon, Gibbon et al. 2001; Rigg 2006).

An assessment was made concerning the ownership of such assets and the estimated market value of such farm tools in the market. The survey results revealed that no respondent owns a tractor. About 38 (15.32%) respondents own generators and 24 (9.68%) respondents own treadle pumps which are important tools for irrigation activities. The farmers use such facilities for the cultivation of vegetables and irrigation is not practiced for *Teff* production by all the respondents in all districts. About 241 (97.18%) respondents own at least one ploughing set (*Maresha*), 229 (92.4 %) respondents own at least one hoe (*Mekoferia),* 246 (99.19 %) respondents own at least one sickle (*Machid*), 235 (94.79 %) respondents own at least one axe (*Metrebia, Gojemo*), 86 (34.68 %) respondents own at least one hammer (*Medosha)* and 66 (26.61 %) respondents own at least one saw (*Megaz*).

The monetary valuation of farm equipment per household is about Birr 1,115.28 per respondent with a standard deviation of 593.55. By district level, the valuation of equipment is Birr 1,333.77 for Tahtai Maichew district respondents, Birr 1,209.60 for Shenkora na Minjar district respondents, Birr 1,137.03 for Lomie district respondents and Birr 780.73 for the Halaba zone respondents. In this regard, respondents of Tahtai Maichew district own the highest monetary value of farm equipment as compared to other districts while respondents of the Halaba zone own the least monetary value of farm equipment as compared to other districts.

Based on the information obtained from the respondents about the average monetary value of the farm equipment, respondents were categorized into four groups. Only 1 (0.40%) respondent doesn't own farm equipment and on average produce about 50 kg. About 125 (50.40%) of the respondents own farm tools with an estimated monetary value of less than Birr 1000.00 and produce about 886.80 kg per household. About 95 (38.31%) respondents own farm tools with an estimated monetary value from Birr 1000.00 up to Birr 2000.00 and produce 1,362.11kg per household and the remaining 27 (10.89%) respondents own farm tools with an estimated monetary value from of Birr 2000.00 and above produce 1,241.67 kg per household.

When we measure the strength of the linear association between the monetary value of farm equipment and *Teff* production through Pearson correlation, it is positive with a correlation of $r = 0.224^{**}$, P-value < 0 which supports our assumption. This indicates that there is a positive and significant relationship between the monetary value of farm tools and *Teff* production which is like the findings of other researchers such as Swift (1989) and De Haan (2012). When we see the ANOVA test for the mean monetary value of farm assets among the four districts, the average monetary value of farm assets of Halaba zone is statistically different from all the three districts (P-value<0.05) (for the details, please refer Table 5.15 above).

5.3.9. Landholding and *Teff* production

a. Total landholding

In Ethiopia, land is a public property that has been administered by the government for more than four decades. According to Najafi (2003), under subsistence agriculture, landholding size is expected to play a significant role in influencing farm households' food security. In this study, the actual total size of land ownership for each respondent was obtained by summing up the fragments plots of land including owned farmland, cash renting land, sharecropping land and inherited land. It is measured in *Tsimad* (0.25 hectare) and converted to hectares. Farm households who own and cultivate large acreage of land are expected to produce more *Teff* crops.

Discussions on land ownership were undertaken with FGD participants and key informants. The findings showed that the problem of access to land to be serious especially for the youngsters as described hereunder. About scarcity of land, a study participant from Tahtai Maichew district stated the following.

> Land is very scarce in our area and the young couldn't have their own land and they are dependent on the land of their families. The land is inadequate (Study participant_20).

Similarly, another FGD study participant from Lomie district stated the following.

> Parents have enough land because they have it, but most of the youth have land problems unless they get it from their parents (Study participant_28).

A participant from Lomie district reported on the scarcity of land and its impact on *Teff* production as indicated hereunder.

> When we see access to land, due to the growing population in the region, it is becoming scarce. The land is devoted to different types of crops, not only for *Teff*. Thus, production of *Teff* crops is like all other crops and farmers do not give more land for *Teff* crops as they do have small land. They also want to have various types of crops in that small land. Thus, if we want to produce *Teff* as much as we want to produce, we can't because of the scarcity of the land (Study participant_36).

Confirming the land problem, a participant from Shenkora na Minjar district noted,

> Parents have enough land because they have it. However, due to the increasing trend of population, most of the youth have problems accessing land. Unless they get it from their parents it is difficult to have it. Some parents give birth to a dozen children and the land becomes short. Due to lack of land, most of the young farmers are being forced to migrate to towns or abroad leading us to expensive prices for labour in the market (Study participant 46).

Similarly, participants of FGD from the Halaba zone highlighted the following.

> Due to the increasing trend of population, there is a big problem of accessing land and as a result, the young generation gets the small size of land either from the parents or the government. Only parents do have land. The land is further divided into all the children and the portion of land is getting lesser and lesser due to such division of the existing farmland to the children (Study participant_83).

To solve the problem of access to land specially for the youngsters, the interventions undertaken by the government are highlighted by the key informant from Tahtai Maichew district as follows.

> The needs of human beings are unlimited and the land around us is scarce and it had been already divided among the farmers some years back. There will obviously be new demands from the

> youngsters. There is a provision of land for young farmers and land is given to the youth in group forms for those who want to work on beekeeping, dairy, or fattening projects. However, the access to land is still a big challenge especially for the youth (KII Tahtai Maichew_1).

Thus, land is a scarce resource in all the districts, especially for the youth due to population increase while the land is limited. Only parents have land. The land is further divided among children and the land size is getting smaller due to the sub-division. The youth couldn't get farmland unless it was allocated by their families. Compared to the needs of the farmers, the land is inadequate in most of the cases. Although farmers have the interest to grow *Teff* crops, the inadequacy of land restrains them to plant their land with varied crop types and thus they are waiting for another year through crop rotation. In some cases (such as Tahtai Maichew district) land is provided for youngsters who are interested to work on beekeeping, dairy or fattening projects.

The ownership and availability of land differ among respondents. About 15 (6.05%) respondents do not have their own land and 233 (93.95%) of respondents have their own land with the average land ownership of 1.01 ha per household. About 75 (30.24%) respondents rented land with average land renting size of 0.25 ha, 53 (21.37%) respondents sharecropped land with an average land size of 0.13 ha and the remaining 12 (4.84%) respondents inherited land from their families with an average land size of 0.02 ha.

The survey result also indicates that about 186 (75%) respondents have the certificate of land ownership for their 1st plot of land while 24 (9.68%) respondents don't have the certificate of land ownership. From 56 owners of the 2nd plot of land, about 55 (98.21%) respondents have the certificate of ownership while all the 17 owners of the 3rd plot of land have the certificate of land ownership.

The average landholding of all the respondents is 1.41 ha per household with a standard deviation of 0.87. When we see the landholding in the different districts, about 1.98 ha is for the respondents of Lomie district, about 1.42 ha for the respondents of Shenkora na Minjar district, about 1.43 ha for the respondents of the Halaba zone, and about 0.81 ha is for the respondents of Tahtai Maichew district.

For such available total land; on average about 0.77 ha (54.61%) is allocated for *Teff* production. The result is a bit higher than the previous study of Hailu et al. (2016) that states the average land size of 0.48 ha is used for *Teff* production. In Lomie district farmers own about 1.36 ha per household, Halaba zone respondents own 1.17 ha per household, Shenkora na Minjar district respondents own about 1.0 ha per household while Tahtai Maichew district respondents own 0.52 ha of land per household. This indicates that except for Tahtai Maichew district, all the other districts respondents on average own about 1 ha and above of land per household. Renting land seems better in Lomie district (0.59 ha per household) while sharecropping of land seems better in Tahtai Maichew district (0.27 ha per household) as compared to other districts (for the details, please refer Table 5.17 below).

Table 5.17: Types of land ownership by district

Types of land ownership	**Name of districts**				**Average land in ha for all sample respondents**
	Halaba	**Lomie**	**Shenkora na Minjar**	**Tahtai Maichew**	
Owned land per household in ha	1.17	1.36	1.00	0.52	**1.01**
Rented land per household in ha	0.06	0.59	0.35	0.00	**0.25**
Share cropped land per household in ha	0.20	0.00	0.03	0.27	**0.13**
Inherited land per household in ha	0.00	0.03	0.04	0.02	**0.02**
Total available land for cultivation in ha	1.43	1.98	1.42	0.81	1.41
Teff cultivated land per household in ha	0.74	1.09	0.80	0.44	0.77
Percentage of land allocated for *Teff* production	51.75%	55.05%	56.34%	54.32%	54.61%

Source: Survey result, 2018

The total land ownership and *Teff* production is strongly correlated with Pearson correlation of 0.530** (correlation is significant at the $p < 0.001$ level (2-tailed)). This indicates that there is a positive and strong relationship between total landholding and *Teff* production and the correlation is statistically significant. This means that as land holding increases, *Teff* production increases. This result is like the finding of Najafi (2003) which states food production can be increased extensively through the expansion of areas under cultivation. The ANOVA test for the average landholding of the smallholder farmers among the four districts shows that there is statistical variation for Tahtai Maichew, Shenkora na Minjar and Lomie districts (P-value < 0.05). Moreover, the average land holding of Halaba zone is statistically different from that of Tahtai Maichew and Lomie districts (P-value < 0.05) (for the details, please refer Table 5.15 above).

b. *Teff* cultivated area and *Teff* production

In this study, it is expected that *Teff* cultivated area has a direct and positive relationship to *Teff* production. The average *Teff* cultivated area is 0.77 ha per household and it differs among districts. It is about 1.09 ha for Lomie district and 0.8 ha for Shenkora na Minjar district. It is also about 0.74 ha for Halaba zone and 0.44 ha for Tahtai Maichew district (please refer Table 5.18 below for the details). From the same Table, we can also observe that respondents who allocate more land for *Teff* production produce more *Teff* crops than other respondents.

Table 5.18: Allocated land and *Teff* production by district

Average land allocation and *Teff* production	**Mean and SD**	**Name of districts**				**For all sample respondents (N= 248)**
		Halaba (n=62)	**Lomie (n=62)**	**Shenkora na Minjar (n=62)**	**Tahtai Maichew (n=62)**	
Available land for cultivation in ha	Mean	1.43	1.98	1.42	0.81	1.41
	SD	0.80	0.96	0.77	0.48	0.87
Teff cultivated land in ha per household	Mean	0.74	1.09	0.80	0.44	0.77
	SD	0.34	0.43	0.37	0.27	0.42
Teff production in kg per household	Mean	911.29	1,861.29	1,216.94	427.02	1,104.13
	SD	555.11	794.11	474.85	243.11	757.39

Source: Survey result, 2018

About 49 (19.76%) respondents cultivate less than 0.5 ha of land and on average they produce about 317.35 kg of *Teff* crops per household. About 106 (42.74%) respondents cultivate from 0.5

ha up to 1 ha and on average they produce 881.37 kg of *Teff* crops per household and 61 (24.60%) respondents from 1 ha up to 1.5 ha of land and on average they produce 1,507.38 kg of *Teff* crops per household. About 22 (8.87%) respondents cultivate from 1.5 ha up 2 ha of land and on average they produce about 2,050.00 kg of *Teff* crops per household. The remaining 10 (4.03%) respondents who cultivate 2 ha and above on average produce 2,780.00 kg of *Teff* crops per household (for the details, please refer Table 5.19 below).

About 34 (54.84%) of respondents from Tahtai Maichew district allocate less than 0.5 ha of land for *Teff* production and on average they produce about 277.94 kg per household which is less than the average production within the same group (317.35kg). Respondents of Tahtai Maichew district produce the least amount of *Teff* crops as compared to the average *Teff* production for all respondents in all categories of *Teff* cultivated land in ha. Similarly, respondents of Halaba zone produce less than the average of all respondents with the exception for the categories of 2 and above ha of land. *Teff* production increases as the *Teff* cultivated land increases. As the allocated land for *Teff* production increases, *Teff* production increases (Table 5.19). For every unit increase of *Teff* cultivated land per ha, *Teff* production on average increases by 1,490 kg (figure 5.3).

When we see the strength of linear association between *Teff* cultivated land and *Teff* production, it is strongly correlated with Pearson correlation $r = 0.834^{**}$ and $p < 0.001$(correlation is significant at the 0.01 level (2-tailed)). This indicates that there is a positive and strong relationship between *Teff* cultivated land and *Teff* production and the correlation is statistically significant. This result is like the findings of other researchers such as Dessalegn, Jayne et al. (1998) and Abate, Shiferaw et al. (2015) who state that cultivated area has a direct and positive effect on *Teff* output.

Table 5.19: Total cultivated land in ha and *Teff* production in kg per household by district

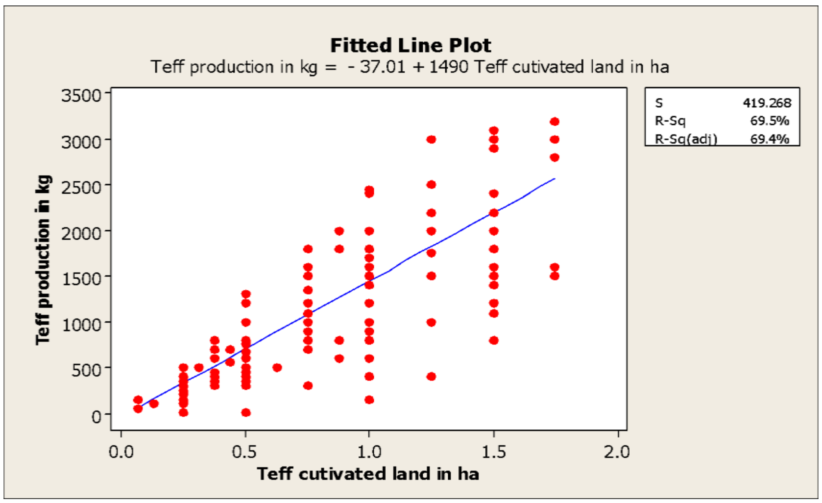
Categories of *Teff* cultivated land in ha	**Name of districts and *Teff* production by sample respondents**								**Total**	
	Halaba		**Lomie**		**Shenkora na Minjar**		**Tahtai Maichew**			
	N	**Mean**	**N**	**Mean**	**N**	**Mean**	**N**	**Mean**	**N**	**Mean**
Less than 0.5 ha	6	308.33	3	233.33	6	591.67	34	277.94	**49**	**317.35**
From 0.5 ha up to 1 ha	35	735.71	15	1260.00	33	1072.73	23	581.52	**106**	**881.37**
From 1 ha up to 1.5 ha	17	1194.12	24	1870.83	16	1493.75	4	712.50	**61**	**1,507.38**
From 1.5 ha up to 2.0	3	1800.00	11	2390.91	7	1800.00	1	800.00	**22**	**2,050.00**

2 ha and above	1	3200.00	9	2733.33	0	0	0	0	**10**	**2,780.00**
Total	**62**	**911.29**	**62**	**1861.29**	**62**	**1216.94**	**62**	**427.02**	**248**	**1104.13**

Source: Survey result, 2018

The ANOVA test for the average land allocated for *Teff* production by the smallholder farmers among the four districts shows that there is statistical difference for Tahtai Maichew, Shenkora na Minjar and Lomie districts (P-value < 0.05). Moreover, their average land allocated for *Teff* production by Halaba zone farmers is statistically different from that of Tahtai Maichew and Lomie district farmers (P-value < 0.05) (for the details, please refer Table 5.15 above).

Figure 5.3: Relationship of *Teff* cultivated land and *Teff* production (fitted line plot)



Source: Survey result, 2018

5.3.10. Soil fertility and *Teff* production

The potential to improve yields depends strongly on quality of soil (Sah 2002). In this regard, discussions were undertaken with FGD participants and key informants in relation to the suitability of of the land for *Teff* production. A participant from Tahtai Maichew district highlighted the following.

> *Teff* grows better in a land that has thick soil content. The best soil for *Teff* production is clay. If it is well prepared at first, red clay also gives good production. However, in times when there is too much rain, sandy fields are better for *Teff* production. In the time of water stress, as black clay gets swampy, it is preferable for Teff more than a sandy field. Generally speaking, our land is suitable for Teff production (Study participant_9).

Similarly, an FGD participant from Lomie district stated the following in relation to the suitability of their land for *Teff* production.

> Our land is fertile and preferable for *Teff* cultivation. The land here is better than the land elsewhere. Our land is the best for *Teff* production, because it is rich with minerals. It has resistance to rain shortage (Study participant_40).

A study participant from Shenkora na Minjar district also stated the following.

> Minjar is one of the best places for *Teff* production because the land is good and fertile. Our land is very suitable for Teff production and there are many farmers who wish to buy our product (Study participant_50).

A study participant from the Halaba zone stated the following.

> Our land is very good for *Teff* and pepper production. *Teff* grows well in this area and the harvest is very good if there is no problem with rain and access to improved seed (Study participant_68).

The best soil for *Teff* production is clay. If it is well prepared at first, red clay also gives good production. However, in times when there is too much rain, the sandy field is better for *Teff* production. As per the information of the study participants, it can be generalized that the land of all the districts is suitable for *Teff* production.

The perception of the respondents towards the soil fertility of their farmland was assessed and the survey result indicates that about 180 (72.58%) respondents consider their land as "highly fertile." Similarly, about 50 (20.16%) respondents perceive their land as "average fertile" and 18 (7.26%) respondents consider their land as "poor fertile". When we assess the average *Teff* production per household for 2010 E.C (2017/18) crop year, we can observe that about 1,369.86 kg per household *Teff* production for respondents with the perception of "high soil fertility", about 473.00 kg per household for respondents with the perception of "average soil fertility" and 200.00 kg per household for respondents with the perception of "poor soil fertility."

When we see the perception of respondents towards soil fertility of their land by district, about 54 (87.1%) respondents of Lomie district label their land as "highly fertile" and 51 (82.26%) respondents of Shenkora na Minjar district label their land as "highly fertile". About 45 (72.58%) of respondents of the Halaba zone label their land as "highly fertile" while about 30 (48.39%) respondents of Tahtai Maichew district respondents label their land as "highly fertile". "Average soil fertility" is high for Tahtai Maichew district respondents and "low soil fertility" is high for both the Halaba zone and Tahtai Maichew districts. This clearly shows there is a difference in perception among the respondents towards the fertility of their farmland (for the details, please refer Table 5.20 below).

When we see the relationship between soil fertility and *Teff* production by Pearson correlation, we can find that there is significant positive relationship of $r = 0.561^{**}$ with $p < 0.001$ (correlation is significant at the 0.01 level (2-tailed)) which is like the study result of Sah (2002) that states better land quality boosts crop production.

Table 5.20: Soil fertility perception and *Teff* production by district

Perception of the respondent towards soil fertility	Number of sample respondents		Name of districts				Average *Teff* production in kg per household
	N	%	Halaba	Lomie	Shenkora na Minjar	Tahtai Maichew	
Low soil fertility	18	7.26	7	3	1	7	200.00
Average soil fertility	50	20.16	10	5	10	25	473.00
High soil fertility	180	72.58	45	54	51	30	1,369.86

Source: Survey result, 2018

5.3.11. Rainfall and *Teff* production

The potential to improve yields depends strongly on rainfall patterns (Sen 1981). An assessment made by FAO in some African countries has shown that rainwater harvesting can increase yields two to three times as compared with conventional dryland farming. Furthermore, rainwater harvesting often has double or triple benefits: not only does it provide more water for the crop but it also adds to the recharging of groundwater and helps reduce soil erosion (Wiebe, Soule et al. 2001). In this study, we expected a positive relationship between suitable rainfall conditions and *Teff* production.

Discussions were undertaken with FGD participants and key informants in relation to the suitability of weather and adequacy of rainfall to *Teff* production. In Lomie district the suitability of the weather and availability of rainfall was described as follows:

> Except in a few cases where there is drought, the weather is suitable for *Teff* production. We can say that the weather is perfect for Teff production. There is enough rainwater and, in some cases, untimely rains, especially in November, affect *Teff* production (Study participant 30).

Similarly, a study participant from Shenkora na Minjar district highlighted the following.

> Our district has enough rain, and the temperature is also very good for *Teff* production, but this does not mean that sometimes it does not fluctuate (Study participant_48).

A study participant from the Halaba zone stated the following in relation to the weather condition and the problems faced during the last two years.

> The weather is very good for *Teff* production. However, in the last two years there was a shortage of rainfall that negatively affected our *Teff* production (Study participant_75).

A key informant from Tahtai Maichew district stated the following about the weather and the irrigation schemes.

> The weather in our district is wet and it is suitable for *Teff* production. As a result, the district is chosen as one of the ten potential areas for *Teff* production in the region. We can say that the weather is suitable. However, the productivity of *Teff* depends on the seasonal pattern of rainfall. Applying irrigation that can boost *Teff* production has not yet begun in our district (KII Tahtai Maichew_1).

From the above discussions, we can learn that the weather in all districts is suitable for *Teff* production. However, fluctuation of rainfall and untimely rain negatively affects *Teff* production. For example, we can observe that in the Halaba zone there was a shortage of rainfall for the last two years that negatively affected *Teff* production in the study area.

From the survey, we can see that about 224 (90.32%) respondents assume that there was adequate rainfall during 2010 E.C. (2017/18) harvest period and on average they produce 1,142.97 kg per household. About 24 (9.68%) respondents assume there was no adequate rainfall during 2010 E.C. (2017/18) harvest period and on average they produce about 741.67 kg per household. About 19 (7.67%) respondents that assume "there was no adequate rainfall" during 2010 E.C. (2017/18) are from the Halaba zone while the remaining 5 (2.02%) respondents are from Tahtai Maichew and Lomie districts.

When we see the perception of the respondents towards adequacy of rainfall during 2010 E.C. (2017/18) by district, all the 62 (100%) respondents of Shenkora na Minjar district, 60 (96.77%)

respondents of Lomie district and 59 (95.16%) respondents of Tahtai Maichew district say there was “adequate of rainfall”. About 43 (69.35%) respondents of Halaba zone assume there was “adequate of rainfall.”

The other issue assessed during the survey was whether farmers are producing *Teff* crops using irrigation schemes or not. The response of all the respondents is similar and irrigation is not used for *Teff* production in all districts. Production of *Teff* crops is once per year during the rainy season and irrigation is used by the farmers for growing vegetables and some other crops such as maize. The reason for such absence of irrigation schemes for *Teff* production is that it demands huge labour force and hard work as compared to growing vegetables though irrigation which requires small effort. The other reason is that if the farmers harvest *Teff* crops twice or three times per year using irrigation schemes, they fear that the fertility of the soil might be decreased as it loses its content due to frequent land use.

Looking into the overall relationship of the perception of the respondents towards the availability and adequacy of rainfall with *Teff* production through Pearson correlation, it is $r = 0.157^*$, $p = 0.013$ (correlation is significant at the 0.05 level (2-tailed)). This indicates a positive and significant relationship between adequacy of rainfall and *Teff* production. The result is like our hypothesis and the research work done by the World Bank in Burkina Faso, Kenya, Niger, Sudan and the United Republic of Tanzania (World Bank, 2002).

5.3.12. Application of agricultural inputs and *Teff* production

Fertilization of farmland can boost agricultural production and influence the food security status of a household. Thus, in this study, fertilization and *Teff* production are expected to have a direct and positive relationship. Discussions were undertaken with farmers through focus group discussion (FGD) and key informants concerning the access to chemical inputs and manures. A study participant from Tahtai Maichew district raised the following issue about the trend of using fertilizers and chemicals and associated costs.

> In the past, farmers were pushed to take fertilizer but now the farmers are initiating their demand for inputs to development agents in their localities. This indicates that the farmers have learned the importance of fertilizers in boosting agricultural outputs and considered it as a step forward for better production. There is enough supply for fertilizer, better seed, and anti-pest supply as well. However, the price for all the supplies increases from year to year and this is a big challenge to all

the farmers. The farmer has been victim to unnecessary expense because it was sold for 500 Birr to 600 Birr for a 100 kg of DAP five years ago but now it costs us more than 1300 Birr (Study participant_8).

Similarly, a study participant from Lomie district raised the following issue concerning the problems of accessing the agricultural inputs and using composite.

First, farmers were using compost for their land. Now, there is enough fertilizer and chemical supply, even though the chemical is somehow making our land less fertile from time to time. I think that there is nothing that can be better than compost, but the farmers these days are getting tired of collecting the ingredients to make compost like dried leaves and cattle dang and simply apply a chemical fertilizer, which eventually harms the land even though the product is easily obtained. Nevertheless, we are supplied with fertilizer without a delay whenever we need it (Study participant_30).

Another dimension of the problem of inputs is raised from Shenkora na Minjar district FGD participant as indicated below.

There is a big problem in the quality of the chemicals that are provided to the farmers. The weeds take over our crop before we control it. It is only those who have the money who take advantage of the limited supply. Even if we have the supply, it is not strong enough to kill the pests. Nowadays, there is a new weed that is taking over our farmland and we are desperate what to do with it and it requires a solution urgently (Study participant_61).

Similarly, a study participant from the Halaba zone stated the following concerning the problems of input supply and its price.

We do get enough supply of fertilizer, but the problem is with seed and chemical supply. The price of fertilizer has also increased tremendously. Before two years, the price for DAP was Birr 6.00 per kg but now it is Birr 13 per kg. Seed supply is available in small quantities and still, it is expensive. Anti-pest is not available mostly and if we want to buy in town, it is on the market, but its effectiveness is not good, and its cost is high (Study participant_68).

A key informant from Shenkora na Minjar district also stated the following about the problems of application of inputs and associated issues.

The main problems of *Teff* production are the use of blanket fertilizer for all types of land, weeds and the land is getting old because of erosion. The other problem is the way we use a fertilizer that some farmers overuse it and it has side effects. Too much anti-pest kills the microorganisms in the land and affects production negatively. The problem with the chemicals is that farmers buy unknown chemicals from the market that have damaged and dried the crop even though we advise them not

> to do so. Some farmers use DDT (Dichlorodiphenyltrichloroethane) without our consent and advice and end up harming their crop and their farmland. Farmers can solve this problem by using compost, but the farmers may not accept the advice of experts and they are not working hard to solve the problems. If the problem is not solved shortly with the help of the government, it will affect productivity in the long run (KII Shenkora na Minjar_2).

On the other side, the practice of using manure as input for soil fertility is declining and one key informant from Tahtai Maichew district stated the following concerning this issue.

> Organic fertilizers are rarely used by farmers as a means of enhancing soil fertility. When it comes to access to natural inputs like manure, it is not mainly used for soil fertility because farmers use it as a fuel to cook their food. Farmers don’t use the crop residues as well since they use it to feed their animals (KII Tahtai Maichew_2).

Considering the national level supply of inputs, insecticides, pesticides and herbicides, a key informant from the Ministry of Agriculture and Rural Development stated the following.

> Even though it is not as much as the farmers might need for maximum production level, there is enough input supply at the national level. When we evaluate the situation to the requirements of the package, farmers in remote areas may not get all types of inputs. But relatively there is a better trend. Regional Bureaus of Agriculture and Rural Development offices and their structures at district together with cooperatives at Kebele level are taking the lead in the distribution of fertilizer like DAP, UREA, chemicals, and improved seed (Federal MoARD_1).

Thus, the distribution of fertilizer is good in all districts and farmers are convinced that the use of inputs can boost *Teff* production. As a result, farmers are initiating their demand for inputs to local authorities. However, there are inconsistencies in the supply of some improved seeds and chemicals especially in the Halaba zone and in remote areas. Organic fertilizers are rarely used by farmers as a means of enhancing soil fertility. The main concern of the farmers includes the increasing trend of prices for farm inputs from time to time, poor quality of the inputs and chemicals, use of blanket fertilizer for all types of land, improper use of inputs and chemical by farmers, the declining trend of using manure or composite and as the result the fertility of the soil is declining from time to time. The input utilization of the survey as indicated in Table 5.21 suggests that about 246 (99.19%) respondents use DAP, 227 (91.53%) respondents use UREA while 223 (89.92%) use improved *Teff* seed. This indicates that the awareness and utilization of chemical inputs and improved *Teff* seed among the respondents are very high. However, the number of respondents who are using fungicide and insecticide is very low. Also, about 24 (9.68%)

respondents use manure and this shows that farmers are using more chemical inputs as compared to animal dung or compost to increase the fertility of their lands.

From the chemical inputs, DAP is the highest utilized input (on average about 130.27 kg of DAP per household with a standard deviation of 148.51) followed by UREA (on average 67.88 kg of UREA per household with a standard deviation of 78.71). The average improved *Teff* seed utilization is 18.16 kg per household with a standard deviation of 20.06. The average manure utilization is about 78.63 kg with a standard deviation of 647.94 which shows high variability. When we see the average price of inputs per kg, it is about Birr 25.28 per kg for improved seed, Birr 13.27 per kg for DAP and Birr 10.69 per kg for UREA (for details, please refer Table 5.21 below).

Table 5.21: Input utilization, quantity of inputs used and average price of inputs

Types of inputs utilized in 2010 EC	Number of sample respondents				Quantity of inputs utilized in kg/ liter		Price per kilogram/ liter in Birr	
	Not users of inputs		Users of inputs					
	Frequency	%	Frequency	%	Mean	SD	Mean	SD
DAP	2	0.81	246	99.19	130.27	148.51	13.27	2.03
UREA	21	8.47	227	91.53	67.88	78.71	10.69	3.54
Improved *Teff* seed	25	10.08	223	89.92	18.16	20.06	25.28	11.53
Herbicide	82	33.06	166	66.94	0.54	0.81	295.25	349.74
Insecticide	171	68.95	77	31.05	0.36	1.92	131.51	226.37
Fungicide	238	95.97	10	4.03	0.01	0.07	4.16	21.92
Manure	224	90.32	24	9.68	78.63	647.94	0.09	0.48

Source: Survey result, 2018

When we see the category for the total cost of input incurred by households, about 106 (42.74%) respondents invest less than Birr 2,000.00. About 79 (31.85%) respondents invest from Birr 2,000.00 up to Birr 4,000.00 as the total cost of inputs and the remaining 63 (25.40%) invest Birr 4,000.00 and above as the total cost of inputs. The average cost for input for all respondents is Birr 3,018.40 per household with a standard deviation of 2,036.53. A comparison is also made among the districts to identify the status of the investment for inputs per household. The highest average investment for inputs (Birr 5,342.79 per household) is incurred for the respondents of Lomie district and the least investment (Birr 1,775.01 per household) is for the respondents of Tahtai Maichew district (for the details, please refer Table 5.22 below).

Table 5.22: Total investment for inputs and *Teff* production by districts

Categories of investment for inputs in Birr	Name of districts and average investment for inputs							
	Halaba		Lomie		Shenkora na Minjar		Tahtai Maichew	
	N	Mean	N	Mean	N	Mean	N	Mean
Less than Birr 2000	32	1,400.33	7	1,536.25	20	1,372.44	47	1,208.07
From Birr 2000 up to Birr 4000	26	2,858.51	11	3,060.50	31	2,742.24	11	3,099.64
From Birr 4000 up to Birr 6000	4	4,338.00	10	4,926.80	8	4,646.00	4	4,793.75
Birr 6000 and above	0	0	34	6,987.23	3	7,050.00	0	0
Total	**62**	**2,201.35**	**62**	**5,342.79**	**62**	**2,754.46**	**62**	**1,775.01**

Source: Survey result, 2018

When we measure the strength of the linear association between investment for inputs and *Teff* production through Pearson correlation, it is positive and strong with the correlation of $r = 0.784^{**}$ (correlation is significant at the 0.01 level (2-tailed)). This indicates that the influence of households' investment on inputs in generating more *Teff* crops is strong and significant which is like the results of other researchers such as Crawford, Kelly et al. (2003); Diao, Hazell et al. (2010) and Chauvin, Mulangu et al. (2012).The ANOVA test for the average cost of inputs for the smallholder farmers among the four districts indicates that there is statistical variation for the farmers of Tahtai Maichew, Shenkora na Minjar and Lomie districts (P-value < 0.05). Moreover, the average cost of inputs for the smallholder farmers of the Halaba zone is statistically different from that of Lomie district (P-value < 0.05) (for the details, please refer Table 5.15 above).

5.3.13. Extension services and *Teff* production

It is possible to provide and direct farmers with the appropriate technology and skill through extension programs. Farmers that have frequent contact with development agents are supposed to have better access to knowledge and are expected to produce more output. Some scholars observed that visits by an extension agent had a significant and a positive effect on the quantity of pepper produced and supplied to the market (Mussema 2006). Thus, in this study, frequent contact with extension workers is expected to have a positive effect on *Teff* production. In this regard, discussions were undertaken with FGD study participants and key informants.

A study participant from Tahtai Maichew district highlighted that the extension agents are providing the necessary service and support to the farmers by describing his feeling as indicated below.

> All the services we need are continuously provided by the extension agents and they supply us with all the services we need for farming. They collect our need for fertilizer before we start cultivation and try to fulfil our requirements in consultation with the district Office of Agriculture and Rural Development and cooperatives. They also show us how to plant in rows, how to use the right amount of fertilizer we should apply, and they encourage us to use better seeds and technology. After the crop is grown, they assist us in using anti-pest and update us on weather conditions. Now, we have better awareness, and this is the result of the extension agents who always help us on a daily basis (Study participant_17).

A study participant of the Halaba zone said the following concerning the extension services and the problems associated with it.

> The extension package in our area is very good. The problem is with the farmers, and we are not practicing what the extension agents tell us. Otherwise, the extension service is excellent (Study participant_79).

A key informant from Shenkora na Minjar district also stated the following concerning the extension services and the prevailing problems.

> The extension workers support the farmers. One expert helps one women cluster, one farmer cluster and one young farmer's cluster and this is the way of the extension service provided. The experts sometimes help one cluster and sometimes none. The program has its drawbacks because the farmers are not easily convinced to get help and lack interest. Even though the experts want to help, the farmers are not obedient to the policy of extension (KII_Shenkora na Minjar_1).

From the FGD and key informant interview described above, we can understand that the extension package is very good. The development agents are trying to technically support and continuously supervise the farmers. However, even though the development agents want to help the farmers, the farmers are not obedient to the policy of extension and some farmers are not practicing what the extension agents tell them.

When we see the survey result, though the frequency of the contact with extension workers is different, about 242 (97.58%) respondents get contact with extension workers within the 2010 E.C (2017/18) harvest period. The highest-level frequency is “twice per month” which is supported by 78 (31.45%) respondents. The next highest-level frequency is “once per week” which is supported by 59 (23.79%) respondents. About 49 (19.76%) respondents get contact with extension agents “once per month” and about 38 (15.32%) respondents get contacted by the extension agents “once per two months”

When we see the frequency of contact by extension workers among the different districts, the highest frequency “once per week” is observed to be high (26 respondents) in Lomie district followed by Shenkora na Minjar district (16 respondents). The frequency of contact “twice per month” is also the highest in Halaba zone (34 respondents) followed by Shenkora na Minjar district (26 respondents). The response of “no visit at all” is found in Lomie district (5 respondents) and one respondent from Tahtai Maichew district.

If we see the trends of *Teff* production with the frequency of contact with extension agents, it shows a variable result. Four categories of respondents produce more than the average (1,104.13 kg per household) while the remaining four categories produce less than the average of the *Teff* crops. Respondents whose contact with development agents is “once per week” produce 1,424.58 kg of *Teff* crops per household; respondents whose contact with development agents is “twice per month” produce 1,154.49 kg of *Teff* crops per household and respondents whose contact with development agents is “once per month” on average produce 1,107.65 kg of *Teff* crops per household. This all indicates that frequent contact with extension agents enhances *Teff* production. Contrary to our hypothesis, respondents with “no visit at all” produce the highest *Teff* crops (1,483.33 kg per household). This might be associated with higher *Teff* cultivated land and higher ownership of oxen which enable them to cultivate large amounts of land as compared to others. The remaining four categories of respondents who are having a lower rate of the frequency with extension agents produce within the range of 378.57 kg of *Teff* crops per household to 850.00 kg of *Teff* crops per household which is much lower than the average of all respondents (for the details, please refer Table 5.23).

Table 5.23: Frequency of contact by extension agents and *Teff* production by district

Number of visits by extension agents	Name of districts				Total	%	*Teff* production per household
	Halaba	Lomie	Shenkora na Minjar	Tahtai Maichew			
	N	N	N	N			
No visit at all	0	5	0	1	6	2.42	1,483.33
Once per year	0	1	2	0	3	1.21	850.00
Once per six months	2	2	1	2	7	2.82	378.57
Once per three months	1	1	2	4	8	3.23	793.75
Once per two months	11	2	9	16	38	15.32	657.89
Once per month	3	16	6	24	49	19.76	1,107.65
Twice per month	34	9	26	9	78	31.45	1,154.49
Once per week	11	26	16	6	59	23.79	1,424.58
Total	**62**	**62**	**62**	**62**	**248**	**100.00**	**1,104.13**

Source: Survey result, 2018

The respondents were requested to identify the benefits they get from contacting the extension agents. As a result, about 79 (31.85%) respondents explained that they got benefit from training and consultations on farming methodologies, about 59 (23.79%) respondents highlighted that they got technical support as well as training and consultations on farming methodologies and about 47 (18.95%) respondents stated that access to farm inputs, technical support as well as training and consultations on farming methodologies.

On the other side, in the survey the respondents mentioned some problems of extensions workers such as "lack of transparency in selecting farmers for training" ranked as number one problem chosen by 71 (28.63%) respondents; "extension workers are not available when needed" ranked as number two problem chosen by 66 (26.61%) respondents and "inappropriate timing" ranked as number three problem chosen by 44 (17.74%) respondents. The other problems mentioned by the farmers include "lack of educational materials" chosen by 42 (16.94%) respondents, "inadequate technical support" chosen by 39 (15.73%) respondents, "not demand-driven support" chosen by 30 (12.10 %) respondents and "capacity limitations of trainers" chosen by 26 (10.48%) respondents.

When we measure the strength of the linear association between frequency of contact with extension agents and *Teff* production through Pearson's correlation, it is positive with the correlation of 0.219^{**} (correlation is significant at the 0.01 level (2-tailed)) and the correlation is statistically significant. This indicates that there is a positive and significant relationship between the frequency of contact with the extension workers and *Teff* production. This result is like the findings of Rehima, Belay et al. (2013) and Girma and Endrias (2015) that state visits by extension agents had a significant and positive effect on the quantity of agricultural commodities produced and supplied to the market.

5.3.14. Access to training and *Teff* production

As part and parcel of capacity building programs, different short-term training programs are given to farmers through extension programs. The objectives of such training are to introduce better farming practices to the farmers and provide proper utilization of inputs that enable farmers to improve agricultural production. In this study, training is expected to have a direct and positive role in boosting *Teff* production. In this regard, discussions were undertaken with FGD study participants and key informants.

A study participant from Tahtai Maichew district described the following concerning the training programs arranged by extension agents.

> There are training programs arranged to farmers about planting *Teff* crops in rows, handling moisture, soil and water conservation and others. The experts are always with us giving the necessary support as per the requirements of the farmers. They often give us training at church gatherings and at field levels, with all the detail we might need during *Teff* production (Study participant 13).

Another FGD participant from Lomie district also expressed his opinion about the benefits of training as indicated below.

> .... yes, the extension workers do help us with training and even if I miss the training for this year, I can get it from my neighbour farmers. There is a good arrangement to practice better techniques of *Teff* production and hence there is a visible difference between those who use modern techniques and those who don't use it (Study participant_33).

Similarly, FGD participants from Shenkora na Minjar district state the following concerning training providers.

> Extension workers and district level experts usually give us training on agriculture-related training including practical demonstrations (Study participant 55).

From the above discussions, we can learn that extension workers and district level experts are providing training to the farmers on planting *Teff* crops in rows, handling moisture, soil and water conservation and practical demonstrations at field levels and church gatherings.

When we see the access to training for survey respondents in the past two years (2009 and 2010 E.C), about 203 (81.85%) respondents got training at least once in agriculture-related fields and the remaining 45 (18.15%) didn't have access to training. The average training days per respondent is 5.87 with a standard deviation of 5.58. The minimum training day is one and the maximum is 30 training days.

When we see the relationship between training and *Teff* production by the district, we can see that there is variation among the districts. The frequency of training among the districts with "no training at all" is high for Lomie district with 21 (33.87%) respondents but with better *Teff* production (1,585.71 kg respondent) as compared to the other sample respondents. Conversely, respondents from Tahtai Maichew who took 20 training days and above on average produce about 412.50 kg per respondent. On the other side, respondents of Lomie district who got training from 10 up to 20 days produce the highest *Teff* crops (2,114.29 kg per household).

The highest *Teff* production per household (1,154 kg per household) is observed for those respondents who took up to 10 training days. The least *Teff* production (928.13 kg per respondent) is observed for the respondents who took from 10 to 20 days of training. For all categories of training, Lomie district respondents produce more *Teff* crops (more than the average *Teff* production for each category) than the other district respondents. Respondents of Tahtai Maichew district produce the least *Teff* crops (less than the average *Teff* production for each category) as compared to other districts.

The types of training programs provided to the respondents include the "use and application of inputs" to 192 (77.42%) respondents, "modern farming methods" to 151 (60.89%) respondents, "soil and water conservation" to 149 (60.08%) respondents, "adoption of new technologies" to 143 (57.66%) respondents, "post-harvest management" to 71 (28.63%) respondents and "animal husbandry" to 54 (21.77%) respondents. As per the result of the survey, the most three training providers are extension agents, district experts and farmers' training centers which were chosen by 170 (68.55%) respondents, 97 (39.11%) respondents, and 85 (34.27%) respondents, respectively.

When we measure the strength of the linear association between training days with *Teff* production through Pearson correlation, it is negative with the correlation of r = -0.051 and p = 0.423. This indicates that there is a negative but weak relationship which implies that the relationship of farmers' training days to *Teff* production is loosely and negatively correlated which is against the findings of some researchers (Fafchamps, Gabre-Madhin et al. 2005). This could be due to the lack of effective training program arrangements to the farmers and poor follow up of the extension agents during implementation.

The ANOVA test for the average training days attended by smallholder farmers among the four districts indicates that the mean training days attended by the farmers of Tahtai Maichew district is statistically different from the average training days attended by the farmers of the three districts (P-value < 0.05) (for the details, please refer Table 5.15 above).

5.3.15. Availability of credit services and *Teff* production

Farmers do not have adequate money to plant and harvest their crops and thus they need access to credit for the purchase of inputs, chemicals, cover labour costs, land improvement and capital expenditures. In this study, access to finance is expected to have a direct and positive relationship to *Teff* production. In this regard, discussions were undertaken with farmers through focus group discussion (FGD) in relation to the access to finance for *Teff* production. In the FGD with the farmers of Tahtai Maichew district, a study participant described the following about access to finance to farmers.

> There are not many farmers who take loans around this area fearing the interest as they think that they will not be able to pay it back. But there are also farmers who take loans from microfinance institutions and saving and credit cooperatives (Study participant_6).

Another study participant from Lomie district stated the following concerning the problems of accessing the finance.

> Collateral is a big challenge in accessing credit. Farmers have to be grouped first to get the loan and this takes too much time that the crop gets attacked by insects until the farmer gets anti-pest (Study participant 26).

A study participant from Shenkora na Minjar district stated the following concerning the problems of accessing the finance.

> There is access to loan; however, most of the farmers fear using it because paying the loan back might be hard to them. It requires good management skills, and most farmers are scared to take the risk. It sometimes leaves couples separated. Some might end up selling their animals and fixed assets to pay their loans. Lengthy process and high-interest rates are also the problems in accessing loans (Study participant 63).

From the Halaba zone, a study participant stated the following about accessing credit.

> There is limited access to credit to the poor who couldn't provide collateral and the interest rate is very high. In this year, there was no financial loan given to us. Earlier the fertilizer was given to us as a loan but not now and we are purchasing it in cash. No training is also given to us on the utilization of loan and calculation of interest rates (Study participant_80).

Though there are limited opportunities to access loans, most farmers do not take loans. The reason could be seen from two sides. From the farmers' point of view, fear of taking loans, lack of skills in managing loans and problem of presenting collateral to the lending institutions are described as the major problems. From the financial institutions' side, the problems include high-interest rate, lengthy process and no training is given to the beneficiaries on credit management.

The survey result indicates that about 109 (43.95%) respondents have the experience of taking loans from different sources for their agricultural activities and the remaining 139 (56.05%) respondents do not have the experience of taking credit. In the 2010 E.C (2017/18) harvest period, only 62 (25%) respondents took loans. The average amount of borrowed money is Birr 1,811.53 per household with a standard deviation of 4182.68 which shows higher variability among survey participants. From this amount of loan, on average about Birr 392.14 (21.65%) is allocated for *Teff* production with a standard deviation of 1672.19 which also shows higher variability among the survey respondents.

Among all the districts, Shenkora na Minjar district farmers on average took the highest loans (Birr 4,061.29 per respondent) and allocated the highest amount of loan to *Teff* production (Birr 1,274.19

per respondent). Respondents of Tahtai Maichew district become the second in accessing loans (Birr 2,573.55 per respondent). However, they allocate a small amount of money (Birr 90.32 per respondent) for *Teff* production. As compared to the other districts, Lomie district and Halaba zone took a small amount of loan.

About 43 (69.35%) respondents of Tahtai Maichew district have the experience of taking loans which is the best experience among all the districts. Similarly, about 38 (61.29%) respondents of Shenkora na Minjar district have the experience of taking loans. About 18 (29.03%) respondents and 10 (16.13%) respondents are having the experience of taking loans from Lomie district and Halaba zone, respectively. In terms of access to loans from lending institutions, respondents of Tahtai Maichew district and Shenkora na Minjar district are better than the other districts. When we see the maturity date (duration of the loan), 24 (9.68%) respondents say "less than one year", 21 (8.47%) respondents ``from one year up to two years", 8 (3.23%) respondents ``from two to three years" and the remaining 9 (3.63%) respondents ``from three up to four years. ``

Respondents were requested to identify the three main sources of loan for their farming activities. Accordingly, 69 (27.82%) respondents choose "microfinance institutions" as the first source of loan. The next source of loan is "saving and credit cooperatives" which was chosen by 26 (10.48 %) respondents and then "non-governmental organization" chosen by 5 (2.02%) respondents. The other sources of loans are also "relatives and neighbours" as mentioned by 4 (1.61%) respondents, "community organization such as *Equib"* mentioned by 3 (1.21%) respondents and "money lenders" chosen by 2 (0.81%) respondents.

A question was also raised to the respondents to identify the three major reasons for not taking loans. Accordingly, 102 (41.13%) respondents choose "I don't want to take risks." The next reason is "interest rate on the credit is too high" as chosen by 81 (32.66%) respondents followed by "credit is not available in time" as chosen by 26 (10.49%) of the respondents. The other reasons include there are no credit providers in our locality by 10 (4.03%) respondents, lack of group members for collateral by 10 (4.03%) respondents, lack of money for initial down payment by 9 (3.63%) respondents and 10 (4.03%) respondents do not have an opinion on this issue.

Respondents were also requested to rank the major problems in accessing credit. As a result, "high risk of taking loans" mentioned by 140 (56.45%) respondents as number one problem followed by “high-interest rate” mentioned by 131 (52.82%) respondents and “bureaucracy or lengthy process in getting loans” mentioned by 71 (28.63%) respondents as number three problem. Other problems were also mentioned by the respondents such as “short maturity period” by 48 (19.35%) respondents, “problem of money lenders” by 46 (18.55%) respondents, “small amount of loan” by 36 (14.52%) respondents and “no lending financial institutions in our locality” by 32 (12.90%) respondents.

When we measure the strength of the linear association between the amount of money allocated through credit to *Teff* production and *Teff* production through Pearson correlation, it is positive with a correlation of $r = 0.062$, $p = 0.329$. This indicates that there is a positive relationship. However, it is very weak and insignificant. This implies that the strength of the association between the two variables is not strong, which is like some authors such as Carswell (2000) that state inflexible credit repayment procedures are widely reported as hindering smallholders’ interest in farm credit.

The ANOVA test for the average amount of loan allocated for *Teff* production by smallholder farmers among the four districts indicates that the mean loan allocated for *Teff* production by Shenkora na Minjar is statistically different from the average loan allocated for *Teff* production by the farmers of the remaining three districts (P-value < 0.05) (for the details, please refer Table 5.15 above).

5.3.16. Cooperative membership of the respondents and *Teff* production

As one of the rural institutions, cooperatives are providing different services to their members such as distribution of improved seed, fertilizers (DAP, UREA), chemical pesticides, grain mill service, consumer goods, distribution of motor pump, treadle pump, local breed milking cows, modern beehive colonies and the likes (Francesconi and Heerink 2010). In this regard, in rural areas of Ethiopia, there are different types of cooperatives such as multipurpose cooperatives, saving and credit cooperatives, irrigation cooperatives, marketing cooperatives, consumer cooperatives and other forms of cooperatives which are legally registered and licensed to provide services to their members. In this study, being a member of the cooperative is expected to positively influence *Teff* production.

In the FGD and KII the participants from all districts highlighted that the cooperatives are involved in the provision of services like fertilizers and insecticides in their localities. For instance, a study participant from Tahtai Maichew district described the following with regard to the services provided by the cooperatives.

> Cooperatives provide us with fertilizer and other inputs. They also support the farmers by supplying sugar and edible oil in their localities. However, the cooperatives don't have a visible role in *Teff* marketing at all. Currently, efforts are underway by the government to link farmers with cooperatives and traders in relation to marketing issues (Study participant_12).

Similarly, a key informant from Shenkora na Minjar district stated the following about the role of cooperatives in boosting *Teff* production.

> Cooperatives supply inputs and chemicals to farmers and their contribution in *Teff* production can be considered as very good (KII Shenkora na Minjar_1).

From FGD with study participants and KII, we can understand that the cooperatives are highly involved in the supply of fertilizer, inputs and industrial goods to the farmers but their involvement in marketing service is limited.

From the survey result, about 216 (87.10%) of the respondents are members of at least one cooperative society while the remaining 32 (12.9%) are not the members of any cooperative societies. About 80 (32.26%) respondents are members of one cooperative society, 69 (27.82%) respondents are members of two cooperative societies, 63 (25.41%) respondents are the members of three cooperative societies and the remaining 4 (1.61%) respondents are members of four cooperative societies. About 213 (85.89%) respondents are members of the multipurpose cooperative, 131(52.82%) respondents are members of marketing cooperatives, and 70 (28.22%) respondents are members of saving and credit cooperatives and 9 (3.63%) respondents are members of irrigation cooperatives.

When we see the experience of membership in a cooperative, respondents on average have 10.33 years of experience with a standard deviation of 8.39. If we see the cooperatives memberships by district, about 60 (96.77%) respondents from Tahtai Maichew district are members of cooperatives, about 55 (88.71%) respondents of Lomie district are members of cooperatives and about 54 (87.10%) respondents of Shenkora na Minjar district are members of cooperatives. About 47 (75.81%) of the respondents of Halaba zone are also members of cooperatives. Respondents with the highest years of membership (30 years and above) are observed in Lomie, Shenkora na Minjar and Tahtai Maichew districts and their *Teff* production are the highest (1,541.67 kg per respondent) among the other categories of cooperative membership in years (please refer Table 5.24 for the details).

Table 5.24: Experience in cooperative membership by district and *Teff* production

Categories of cooperative membership in years (experience in cooperative membership)	Name of districts				Total N	Average *Teff* production in kg
	Halaba	Lomie	Shenkora na Minjar	Tahtai Maichew		
	N	N	N	N		
Not a member of cooperatives	15	7	8	2	32	937.50
Less than 10 years	33	16	16	29	94	879.52
From 10 up to 20 years	7	22	18	18	65	1393.08
From 20 up to 30 years	7	11	17	10	45	1157.78
30 years and above	0	6	3	3	12	1541.67
Total	**62**	**62**	**62**	**62**	**248**	1104.13

Source: Survey result, 2018

A question was also raised to the respondents how often they use the services of the cooperatives. Accordingly, about 84 (33.87%) respondents are “regular users of the services of cooperatives”, 91 (36.69%) respondents “often use the service” and 36 (14.52%) respondents “sometimes use the services”. About 2 (0.81%) respondents “rarely use the service” and 3 (1.21%) respondents “never use the service” of the cooperatives.

The respondents were also requested to identify the most common methods of communications practiced in their areas for the promotion of cooperatives. Accordingly, about 120 (48.39%) respondents choose farmers’ meeting as the method of communication practiced, 78 (31.45%) respondents choose cooperative promoters as the method of communication practiced and 70 (28.23%) respondents choose farmers’ associations as the method of communication practiced. The other methods of communications practiced include community meetings (65 respondents), fellow farmers (by 56 sample respondents), visits of development agents (54 respondents) and farmers’ training centres (14 respondents).

A question was also raised to respondents to identify the common services or benefits provided by the cooperative societies and the level of satisfaction. As a result, about 172 (69.35%) respondents get "input delivery services" out of which 156 (90.69%) beneficiaries are satisfied with the service. About 168 (67.74%) respondents "get affordable input price" out of which 126 (75.00%) beneficiaries are satisfied with the service. About 135 (54.44%) respondents "get fair farm gate output price" out of which 108 (80.00%) beneficiaries are satisfied with the service. About 93 (37.5%) respondents "get market information" out of which 67 (72.04%) beneficiaries are satisfied with the service. About 79 (31.85%) respondents "get saving service" out of which 64 (81.01%) beneficiaries are satisfied with the service. About 64 (25.81%) respondents "get a dividend for their membership" out of which 42 (65.63%) beneficiaries are satisfied with the service. About 56 (22.58%) respondents "get technical assistance" out of which 33 (58.93%) beneficiaries are satisfied with the service. About 48 (19.35%) respondents "get easy access to credit" out of which 33 (68.75%) beneficiaries are satisfied with the service. About 45 (18.15%) respondents "get access to storage services" out of which 29 (64.44%) beneficiaries are satisfied with the service. About 34 (13.71%) respondents "get low-cost credit" out of which 30 (88.24%) beneficiaries are satisfied with the service and 23 (9.27%) "get strong bargaining power in the market for their outputs" out of which 22 (95.57%) beneficiaries are satisfied with the service.

From the above analysis, we can see that cooperative societies are providing different services to their members. More than 50% of the respondents benefited from input delivery services, affordable input price and fair farm gate output price. However, the coverage for the services of strong bargaining power, access to credit, storage facilities, and dividend payments is low which needs further improvement.

When we measure the strength of the linear association between the number of years of experience of membership in cooperatives and *Teff* production through Pearson correlation, it is positive with a correlation of $r = 0.217^{**}$ (correlation is significant at the 0.01 level (2-tailed)). This indicates that there is a small but positive and significant relationship between the two variables which is like other researchers' findings such as Spielman, Byerlee et al. (2010) and Rehima, Belay et al. (2013) that implies membership in cooperatives helps in promoting *Teff* production.

The ANOVA test for the average amount of years in cooperative membership by smallholder farmers among the four districts indicates that the mean years in cooperative membership of the farmers in Halaba zone is statistically different from the average years in cooperative membership of the remaining three districts (P-value < 0.05) (for the details, please refer Table 5.15 above).

5.3.17. Government services and *Teff* production

Government programs and policies affect agricultural production. Some scholars such as Fulginiti and Perrin (1993) argue that public investments in infrastructure such as roads, utilities, and communications can increase agricultural production, by lowering the cost of inputs at the farm level and increasing farmers' access to marketing opportunities. In this regard, study participants were requested to what extent they are satisfied with the support from the government in the areas of extension work, provision of agricultural input, access to market information, access to credit, trade policy, and infrastructure.

In a focus group discussion held at Tahtai Maichew district, a study participant stated the following regarding the services offered by the government to the farmers.

> There is a lot of help from the government in relation to loans, infrastructure, and power supply. The supply of inputs satisfies the farmers as it boosts our production. These days there is light in every corner with the exception of remote rural areas. Besides we get the health services and education for our children in our areas (Study participant 12).

Another study participant from Tahtai Maichew district stated the following about the services of the government and its associated problems.

> Even though we are provided with fertilizer by the government, the price increases each year, and this is one of the biggest challenges for the farmers. In this regard, there are many farmers who murmur that the government is taking the profit for itself. There are also problems from the farmers' side that some farmers spend the loan they take in an inappropriate way (Study participant 15).

Another participant from Lomie district described the following about the services of the government.

> We are satisfied with the support of the government. However, the problems are the high cost of input and interest rate for loans (Study participant_29).

A study participant from Shenkora na Minjar district also stated the following.

> The agricultural policy of the government is very good. Extension agents support us every now and then with the experts' advice. Sometimes there are problems with farmers in the implementation of the expert's advice (Study participant 52).

A study participant from the Halaba zone also gave his views as indicated below.

> We are really satisfied with all the services except the price of inputs and access to improved *Teff* seed (Study participant_65).

From the above discussion with the study participants, we can learn that the farmers are satisfied with the support of the government, especially in input supply and infrastructure. However, there are complaints concerning the high cost of inputs, high-interest rates for loans and access to improve seed. Sometimes there are also problems with farmers in the implementation of the experts' advice and inappropriate use of loans. Generally, even though there are some limitations, almost all the respondents appreciate the effort of the government in creating a favourable working environment for the rural community.

When we see the access to the infrastructure of the survey respondents, about 193 (77.82%) of the respondents have access to potable water, 74 (29.83%) of the respondents have access to electricity and 217 (87.50%) of the respondents have access to mobile. But no one respondent is having access to internet services or fixed telephone lines. The average initial investment cost for utility service per household is Birr 1,063.20 with a standard deviation of 910.31. When we see the details, the average investment per household to get potable water service is Birr 58.73 with a standard deviation of 243.49, Birr 145.52 for electricity service with a standard deviation of 339.50 and Birr 858.95 for mobile apparatus and mobile service with a standard deviation of 1158.51.

On the other hand, the average monthly expenditure for utility service per household is Birr 104.59 with a standard deviation of 85.95. The monthly expenditure to get potable water supply is Birr 32.62 per household with a standard deviation of 37.31. The monthly expenditure to get electricity services is Birr 7.35 per household with a standard deviation of 15.79 and the monthly expenditure on mobile services is Birr 64.62 per household with a standard deviation of 63.55. When we see the reliability of the service, about 152 (61.29%) respondents rated as "good or very good" for potable water services, about 66 (26.61%) respondents rated as "good or very good" for electric power and about 195 (78.63%) respondents rated as "good or very good" for mobile services.

When we see the category of investment, about 148 (59.68%) of the respondents invest less than Birr 1000.00 per household and on average they produce 976.18 kg per household. The highest *Teff* production (1,588.33 kg per household) is observed for those respondents whose investment is Birr 3000.00 or above. Conversely, respondents with no investment are producing 1,311.54 kg per household which is better than the other categories except for those respondents whose investment is Birr 3000.00 or above.

When we assess the strength of the linear association between investment in utilities and *Teff* production through Pearson correlation, it is positive with a correlation of $r = 0.249^{**}$ (correlation is significant at the 0.01 level (2-tailed)) which supports our assumption. This indicates that there is a positive relationship between investment in infrastructure and *Teff* production which is like the findings of other researchers such as Rashid and Dorosh (2009).

The mean comparison using ANOVA for the investment of utilities among all the districts indicates that the average investment for Tahtai Maichew is significantly different from the other districts (P-value < 0.05) (for the details, please refer Table 5.15 above).

5.4. Regression model: effects of different variables on *Teff* production

5.4.1. Model specification

A model specification error can occur when one or more relevant variables are omitted from the model or one or more irrelevant variables are included in the model. If relevant variables are omitted from the model, the common variance they share with included variables may be wrongly attributed to those variables, and the error term is inflated. On the other hand, if irrelevant variables are included in the model, the common variance they share with included variables may be wrongly attributed to them. Model specification errors can substantially affect the estimate of regression coefficients. There are various methods of checking model specifications such as link tests that help one to test for possible factors as being excluded and omitted variables test to test for potential factors to be included in the model. When we come to our multiple linear regression model, a link test has been conducted. The result of the link test shows that the hatsq coefficient was found to be statistically insignificant (p-value = 0.619 > 0.05), hence the model is correctly specified. Furthermore, the omitted variable test was conducted on the model proposed and the Ramsay

Regression Specification Error Test (RESET) shows that there are no more relevant variables that were excluded from the proposed model.

In the classical regression model, each estimate gives the partial effect of a coefficient with the effects of other X variables being controlled.

$$Y = \alpha + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + \beta_8X_8 + +\beta_9X_9 + \beta_{10}X_{10} + \beta_{11}X_{11} + \beta_{12}X_{12} + \beta_{13}X_{13} + \beta_{14}X_{14} + \beta_{15}X_{15} + \beta_{16}X_{16} + \beta_{17}X_{17} + \beta_{18}X_{18} + \beta_{19}X_{19} + \beta_{20}X_{20} + \beta_{21}X_{21}$$

Where:

- Y=*Teff* production in kg
- α = Intercept (constant)
- β_1 to β_{21}= Regression coefficients (It represents the mean change in the response variable for one unit of change in the predictor variable while holding other predictors in the model constant).
- X_1 to X_{21} = Explanatory variables

5.4.2. Normality and Multicollinearity test

Normality test: For the proposed model, the Shapiro-Wilks test is W= 0.92, df = 248, P-value < 0.0001, hence not normal. Thus, of all transformations on the response variable that ensures normality, the square root transformation of the *Teff* production was undertaken that made normally distributed (Shapiro-Wilks W = 0.9917, P-value = 0.176 > 0.05), hence the square root of transformed response variable become normally distributed.

Multicollinearity test: The selected independent variables were checked for potential multicollinearity problems using the Variance Inflation Factor (VIF) tests. The result showed that the VIF for all predictors is less than 10 indicating that there were no multicollinearity problems in the data (for the details, refer Table 22 in the annex).

5.4.3. Results of Coefficient of Determination (R^2)

The coefficient of determination (R^2) is 0.6689 (refer Table 5.25 below). This shows that about 66.89% of the total variation of the dependent variable (*Teff* production) is explained by the factors incorporated in the above model. Therefore, in order to find out the reasons for such an increase in *Teff* production, it needs to look at other variables beyond the listed independent variables. Hence, the actual reason for the increase in *Teff* production can be attributed to other factors such as quality of *Teff* seed utilized, crop rotation, proper application of agricultural inputs and other factors.

5.4.4. Model coefficient estimates and their interpretation

From the 21 explanatory variables included in the model, about nine (9) predictors are found to be positively and statistically significant at 95 % level of confidence in determining *Teff* production in the study areas. These variables are: three districts (Shenkora na Minjar, Lomie and Halaba zone) with p-value < 0.001, economically active labour force with p-value = 0.026, labour cost with p-value < 0.001, frequency of contact with extension workers with p-value = 0.036, monetary value of farm asset with p-value < 0.001, owned land in ha with p-value = 0.006 and rented land in ha with p-value < 0.001(for the details, refer Table 5.25 below).

5.4.5. Explanation on the results of multiple regression model

Referring Table 5.25 below, the regression model for the *Teff* production is described hereunder.

Y = 0.971 + 12.097 SM + 16.586 LOM+ 10.435 HAL + 0.832 LABOUR + 0.001 LABCOST + 0.613 EXT +0.004 FARM ASSET + 2.268 OWNED LAND + 4.869 RENTED LAND

Where Y is the square root of the *Teff* production, the interpretation of the coefficient parameter estimates of the factors refers to the transformed response *Teff* production variable.

Districts: The regression analysis indicates that there is statistically significant variation in *Teff* production among the four districts at 95% level of confidence.

Economically active labour force: The availability of an economically active labour force is a factor that boosts agricultural production. The availability of an economically active labour force is explained by the number of persons with the age category of 18 to 65. The regression analysis is found to be statistically significant at 95% level of confidence in determining *Teff* production in the study areas. In this regard, an increase of one economically active labour force increases *Teff* production by 8.32%. This is like the previous result of Girma and Endrias (2015) and Getu Hailu et al (2016) which states that *Teff* production is the function of labour and availability of labour force is assumed to have a positive relationship with the volume of *Teff* production.

Labour cost: Referring to the labour-intensive *Teff* farming practice, investment in labour is assumed to have a positive relation with volume of production. The result of the regression model shows that the monetary investment on labour is found to be statistically significant at 95% level of significance in determining *Teff* production in the study areas. From the regression model, we can see that an increase of investment of Birr 1000.00 on labour leads to an increase of *Teff* production by 1% which is like the findings of other researchers such as Thomas and Leatherman (1990) and Dixon, Gibbon et al. (2001).

Frequency of contact with extension agents: Farmers that have frequent contact with the development agent and other service providers do have better knowledge and skill of agricultural production. Frequent contact with development agents enables farmers to acquire knowledge and skills of modern farming that leads to improved farm productivity. The result of the regression model shows that the frequency of contact with extension agents is found to be statistically significant at 95% level of significance in determining *Teff* production in the study areas. This result is like the report of MoFED (2012) that states it is possible to provide and direct the farmers with the appropriate technology and skill so that the level of production will rise and bring more income. Similarly, Mussema (2006) observed that visits by an extension agent had a significant and positive effect on the quantity of pepper supplied to the market.

Farm asset: The existence of farm equipment (tools) is important for the cultivation of *Teff* crops. The regression model shows that the monetary value of farm assets is statistically significant in determining *Teff* production in the study areas. From the regression model, we can see that an increase of investment of Birr 1000.00 in farm tools leads to an increase in *Teff* production by 4%. The result is like the findings of other researchers such as Dixon, Gibbon et al. (2001), Rigg (2006) and Haileselassie, Araya et al. (2016) that state there exists a positive relationship between access to farm equipment and agricultural production.

Owned land in ha: In this study**,** a positive relationship is expected between owned land and *Teff* production. In the regression analysis, the owned land in ha is found to be positively and statistically significant (at 95% level of confidence) in determining *Teff* production in the study areas. This means that as land holding increases, *Teff* production increases. This is like the result of Najafi (2003) that argued food production can be increased extensively through the expansion of areas under cultivation.

Rented land in ha: The cultivation of more *Teff* land enables the owner to earn more *Teff* output. In the regression analysis, the rented land in ha is found to be positively and statistically significant at 95% level of confidence in determining *Teff* production in the study areas. This result is like the findings of Asrat, Belay et al. (2004) that state *Teff* cultivated areas have a direct and positive relationship with *Teff* production.

Table 5.25: Regression analysis of *Teff* production

Source	SS	df	MS
Model	22270.9499	21	1060.52142
Residual	11022.1368	226	48.7705167
Total	33293.0867	247	134.789825

Number of obs	= 248
F(21, 226)	= 21.75
Prob > F	= 0.0000
R-squared	= 0.6689
Adj R-squared	= 0.6382
Root MSE	= 6.9836

sqrt_Teff_p~n	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
SM	12.09744	1.88216	6.43	0.000	8.388617	15.80627
LOM	16.58563	1.910915	8.68	0.000	12.82014	20.35112
HALA	10.43488	1.994996	5.23	0.000	6.503703	14.36605
GENDER	2.793667	1.824484	1.53	0.127	-.8015087	6.388843
AGE	-.0310537	.0494939	-0.63	0.531	-.1285821	.0664748
MARITAL	.8092385	.5514998	1.47	0.144	-.2775007	1.895978
LABOUR	.8324602	.3705343	2.25	0.026	.1023165	1.562604
SCHOOL	-.2633249	.1428763	-1.84	0.067	-.544865	.0182153
OX	-.4510639	1.52699	-0.30	0.768	-3.460023	2.557895
LABCOST	.0013051	.0003236	4.03	0.000	.0006674	.0019428
EXT	.6125999	.2909789	2.11	0.036	.0392212	1.185979
TRAIN	.059835	.0951628	0.63	0.530	-.1276849	.2473548
TEFFLOAN	.0000268	.0002877	0.09	0.926	-.0005401	.0005938
COOP	.1072772	.0657308	1.63	0.104	-.0222463	.2368008
FARMASSET	.0038821	.0009255	4.19	0.000	.0020584	.0057057
UTILITY	-.0004894	.0005931	-0.83	0.410	-.0016581	.0006794
OWNEDLAND	2.267586	.8110696	2.80	0.006	.6693602	3.865812
RENTEDLAND	4.869395	1.108413	4.39	0.000	2.685249	7.053541
SHARELAND	-.9041202	1.861866	-0.49	0.628	-4.572958	2.764717
INHERITEDLAND	-4.689076	4.499866	-1.04	0.299	-13.55613	4.177982
RAI	2.229979	1.734816	1.29	0.200	-1.188505	5.648462
_cons	.9707188	4.421037	0.22	0.826	-7.741006	9.682444

Source: Survey result, 2018

5.5. Problems of *Teff* production by study sites

To identify the major problem of *Teff* production, discussions were undertaken with FGD participants and key informants in all the districts. As a result, a study participant from Tahtai Maichew district stated the following.

> Before some years, most farmers were not convinced about the importance of fertilizer but now farmers do not have such a problem in taking the product. Farmers don't take fertilizer with loans like previous years, and they buy it in cash these days. However, as it is demanded by most of the farmers, it becomes costly. Even though the price is high, farmers make a long line to get fertilizer, and this is a problem for farmer (Study participant 11).

Another study participant from the same district also said the following.

> There is high population growth in this area and thus the main problem is lack of enough land especially for the young. This has led to the dependency of the youth on their families. This has restrained the amount of *Teff* production obtained by farmers. Also, some farmers who don't use fertilizer and anti-pest produce less amount of Teff (Study participant 20).

Another study participant from Lomie district described insects as a major problem in *Teff* production as described hereunder.

> The biggest problem is the swarms of insects that attack the crop. Sometimes, there is also a problem of harsh weather that destroys the growth of *Teff* crops (Study participant 25).

The other dimension of *Teff* production as per the FGD participant from Lomie district is the shortage of manpower as described hereunder.

> Our major problem with *Teff* production is the high labour demand during weeding, harvesting, and threshing of *Teff* crops. If there could be a technology that can support us with *Teff* production, it could have been good. Also, *Teff* crop is not strong, and it usually falls by strong wind and rainfall (Study participant_36).

The other problem of *Teff* production as per the key informant from Shenkora na Minjar district is indicated as follows.

> Dense sowing, a tiresome process not supported with technology, use of unknown and excessive chemicals and overuse of the land are the main problems in *Teff* production (KII Shenkora na Minjar_1).

The other issue mentioned by a study participant from Shenkora na Minjar concerning *Teff* production problems is highlighted as follows.

> The main problems in our farming process are weeds and pests. To avoid the weeds and pests most farmers use too many chemicals. Farmers can solve this problem with compost. However, they are not accepting the advice of experts. If not solved shortly with the help of the government, it will negatively affect productivity in the long run (Study participant_43).

A study participant from the Halaba zone stated the following about the problems of *Teff* production.

> We use rainwater for *Teff* production. We are always dependent on rainfall and there is water stress in our area and thus fluctuation of rainwater is the major problem. We don't have a backup water supply or irrigation schemes for our crops. There is also a problem with the quality of the seed supplied to the farmers and the seed is not productive (Study participant_77).

A key informant from the Halaba zone also stated the following.

> One big challenge is farmers are not sowing in rows. They use the plastic bag but it is time-consuming. If there could have been technological equipment, this problem could have been solved. The other problems are limited access to improved *Teff* seed and fluctuation of rainfall. Also, farmers do not follow the advice given by experts (KII Halaba_1).

A key informant from Tigrai regional state also mentioned some problems concerning the *Teff* production as indicated below.

> *Teff* production is affected by pests, pests that bring diseases and it comes mainly from the weed. So weeding is the major problem for this crop. If it is not weeded, production lowers up to 30%. But, like all the other crops, its main problems are water and soil factors (Tigrai region expert_1).

As indicated in the above discussion, each district has a major problem for *Teff* production. In this regard, the problem for Tahtai Maichew district is high cost of inputs, population pressure that resulted in the shortage of farmland and the youth are dependent on their families. Some farmers don't use fertilizer and anti-pest. The problems of Lomie district include insects and harsh weather conditions that destroy the growth of *Teff* crops. The other problems are high labour demand during weeding, harvesting, and threshing of *Teff* crops that requires technology. *Teff* crop is not strong, and it usually falls by strong wind and rainfall. The problems of *Teff* production in Shenkora na Minjar district include dense sowing, weeds and pests, use of unknown and excessive chemicals, overuse of the land and tiresome process of *Teff* production which is not supported with technology and farmers are reluctant to accept the advice of experts. The major problems for Halaba zone are dependency on rainfall, fluctuation of rainfall, unpredicted climatic condition (water stress), shortage of high-quality seed supply, diseases and pests, farmers do not sow in rows, and they do not follow the advice given by experts.

Though the types and severity of the problems vary among the study areas, the major ones are in relation to the availability of inputs, seeds and chemicals, scarcity and overuse of land, absence of technology, diseases, and pests, dependency, and fluctuation of rain. The findings are like the previous studies of Girma (2015) that state high production cost, lack of appropriate extension and credit services and lack of technologies like row maker for sowing, weeding, harvesting, and threshing are the major problems of *Teff* production. Similarly, our findings are like the research output of Getu et al. (2017) that state considerable variations in the productivity of plots growing *Teff* across Ethiopia is available due to the levels of input use, the management practices employed, the age of the operator, the ease of access to markets, and the level of engagement in extension efforts.

On the other side, the survey respondents were asked to identify major five problems that affect *Teff* production in their localities. Accordingly, in the Halaba zone high price of the input, low yield of *Teff* crops, drought or insufficient rain, shortage of improved seed and small land size (shortage of oxen) are identified as the major problems for *Teff* production. Similarly, in Lomie district high price of the input, high cost of labour, small land size, shortage of improved seed and shortage of agricultural inputs were identified as the major problems for *Teff* production. In Shenkora na Minjar district the five problems of *Teff* production are identified as high price of the input, shortage of agricultural inputs, small land size, shortage of improved seed and high cost of labour. Likewise, the five major problems identified by Tahtai Maichew district respondents are high price of the input, small land size, shortage of oxen, low yield of *Teff* crops and high rainfall (flood).

When we see the overall problems of *Teff* production for all the districts high price of input is ranked 1st (chosen by 80.24 % of the respondents), small land size ranked 2nd (chosen by 46.77% of the respondents), high cost of labour ranked 3rd (chosen by 36.29% of the respondents), low yield of *Teff* crops ranked 4th (chosen by 35.08% of the respondents) and shortage of improved seed ranked 5th (chosen by 32.66% of the respondents). The other problems as mentioned by survey participants are shortage of agricultural inputs, financial problems for purchasing inputs, shortage of labour, shortage of oxen, drought or insufficient rain, pests and insects and weeds.

Summary

The total number of survey respondents is 248 heads of household (31 female respondents and 217 male respondents) with the same sample size of 62 respondents from each of the four districts. In addition, a total of 8 FGDs (4 women groups and 4 male groups) were conducted during the survey from the four districts. About 42 (50%) participants of the FGD are males while the remaining 42 (50%) participants are female. Moreover, about 25 key informants were involved in the survey. The survey result indicates that about 246 (99.19%) of the respondents were involved in *Teff* production and only 2 (0.81 %) respondents didn't involve in *Teff* production in 2010 E.C as they shifted their land to other cereal crops to have the advantage of crop rotation.

The FGD participants argued that *Teff* came from the ancient generation passing down to their generation. It is an indigenous crop to Ethiopia and has been produced for a very long time by the indigenous people. The importance of *Teff* crop is also discussed and it is used as the major source of food for people, fodder for cattle, it is good to eat and as a source of protein for the people, traditionally, it is believed to help people in blood circulations, as it is a major source of income for the farmers as it has a very good market price as compared to other crops, used during ceremonies and festivities such as serving special guests and wedding and farmers use a straw for building houses (plastering) in combination with soil and sand.

The average *Teff* production of all survey respondents is 1104.13 kg per household with a standard deviation of 757.39. However, there is a big difference in *Teff* production among the districts. The average *Teff* production is the highest (1,861 kg per household) in Lomie district from Oromia regional state while that of Tahtai Maichew district from Tigrai regional state is the least among the districts which is 427.02 kg per household.

The result of the survey indicates that both men and women are involved in *Teff* production activities. Though it is difficult to clearly show the roles of women and men in *Teff* production activities, women are engaged in land preparation, weeding, and preparing food for the whole family while male are doing all farming activities (ploughing and land preparation, planting, harvesting, and threshing). The average *Teff* production for female-headed respondents is 782.35 kg per household while that of male-headed respondents is 1155.26 kg per household.

The average number of labour days required to do all the activities of *Teff* production for 0.25 ha is estimated to be 32.80 labour days with a standard deviation of 14.55. About 23.06 (70.3%) labour days are covered from family labour followed by 7.94 (24.21%) labour days from the hired labour force and the remaining 1.80 (5.49%) labour days from labour pooling systems.

Oxen serve as a source of traction in many developing countries and thereby significantly affect households' crop production. The average oxen ownership of the survey respondents is 1.97 with a standard deviation of 1.29. The survey result also indicates that about 30 (12.1%) respondents don't own ox while 50 (20.16%) respondents own only one ox. Livestock contributes to households' economy in different ways as a source of pulling power, source of cash income, source of supplementary food and means of transport. Respondents were asked whether they own livestock or not and as a result, the average ownership per household is 1.97 for ox, 1 for a cow, 7.42 for chicken, 2.02 for sheep, 1.94 for goat and 1.34 for a donkey.

The mean landholding for all the survey respondents is about 1.41 ha per household. However, there is a variation of landholding among the districts. The land is becoming a scarce resource in all the districts, and it is a big challenge especially for the youth. The reason for such a challenge is the increasing trend of the population while the land is limited. The youngsters couldn't get farmlands unless they were provided by their families. Compared to the needs of the farmers, the land is inadequate. From the available total land, on average about 0.77 ha (54.61%) is allocated for *Teff* production and it differs among districts.

Farmers are changing their attitude towards the utilization of fertilizers and improved seeds. They know that if a farmer produces *Teff* using modern techniques of production (use of fertilizers and improved seeds, chemicals, line sowing, etc), she/he can get a better *Teff* production. In the last five years, the government has been investing in the supply of fertilizers, improved quality seed and chemicals. The farmers also developed the skill of using agricultural inputs which directly contribute to *Teff* production and better livelihoods. When we see the input utilization of the respondents of the survey, we can observe that about 99.19% of the respondents use DAP, 91.53 % of the respondents use UREA and 89.92% of the respondents use improved *Teff* seed. The average cost for input is Birr 3018.40 per household with a standard deviation of 2036.53. The main concern of the include the increasing trend of prices for farm inputs from time to time, quality of the inputs and chemicals, improper use of inputs and chemical, the declining trend of using manure or composite and the soil fertility is declining from time to time.

The survey result indicates that about 242 (97.58%) of the respondents get contact with extension workers within the 2010 E.C (2017/18) harvest period. The extension workers provide the necessary support to the farmers throughout *Teff* production starting from land preparation till threshing. There are also training programs arranged by the extension workers to the farmers in relation to the application of inputs, modern farming methods, adoption of new technology, planting the crop, handling moisture, swamp, soil and water conservation and others.

From the survey result, we can see that about 87.10% of the respondents are members of at least one cooperative society while the remaining 12.9% are not the members of any cooperatives. On average, respondents have 10.33 years of experience in membership of cooperatives. More than 50% of the respondents benefited from input delivery services, getting affordable input prices and fair farm gate output prices. However, the coverage of some of the services such as bargaining power, access to credit, storage facilities and dividend payments is low which needs further improvement.

The strength of the linear association between all the independent variables and *Teff* production was assessed through Pearson correlation. As a result, the quantity of oxen ownership per household, total available land per household in ha, *Teff* cultivated land per household in ha, perception of the respondent towards land fertility, the total cost for inputs and monetary value of livestock are the variables that have a positive and strong correlation with *Teff* production (significant at 0.001) (for the details, please refer Table 21 in the annex).

From the 21 explanatory variables included in the model, about nine (9) predictors are found to be positively and statistically significant at 95% level of confidence in determining *Teff* production in the study areas. These variables are: three districts (Shenkora na Minjar, Lomie and Halaba zone) with p-value < 0.001, economically active labour force with p-value = 0.026, labour cost with p-value < 0.001, frequency of contact with extension workers with p-value = 0.036, monetary value of farm asset with p-value < 0.001, owned land in ha with p-value $= 0.006$ and rented land in ha with p-value < 0.001.

Though the types and severity of problems of *Teff* production differs among districts, some of the common problems to all districts are high cost of inputs, inadequate land supply specially for the young, backward method of farming, changing weather conditions, absence of technology such as sowing and harvesting machines, not adhering the advice of extension agents by farmers during the application of input to their farmland and the high labour demand for *Teff* production.

CHAPTER SIX: EXAMINING *TEFF* DISTRIBUTION DIFFERENTIALS ACROSS A GROUP OF FARMERS

6.1. Introduction

This chapter tries to review *Teff* distribution differentials across a group of farmers in the study areas which is the third objective of the research. In this research, distribution of *Teff* is primarily concerned with the physical movement of *Teff* crops to the market by smallholder farmers with the purpose of generating an income from selling *Teff* crops. It tries to assess the features of *Teff* distribution and provides highlights on the actors of *Teff* in the value chain. It also reviews the independent variables affecting the amount of *Teff* supplied to the market such as demographic variables, membership in cooperative marketing, distance to market, access to transport facilities, access to market information, cost of transport, storage facilities, price of *Teff* crops and supply of *Teff* crops in kg to the market. The relationships among the dependent and independent variables are analyzed by taking the four districts as case study areas and the results among the districts are compared and presented using frequencies, percentages, means, standard deviation and t-test statistical parameters.

6.2. Features of *Teff* distribution in Ethiopia

6.2.1. Policy of the government on distribution of cereals

A question was raised to FGD participants and key informants about the features of *Teff* distribution and marketing. A study participant from Lomie district stated the following in relation to the features of *Teff* marketing.

> Our government is setting a free-market economic policy whereby buyers and sellers freely agree on the price and quality of the product all by themselves (Study participant_25).

Another study participant from the Halaba zone highlighted the following in relation to where and to whom they sell their *Teff* crops.

> We can sell our *Teff* crops to anyone, anywhere without limit. However, when we take it to the market, we have to pay tax to the government for every quintal (Study participant_72).

A key informant from Lomie district also stated the following about the places where farmers sell their *Teff* crops.

> Kebele markets are the most common markets for farmers in selling their *Teff* crops as these are nearer to the farmers. On the other side, the district level market is chosen by the farmers as there is a fixed marketplace working on a daily basis and there are many buyers (traders and urban dwellers) in the town (KII Lomie_2).

A key informant from the Ministry of Trade and Industry also highlighted the following about the free market economy by taking the existing context of Ethiopia.

> Free market is the policy that our country follows. Therefore, the meaning of a free market can be interpreted in the context of how much wealth one is allowed to accumulate and since there is no limit set, the market can be said it is free. So, any farmer can produce as much as s/he can and can sell it without limitation and intervention from the government or any other third party (KII Federal MoTI_1).

Another key informant from the Ministry of Trade and Industry also said the following.

> The farmers have the right to freely sell their product anytime and anywhere and this is advantageous to the farmer's economy and work (KII Federal MoTI_1).

A key informant from the wholesalers highlighted the advantage of free market economy to the farmers, traders, and consumers as indicated below.

> Free market is good as it makes the farmers, traders and consumers benefit from it. All of them are free to buy or sell *Teff* crops. The market is disturbed if it falls under the influence of the government or big traders. So, the fact that it is free is advantageous to the farmers. The same is true to the customers as well because they can buy anytime, they want to from anywhere (KII Wholesaler_2).

Another key informant from the wholesalers highlighted the problems of the free-market economy as indicated below.

> The free market has killed our business as there are illegal brokers who buy the product to sell it without proper license and storage. They get a lot of benefits because they have no rent to pay, they don't pay tax to the government and most customers go to them because they sell *Teff* crops at a relatively cheaper price as compared to us. They sell the product on trucks and go back to the regions. If they could have delivered it straight to the legal trades, without reaching illegal brokers, the price could have been fairer for all of us. As a result, some traders with licenses and stores have gone bankrupt. However, the farmers are benefited as they sell their product in either way (KII Wholesaler_6).

From the above discussion with study participants and key informants, we can learn that free-market economy is the basic economic policy for the country, especially in relation to grain marketing. Farmers do sell their *Teff* crops at anytime and anywhere without limit, but they mostly prefer *Kebele* or district markets. As per the opinion of the study participants, the free market is good as it makes the farmers, traders and consumers freely negotiate, buy, and sell their *Teff* crops without limit. On the other side, the involvement of illegal brokers in the marketing of *Teff* crops is affecting the business negatively. This result is like the findings of Abraha (2008) which states the present government, which took power in 1991 enforced new economic reform (free-market) in 1991.

6.2.2. Actors in the value chain of *Teff* distribution

Discussions were undertaken with FGD participants and key informants in relation to the distribution of *Teff* crops and actors in the *Teff* value chain. The result of the discussions indicates that the *Teff* value chain begins from the farmers and there are collectors, brokers and traders that link the *Teff* producers to the traders and end users.

In a focus group discussion (FGD) at Tahtai Maichew district, a study participant stated the following concerning the sale of *Teff* crops.

> Often *Teff* is considered as a food for people who belong to higher classes and it is the people in town who directly buy our product. Most farmers don't go to brokers to sell their *Teff* crops and they don't want to be interfered with by third parties. They simply sell it by themselves and what they need to do is travel to towns by themselves (Study participant_5).

Another study participant from Tahtai Maichew district said the following concerning the place where the farmers sell their *Teff* crops and to whom they sell in the market.

> The farmers mostly do sell *Teff* crops in the local market. But farmers don't sell *Teff* here at Kebele level because all the dwellers are farmers and producers of *Teff* crops. However, there are traders (collectors) who take *Teff* from many farmers and sell it in bulk to towns. Woreda Office of Agriculture and Rural Development also takes *Teff* in bulk when it wants to distribute better seed quality to farmers (Study participant_19).

In a focus group discussion (FGD) at Lomie district, a study participant stated the following in relation to the actors in the value chain and how the farmers engaged in the market to sell their *Teff* crops.

> Farmers sell *Teff* crops to cover the cost of fertilizer, education expenses for children, purchase of industrial goods such as edible oil, cloths and the likes. They sell their *Teff* products individually and

> the intermediaries buy them at a cheap price. Mostly, farmers sell their crops at Kebele or district markets. The reason is that farmers can't afford to take their product to major towns and sell their product at those places due to transportation setbacks. However, there are traders (collectors) who take *Teff* from rural farmers and sell it in bulk to towns with better price (Study participant_37).

Another FGD participant from Shenkora na Minjar district also highlighted the problem of illegal brokers in the market and the long market value chain for *Teff* crops.

> There are illegal brokers, but often farmers sell their product to traders. There is a problem with the long market chain and sometimes affects the market and leads to bankruptcy (Study participant_50).

Considering the actors in the *Teff* value chain, a key informant from the Ministry of Trade and Industry stated the following.

> We do have farmers as producers, wholesalers and consumers in the *Teff* value chain. In between the farmers and wholesalers, there are farmer agents and brokers. Between the wholesalers and consumers, we have retailers. The farmers are the producers of *Teff* crops in the value chain. The wholesalers are the major actors of the *Teff* market, who determine the market value. It is not the producers who determine the market value, but the wholesalers most of the time. The free-market is good, but I think it has to be controlled specially for the benefits of the producers. I think the farmers are not benefited from what they produce (KII Federal MoTI_1).

Another key informant from the Ministry of Agriculture and Rural Development stated the following about the actors in the *Teff* value chain.

> There are brokers and traders who bring *Teff* crops from regions to the central market (Addis Ababa) on a commission basis and they deliver it to the wholesalers. They are responsible for determining the price and the wholesalers don't directly meet with the farmers (KII Federal MoARD_2).

Another key informant from Tigrai regional state stated the following in relation to the involvement of brokers and assemblers in the *Teff* marketing.

> I think there are brokers in the market. Brokers are linking the farmers with potential buyers, usually wholesalers or retailers. Those farmers who have a very small amount of *Teff* directly sell their product to the consumer. But there are traders who collect the product from the farmers (assemblers) and then just sell it to the consumers or to the wholesalers in towns (Tigrai expert_1).

From the above discussions, we can understand that producers, intermediaries or commission agents, assemblers, brokers, wholesalers, retailers, and consumers are involved in the *Teff* value chain. The producers are responsible for *Teff* production; the intermediaries are responsible for collecting *Teff* crops from producers and delivering it to wholesalers. The wholesalers further sell

Teff crops to retailers and then to consumers. The research result indicates that due to the low volume of sales and high cost of transportation, usually, farmers do not supply their crops to the major towns by themselves rather they sell their crops in the local market. Brokers are also involved in market facilitation (linking producers to wholesalers). The result of our finding is like the research result of Girma Alemu (2015) that states different entities are involved in *Teff* marketing such as farmer trader, local/regional collectors, regional assemblers, regional retailers, regional wholesalers, urban wholesalers, and urban retailers. This finding is also like the previous researchers such as Gabre-Madhin (2001) that state brokers have an intermediary role of matching geographically dispersed buyers and sellers and, in return, receive a fixed commission. On the other side, the involvement of illegal brokers and the existing long market chain are the major challenges in relation to the distribution of *Teff* crops.

6.2.3. Customers of farmers in *Teff* marketing

A question was raised to the FGD participants concerning the buyers of their *Teff* crops. In a focus group discussion (FGD) at Tahtai Maichew district, a study participant stated the following.

> Most of our customers are people living in towns, traders and people with no land. In this regard, people living in towns, civil servants, workers, retailers and cooperatives mostly purchase our products. The profit the farmers get from selling *Teff* crops is actually not attractive and it doesn't motivate us to do more marketing (Study participant_12).

A study participant from Shenkora na Minjar district stated the following about the main buyers of their *Teff* crops.

> The main buyers of our *Teff* crops are traders in our Kebele and district market. Sometimes we supply our *Teff* crops to the end-users such as public servants and dwellers in towns (Study participant_60).

A study participant from the Halaba zone said the following in relation to the main buyers of their *Teff* crops.

> We often sell our product where there is a better price for it. We supply it to traders, to agricultural agencies for seed distribution and to consumers at the local marketplace. We often take it to the local market and sell it to traders. However, there are also cooperatives and unions who buy our Teff crops (Study participant_81).

From the above discussion, we can learn that farmers sell their *Teff* crops to people living in towns including public servants, workers, retailers and cooperatives mostly. Farmers do also sell their *Teff* crops in the local market to traders, urban dwellers such as civil servants and workers. Farmers simply sell *Teff* crops by themselves and what they need to do is travel to the nearer market. Sometimes the farmers do sell their *Teff* crops to cooperatives, unions, and agricultural agencies (in Halaba zone and Tahtai Maichew district) for seed distribution, especially in Halaba zone. Our finding supports previous research results of Demeke and Di Marcantonio (2019) that state *Teff* is the most preferred cereal among better-off households, especially in urban areas, making it an attractive cash crop for farmers.

6.2.4. Source of *Teff* crops for wholesalers

Discussions were undertaken with key informants about the source of *Teff* crops for the major wholesalers in Addis Ababa. The wholesalers were requested from where they get the *Teff* crops. Accordingly, a key informant wholesaler from Addis Ababa stated the following.

> Well, here we do have different types of *Teff* that come from different places and from experience we know the quality of the *Teff*. I buy the *Teff* by considering the demand of my clients. I don't meet the producing farmers, but the regional traders bring the *Teff* crops to us (KII Wholesaler_1).

Another key informant wholesaler said the following.

> I get *Teff* crops from traders by order. I don't have contact with farmers. We often bring *Teff* from Ada'a, Debre Zeit and it is often the best quality *Teff*. There is also a famous place called Denkata outside Debre Zeit (KII Wholesaler_2).

By supporting the previous ideas, another key informant also stated the following.

> There are brokers and traders who bring *Teff* from regions on a commission basis, and they deliver it to us. They are responsible for linking us with the farmers. We don't meet directly with farmers (KII Wholesaler_3).

Contrary to the above ideas, a key informant stated the following.

> The relationship we have with farmers is when they bring us *Teff* from their respective villages. We often get it from Oromia regional state, and they have their indigenous locations where they bring the product. We pay in cash when we buy it from the farmers (KII Wholesaler_4).

A key informant from the Ministry of Agriculture and Rural Development highlighted the problem as follows.

> There is a problem in the market that *Teff* producers are not meeting the consumers directly as there are traders in between. There are government organs that are supposed to link farmers with end-users and shorten the value chain which can benefit both the producers and consumers. However, the process is not going well as required and farmers are not benefiting from the market (KII Federal MoARD_1).

A key informant from the Ministry of Trade and Industry highlighted the problem of the *Teff* value chain as follows.

> The *Teff* market chain is too long, and this makes the actors in the chain make a profit from it. In this regard, neither the farmers nor the end-users are benefited as much as they deserve to be (KII Federal MoTI_2).

From the above discussion with traders and officers, we can see that in most of the cases the wholesalers in Addis Ababa do not have direct contact with the farmers. Rather it is the regional brokers and traders who bring *Teff* crops from regions to wholesalers on a commission basis. As a result, as the actors in the market chain increases, the profit margin for each actor will bring a burden to the end users. Neither the *Teff* producers benefit from such a long chain. From the discussion, we can also learn that some farmers from Oromia regional states do bring their *Teff* crops to wholesalers in Addis Ababa which is similar to the report of CSA (CSA 2011). The government organs responsible for linking farmers with end-users by organizing cooperative marketing at the local level should also work hard to shorten the chain of *Teff* marketing that benefits both the producers and consumers. This result is like the previous research findings of Bernard, Taffesse et al. (2008), Mussema, Kassa et al. (2015) and Woldu and Tadesse (2015) that elaborate the importance of cooperatives in creating win-win cooperation among chain actors and thereby bring higher economic returns to household farmers.

6.2.5. Customers of wholesalers in *Teff* marketing

Discussions were undertaken with the key informant wholesalers in identifying their regular buyers of *Teff* crops. Accordingly, a key informant wholesaler stated the following.

> Often there are *Teff* millers who buy our *Teff* and sell it to end-users in their areas. We set the price in the morning here and they take on their own transportation. Occasionally, there are also traders

from regions who order us in a large volume of *Teff* crops. Usually, they order us more than 50 quintals at a time. There are also the urban dwellers who buy *Teff* crops from us (KII Wholesaler_2).

The wholesalers were also requested to whom they sell their *Teff* crops. Accordingly, a key informant said the following.

My customers often are urban dwellers and sometimes millers who make flour by grinding *Teff* crops (KII Wholesaler_3).

Another wholesaler also said the following in relation to his major clients.

Most of the time, my customers are household consumers. There are also civil servants who buy *Teff* crops. Sometimes organizations that are involved in baking Injera buy our *Teff* crops. Occasionally, public hospitals and universities also buy *Teff* crops from wholesalers by competition. However, it is difficult to find and procure a higher quantity of uniform and consistent supply of quality *Teff* as it is supplied in small quantities (KII Wholesaler_5).

From the above discussion with the key informant, we can understand that urban dwellers and civil servants are the main clients of the wholesalers. However, occasionally institutions like millers, *Injera* bakers, regional *Teff* traders and public hospitals purchase *Teff* from the wholesalers. This is like the result of some scholars that state the supply of *Teff* to the market is fragmented as a result of the small volume handled by traders and the limited number of large-scale buyers. Due to smallholder farming, large buyers face the challenges of procuring a uniform and consistent supply of quality *Teff* (Rashid and Dorosh 2009; Rashid and Negassa 2011).

From the survey result as indicated in Table 6.1 below, we can see the distribution of *Teff* crops to traders and end-users. About 238 (95.97%) respondents were involved in *Teff* marketing (sale of *Teff* crops) in 2010 E.C (2017/18) while the remaining 10 (4.03%) respondents didn't participate in *Teff* marketing in the same year. The survey respondents were requested to identify the primary buyer of their *Teff* and sales volume during marketing. Accordingly, about 93 (37.5%) respondents do sale their *Teff* primarily to wholesalers, 66 (26.61%) respondents sell their *Teff* primarily to cooperatives, 39 (15.73%) respondents sell their *Teff* primarily to urban consumers and 27 (10.89%) respondents sale their *Teff* primarily to retailers. The remaining 13 (5.24%) respondents do sell their *Teff* primarily to rural consumers, *Injera* bakers, brokers, millers and assemblers.

In terms of sales volume, the respondents do sell their *Teff* crops to different actors in the *Teff* value chain. From the survey result, we can see that farmers do sell their *Teff* crops mainly to wholesales. In this regard, about 110,870 kg (55.45% of the total volume of marketed *Teff* crops) goes to wholesalers. About 50,035 kg (25.02% of the total volume of marketed *Teff* crops), about 17,785 kg (8.89% of the total volume of marketed *Teff* crops) and about 14,115 kg (7.06% of the total volume of marketed *Teff* crops) are distributed to cooperatives, retailers, and urban consumers, respectively. The remaining 7,150 kg (3.58% of the total volume of marketed *Teff* crops) is distributed to *Injera* bakers (processors), rural consumers, brokers, assemblers, and millers (for the details please refer table 6.1 below).

The total sales volume of all the respondents is about 199,955 kg (147,285 kg of *Magna Teff* and 52,670 kg of white *Teff*). The average sales volume for all respondents is 806 kg per respondent with a standard deviation of 654. However, there is a big difference among the districts in terms of sales volume. The average sales volume of Lomie district is 1,410.48 kg per household, the average sales volume for Shenkora na Minjar district is 895.16 kg per household, the average sales volume of Halaba zone is 781.45 kg per household and the average sales volume of Tahtai Maichew district is 137.98 kg per household (for the details, please refer Table 11 in the annex). This result is like the findings of Efa Gobena Tura et al. (2017) that state the average marketed surplus for households that participated in the *Teff* market is 851 kg per household.

From the analysis of actors in the value chain, we can see that farmers are involved in marketing as producers of *Teff* crops and thus they are part of the *Teff* value chain. Even though the farmers consume more *Teff* crops as compared to other crops, about 73.02% of the total *Teff* production is supplied to the market. This result is like the findings of Girma Alemu (2015) that state about 70% of the total *Teff* production is marketed at Bacho district of West Shoa Zone of Oromia regional state.

Nowadays, the farmers can freely sell their product anytime and anywhere and as a result, they sell their products to wholesalers, cooperatives and other actors in the value chain and can get a better price from the negotiations. The survey result also shows that the major clients of farmers are wholesalers, cooperatives, retailers, and urban consumers who take about 192,805 kg (96.42%) of the total supply of *Teff* crops to the market.

The mean for the amount of *Teff* supplied to different buyers were compared using ANOVA by district (P-value < 0.05). Furthermore, pairwise multiple comparisons using Bonferroni correction (t-test) were conducted and the results are presented in Table 6.1 below. When we see the ANOVA test result for the average amount of *Teff* supplied to the wholesalers among the four districts, the mean for Tahtai Maichew district is statistically different from the mean of the other three districts (P-value < 0.05). If we see the ANOVA test result for the mean of the amount of *Teff* supplied to cooperatives among the four districts, the mean for Tahtai Maichew district is statistically different from the mean of Shenkora na Minjar district and Halaba zone (P-value < 0.05). If we see the ANOVA test result for the average amount of *Teff* supplied to retailers, urban consumers and *Enjera* bakers among the four districts, the mean for the amount of *Teff* supplied for Lomie district is statistically different from the mean of the other three districts (P-value < 0.05). However, there is no statistically significant difference among the four study areas for the mean amount of *Teff* supplied to rural consumers, brokers, assembles and millers (P-value > 0.05) (for the details, please refer Table 6.1 below). Generally, the comparison of ANOVA test for the means of total *Teff* supplied to the market among the four districts indicates that the mean for Tahtai Maichew district is statistically different from the other three districts (P-value < 0.05). Moreover, the mean of total *Teff* supplied to the market for Lomie district is statistically different from that of Shenkora na Minjar district and Halaba zone (P-value < 0.05) (for the details, please refer Table 6.1 below).

Table 6.1: Comparison of *Teff* distribution to buyers and sales volume in kg (ANOVA)

Lists of *Teff* buyers	District of the respondents				ANOVA test		Total sales volume of *Teff* crops in kg and in percent	
	Tahtai Maichew	Shenkora na Minjar	Lomie	Halaba zone				
	Mean	Mean	Mean	Mean	F	Sig.	Mean	%
Wholesalers	8_a	606_b	705_b	469_b	16.537	.001	110,870	55.45
Cooperatives	39_a	257_b	$198_{a,b}$	312_b	5.944	.001	50,035	25.02
Retailers	31_a	00_a	256_b	0_a	21.206	.001	17,785	8.89
Urban consumers	58_a	0_a	169_b	0_a	9.635	.001	14,115	7.06
Rural consumers	1_a	13_a	11_a	0_a	.764	.515	2,000	1.00
Processors (*Enjera* bakers)	0_a	0_a	32_b	0_a	4.826	.003	1,900	0.95
Brokers	0_a	0_a	31_a	0_a	1.651	.178	1,550	0.78
Assemblers	0_a	19_a	0_a	0_a	1.393	.245	1,200	0.60

Millers	0_a	0_a	8_a	0_a	1.000	.394	500	0.25
Total sales of *Teff* in kg	**138_a**	**895_b**	**1410_c**	**781_b**	**75.547**	**0.001**	**199,955**	**100**

Source: Survey result, 2018

6.3. Overview of the amount of *Teff* supplied to the market in kg by district

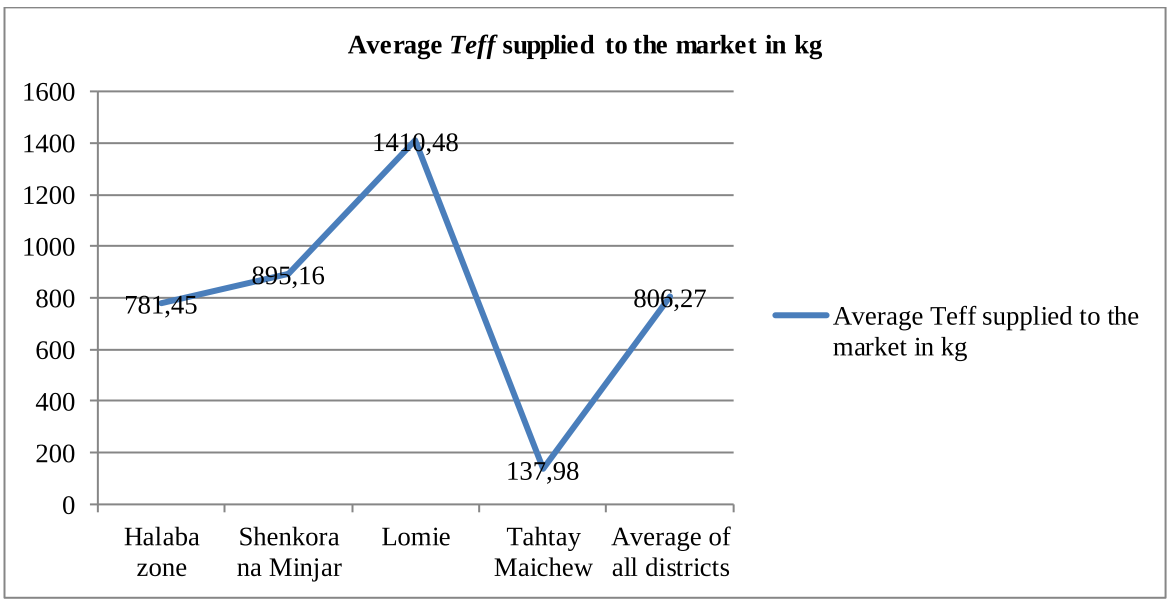
The survey result indicates that about 238 (95.97%) respondents were involved in *Teff* marketing (sale of *Teff* crops) in 2010 E.C (2017/18) while the remaining 10 (4.03%) respondents didn't participate in *Teff* marketing in the same year. When we see the participation of smallholder farmers in *Teff* marketing considering the average *Teff* supply to the market, it is about 806.27 kg per household with a standard deviation of 653.86. As compared to *Teff* production (1104.13 kg per household with a standard deviation of 757), it is about 73.02 % of total production. About 297 kg of *Teff* crops (26.90%) is used for household consumption and the remaining 0.86 kg of *Teff* (0.08%) is used for seed. This shows us that *Teff* crop is a cash crop that farmers use as a source of income rather than consumption. This is like the previous research findings of Kebebew Assefa et al. (2013) that state in the Ada area, about 75% of the *Teff* produced is supplied to the market.

A question was also raised to the survey respondents on how much of their *Teff* production goes to the market in the harvest period of 2010 E.C (2017/18). Accordingly, 99 (39.92%) respondents do sale more than 80% of their *Teff* production, 35 (14.11%) respondents sell from 60% up to 80% of their *Teff* production and 78 (31.45%) respondents sell from 40% up to 60% of their *Teff* production. About 12 (4.84%) respondents sell from 20% up to 40% of their *Teff* produce and 14 (5.64%) respondents sell up to 20% of their *Teff* production. Only 10 (4.03%) respondents were not involved in *Teff* marketing in the harvest period of 2010 E.C (2017/18). The finding of our research is like the findings of Azeb et al. (2017) which state about 82.27% farmers used *Teff* as the source of income in addition to home consumption.

If we see the average *Teff* supplied to the market for each district separately, the highest supply is observed for Lomie district respondent (1410.48 kg per year per household) followed by Shenkora na Minjar district (895.16 kg per year per household) and the Halaba zone (781.45 kg per year per household). The least supply is observed for Tahtai Maichew district (137.98 kg per year per household) (please refer Figure 6.1 and Table 6.1 above). A Chi-test of statistical association for the average amount of *Teff* supplied to the market by districts was found to be statistically significant (P-value < 0.05) (for the details, please refer table 6.2 below). This clearly shows that there is a significant difference among the districts in terms the amount of *Teff* supplied to the market. This result is like the study of Fikadu et al. (2019) that state Oromia and Amhara regions represent the largest *Teff* producing regions. These regions accounted about 85% of the national *Teff* production in volume and 84% of area cultivated during 2010/2011 cropping season. This result is also similar to the findings of Azeb et al. (2017) that state a unit increase in the quantity of *Teff* produced will increase the marketable supply of farmers. It indicates that households who produce more quantity of *Teff* also supply more to the market.

The means for the average amount of *Teff* supplied to the market among the four districts and different variables were compared using ANOVA (P-value < 0.05). Furthermore, pairwise multiple comparisons using Bonferroni correction (t-test) were conducted and the results are presented in Table 6.4 below.

Figure 6.1: Average *Teff* supply to the market in kilogram per household by district



Source: Survey result, 2018

Table 6.2:Supply of *Teff* crops to the market in kg by district

District of the respondent	Category of *Teff* supplied to the market				Mean and SD	
	No Teff supply at all	Less than 1000 kg	From 1000 kg up to 2000 kg	From 2000 kg up to 3000 kg	Mean	SD
Halaba zone	1	43	16	2	781.45	486.98
Lomie	2	15	32	13	1,410.48	707.75
Shenkora na Minjar	0	36	24	2	895.16	385.68
Tahtai Maichew	7	55	0	0	137.98	103.38
Total	**10**	**149**	**72**	**17**	**806.27**	**653.86**
Chi-square = 90.036		df = 9		Sig. =0.001		

Source: Survey result, 2018

6.4. Analyzing variables accounting for *Teff* supply differentials among farmers

In this research, distribution of *Teff* is primarily concerned with the physical movement of *Teff* crops to the market by farmers with the purpose of generating an income from selling *Teff* crops. This is further explained by the amount of *Teff* crops supplied to the market. Hence, the amount of *Teff* supplied to the market by smallholder farmers was analysed using different household and distribution related variables and the results are presented hereunder.

6.4.1. Sex of the respondent and the amount of *Teff* supplied to the market

Rural women make essential contributions to agriculture and pursue multiple livelihood strategies. They are often a crucial resource in agriculture and the rural economy. Comparisons were made between male-headed and female-headed respondents by taking the amount of *Teff* supplied to the market. The survey result indicates that in terms of the amount of *Teff* crops supplied to the market, male-headed household respondents are better off than female-headed respondents (for the details, please refer Table 6.4 below).

The average amount of *Teff* supplied to the market is 806.27 kg with a standard deviation of 653.86. This result is similar to the previous argument of Efa (2017) that states the average marketed surplus for households that participated in the *Teff* market is 8.51 quintals (851 kg) per household. On the other hand, male-headed households on average supplied about 846.75 kg of *Teff* crops to market per year while female-headed households supplied about 551.47 kg of *Teff* crops to market per year. This shows that there is a difference between male-headed and female-headed respondents in relation to the amount of *Teff* crops supplied to the market. This result is like the argument of Conforti (2011) that states the difference between male-headed and female-headed respondents can be because women face severe constraints than men in their access to productive resources that reduce their productivity. When we see the supply of *Teff* by district, the highest average *Teff* supplied to the market is observed for Lomie district for both female-headed and male-headed respondents as compared to other districts. The least average *Teff* supplied to the market is observed for Tahtai Maichew district for both male-headed and female-headed respondents as compared to other districts. This can be attributed to the low production of *Teff* crops in Tahtai Maichew district. However, except in the Halaba zone male-headed households supplied more *Teff* crops to the market as compared to female-headed households (for the details, please refer Table 6.4 below).

The ANOVA test indicates that the mean supply of *Teff* for female-headed and male-headed respondents for Tahtai Maichew district is statistically different from the other three districts. Moreover, the mean supply of *Teff* for male-headed respondents for Lomie district is statistically different from Shenkora na Minjar district and Halaba zone (P-value < 0.05) (for the details, please refer Table 6.4 below). This clearly shows that there is a significant difference among male-headed households and female-headed households in terms of *Teff* crops supplied to the market in all districts. This result is like the research findings of Paddy (2003) that state male-headed households are likely to sell more due to their natural ability to bargain, negotiate and enforce contracts and Giziew (2019) male-headed respondents tend to be more aware of marketing channels because they are more networked socially and undertake most agricultural activities.

6.4.2. Age of the respondents and the amount of *Teff* supplied to the market in kg

Some researchers such as Tshiunza, Lemchi *et al* (2001) found that younger farmers tended to produce and sell more cooking bananas for the market than older farmers. On the other side, other researchers in their study showed that there is a U-shaped relation between age of household head and market orientation of household in the cereal crops (Gebremedhin and Hoekstra 2007).

If we compare *Teff* crops supplied to the market, respondents with the age of 35 up to 65 years supply the highest volume (821.87 kg per household) as compared to the other categories (refer

Table 6.4 below). This could be because older people might have better experience in *Teff* marketing and long-standing customers as compared to the young ones. The highest *Teff* supplier age group is found in Lomie district (1417.71 kg) with the age category of 35 up to 65 years and the least supply (103.33 kg) is observed for the age group of 18 up to 35 years of age for Tahtai Maichew district (for the details, please refer Table 6.4 below).

When we measure the strength of the linear association among the age of the respondents to that of *Teff* supplied to the market through Pearson correlation, the correlation coefficient is $r = 0.036$; $p = 0.576$ (please refer Table 23 in the annex for Pearson correlation values for all *Teff* supply related variables). This indicates that there is a positive but weak relationship between age of the respondents and *Teff* supplied to the market. This shows that there is no significant difference in relation to the *Teff* supplied to the market by taking age as a variable. In this regard, our finding is against the findings of Tshiunza, Lemchi et al. (2001) which states younger farmers better participate in the market as compared to older farmers. This could be due to the fact that older respondents might have experience in marketing and regular customers for their *Teff* crops like that of younger respondents.

The ANOVA test indicates that the mean supply of *Teff* for the different age categories respondents for Tahtai Maichew district is statistically different for all categories of age from the remaining three districts (P-value < 0.05). The mean supply of *Teff* for the age group of 18 up to 35 years for Halaba zone is statistically different from that of Lomie district (P-value < 0.05). The mean supply of *Teff* for the age group of 35 up to 65 years for Lomie is statistically different from that of Shenkora na Minjar district and Halaba zone (P-value < 0.05) (for the details, please refer Table 6.4 below).

6.4.3. Family size, consumption of cereal and the amount of *Teff* supplied to the market

Household size is another factor expected to have an influence on *Teff* consumption and livelihood status of households. In this regard, Paddy (2003) argued that there is a negative correlation between household size and food security as food requirements increase in relation to the number of persons in a household.

The survey result indicates that the average annual consumption of cereal crops is 912.58 kg per household with a standard deviation of 409.01. As the size of the household increases, the trend for the consumption of cereal crops increases which is in line with our assumption. For example, as indicated in Table 6.3 below, the annual consumption of cereal crops is the highest (1,119.00 kg per household) for the households with 9 and above family members whereas it is about 505.64 kg for the households up to three family members. When we see the consumption of *Teff* crops among the different family sizes, it shows a variable trend. It is low for households with family size from 1 to 2 (260 kg per year), then increases into to 316.42 kg per household per year for the family size of three up to six and then decreases to 245.83 kg per household per year for households with a family size of nine and above. More supply of *Teff* crops to the market is also observed for those respondents whose family size is six and above which is against previous findings of Paddy (2003) that argued that there is a negative correlation between household size and food security as food requirements increase in relation to the number of persons in a household (for the details, please refer Table 6.3 below).

Table 6.3: Consumption of cereal and *Teff*, and supply of *Teff* to the market by family size

Category of family size	n	Mean and SD	Cereal consumption in kg per year per households	*Teff* consumption in kg per year per household	*Teff* supplied to the market in kg per year per household
Up to 3 family size	22	Mean	505.64	260.00	787.73
		SD	267.11	158.44	608.10
From 3 up to 6 family size	120	Mean	842.50	316.42	737.25
		SD	337.69	193.17	566.53
From 6 up to 9 family size	94	Mean	1,070.94	288.09	866.22
		SD	427.19	212.19	743.20
9 and above family size	12	Mean	1,119.00	245.83	1,060.83
		SD	445.08	182.73	773.22
Total	**248**	**Mean**	**912.58**	**297.26**	**806.27**
		SD	**409.01**	**197.52**	**653.86**

Source: Survey result, 2018

When we measure the strength of the linear association between family size of the respondents and consumption of cereals through Pearson correlation, r = 0.440** (Correlation is significant at the 0.01 level (2-tailed)). The findings of our research support the argument of Paddy (2003) that states as the family size increases, the consumption for cereal crops increases. On the other side, when we see the strength of the linear association between family size of the respondents and consumption of *Teff* crops through Pearson correlation, r = -0.072; p = 0.26 which shows a negative and very weak relationship which indicates as the family size increases, the consumption for *Teff* crops decreases and this argument supports the previous findings of Efa, Degye et al. (2017) that state smallholder farmers' decision to participate in *Teff* market is determined significantly and negatively by family size. When we measure the strength of the linear association between family size of the respondents and the amount of *Teff* supplied to the market through Pearson correlation, r = 0.110; p= 0.083 (please refer Table 23 in the annex of Pearson correlation). This indicates that though it is not significant, there is a positive but weak relationship between family size and *Teff* crops supplied to the market and thus, as family size increases, the trend for supply of *Teff* crops increases which is against the previous findings of Efa, Degye et al. (2017) that state smallholder farmers' decision to participate in *Teff* market is determined significantly and negatively by family size. The reason could be that respondents with higher family size tend to be market-oriented and thus they sell their *Teff* crops to generate more income rather than consuming it and they might prefer other crops for consumption.

When we compare the supply of *Teff* among the four districts, the highest *Teff* supplier is found in Lomie district (1,800 kg per household) for the family size of 9 persons and above; and the least supply (66 kg per household) is observed for the for the family size up to three for Tahtai Maichew district. The ANOVA test indicates that the mean supply of *Teff* for the family size of up to three person respondents for Tahtai Maichew district is statistically different from Shenkora na Minjar and Lomie districts (P-value < 0.05). Moreover, the mean supply of *Teff* for the family size of up to three persons for Lomie district is statistically different from that of Halaba zone (P-value < 0.05). The ANOVA test also indicates that the mean supply of *Teff* for the family size from 3 up to 6 and family size of 6 up to 9 persons for Tahtai Maichew district is statistically different from all the other three districts (P-value < 0.05). Moreover, the mean supply of *Teff* for the family size from 3 up to 6 and family size of 6 up to 9 persons for Lomie district is statistically different from that of Shenkora na Minjar district and Halaba zone (P-value < 0.05). However, there is no significant difference (P-value > 0.05) for all districts with the family size of 9 and above persons (for the details, please refer Table 6.4 below).

Table 6.4: Supply of *Teff* to the market in kg by district and explanatory variables

Variables	Average *Teff* supplied to the market by district of the respondent				All respondents	ANOVA Test	
	Tahtai Maichew	Shenkora na Minjar	Lomie	Halaba zone			
	Mean and SD	Mean and SD	Mean and SD	Mean and SD	Mean and SD	t	Sig.
Sex and average *Teff* supply							
Female (n= 34)	$106.25_{a}\pm75.00$	$816.67_{b}\pm318.85$	$1260.00_{b}\pm477.49$	$835.71_{b}\pm356.74$	551.47±520.41	29.402	0.001
Male (n= 214)	$149.02_{a}\pm110.13$	$903.57_{b}\pm393.68$	$1423.68_{c}\pm726.05$	$774.55_{b}\pm503.31$	846.75±664.68	56.024	0.001
Age group and average *Teff* supply							
From 18 up to 35 years of age (n= 58)	$103.33_{a}\pm130.29$	$920.00_{b,c}\pm298.09$	$1383.33_{b}\pm649.36$	$742.86_{c}\pm442.78$	755.69±519.53	13.535	0.001
From 35 up to 65 years of age (n= 174)	$144.79_{a}\pm103.60$	$889.13_{b}\pm416.59$	$1417.71_{c}\pm739.86$	$825.76_{b}\pm527.99$	821.87±687.41	51.185	0.001
Above 65 years of age (n=16)	$136.67_{a}\pm43.20$	$800.00^{2}\pm0$	$1387.50_{b}\pm622.06$	$400.00^{2}\pm0$	820.00±742.65	8.175	.003
Family size and average *Teff* supply							
Up to 3 family size (n= 22)	$66.00_{a}\pm61.48$	$970.00_{b,c}\pm271.01$	$1360.00_{b}\pm673.05$	$250.00_{a,c}\pm353.55$	787.73±608.10	11.831	0.001
From 3 up to 6 family size (n= 120)	$128.52_{a}\pm104.32$	$795.71_{b}\pm342.65$	$1207.14_{c}\pm631.54$	$647.83_{b}\pm324.90$	737.25±566.53	34.597	0.001
From 6 up to 9 family size (n= 94)	$149.11_{a}\pm101.03$	$1030.00_{b}\pm499.21$	$1742.86_{c}\pm750.05$	$840.00_{b}\pm431.20$	866.22±743.20	45.512	0.001
9 and above family size (n= 12)	$290.00_{a}\pm14.14$	$1250.00_{a}\pm70.71$	$1800.00^{2}\pm.$	$1121.43_{a}\pm888.75$	1,060.83±773.22	1.030	.430
Education and average *Teff* supply							
Not attending schools (n= 135)	$130.00_{a}\pm80.90$	$940.48_{b}\pm417.93$	$1457.89_{c}\pm700.05$	$866.67_{b}\pm557.67$	952.37±664.27	27.467	.001
Elementary school (Grade 1-8) (n= 91)	$136.62_{a}\pm110.04$	$835.29_{b}\pm300.40$	$1386.84_{c}\pm703.53$	$650.00_{b}\pm346.83$	629.73±609.62	46.579	.001
High school (Grade 9-12) (n= 18)	$166.00_{a}\pm149.26$	$600.00_{a}\pm173.21$	$1140.00_{a}\pm873.50$	$550.00_{a}\pm331.66$	615.56±596.51	3.086	.062
Attend college or university (n= 4)	$200.00^{2}\pm0$	0	0	$933.33^{1}\pm305.51$	750.00±443.47	4.321	.173

Source: Survey result, 2018

6.4.4. Education of the respondents and the amount of *Teff* supplied to the market

To create a viable livelihood from farming, farmers need to move from a sole focus on production for home consumption and focus on surpluses for the market by responding to the continuously changing market demands. In this regard, education plays a key role to achieve success in running their farms as sustainable and profitable businesses (Wongtschowski, Belt et al. 2013).

The amount of *Teff* supplied to the market is highest (952.37 kg per household) for those respondents who do not attend schools as compared to literates while the least supply (615.56 kg per respondent) is observed for the respondents whose educational status is from grade 9 to grade 12. This indicates that illiterate respondents are scoring better supply of *Teff* as compared to literates and this is against previous findings of Abraha (2015) which states education broadens farmers' skills and techniques of modern farming which enables them to perform farming activities wisely and diversification of household incomes which in turn would enhance households' food supply.

In order to compare the amount of *Teff* crops supplied to the market among the different categories of education levels, Chi square test was used. The Chi-square test result shows that there is a statistically significant difference among the respondents (x^2= 14.570, df= 6 and P= 0.024) as indicated in Table 6.5 below. This clearly indicates that there is a difference in the amount of *Teff* crops supplied to the market among the illiterate and literate respondents whereby illiterates are supplying more *Teff* to the market as compared to literates. This result is against the study of Wongtschowski, Belt et al. (2013) in which state education plays a key role to achieve success in running their farms as sustainable and profitable businesses.

Table 6.5: Supply of *Teff* crops by literacy status of the respondents

Literacy status of the respondent	Category of *Teff* supplied to the market			
	No *Teff* supply at all	Less than 1000 kg of *Teff* supply	From 1000 kg up to 2000 kg of *Teff* supply	From 2000 kg up to 3000 kg of *Teff* supply
	Count	Count	Count	Count
Cannot read and write	2	63	42	12
Read and write	8	86	30	5
Chi-square = 14.570	**df = 6**		**Sig. = 0.024**	

Source: Survey result, 2018

Similarly, when we measure the strength of the linear association between the level of education attended by the respondents and the amount of *Teff* supplied to the market through Pearson correlation, the result is r = -0.214** (correlation is significant at the 0.01 level (2-tailed)) (please refer Table 23 in the annex of Pearson correlation result). This indicates that there is a negative and statistically significant relationship between education and the amount of *Teff* crops supplied to the market. This points out that as the level of education increases, the amount of *Teff* supplied to the market decreases. This result is against the previous research findings of Wongtschowski, Belt et al. (2013) which state education plays a key role to achieve success in running their farms as sustainable and profitable businesses. The reason could be because illiterate respondents might own more of productive resources such as land and oxen and thus they are producing more *Teff* crops than literate.

When we compare the average *Teff* supply among the four districts, the highest average *Teff* supply is found in Lomie district (1457.89 kg) for illiterates and the least average *Teff* supply (130.00 kg) is observed for illiterates of Tahtai Maichew district (for the details, please refer Table 6.4 above). The ANOVA test indicates that the mean supply of *Teff* for the respondents not attending schools and elementary school of Tahtai Maichew district is statistically different from the mean supply of *Teff* for all the three districts (P-value < 0.05). Moreover, the mean supply of *Teff* for respondents not attending schools and elementary school for Lomie district is statistically different from that of Shenkora na Minjar district and Halaba zone (P-value < 0.05). However, there is no statistically significant variation (P-value > 0.05) for all high school and college/ university respondents in all the four districts (for the details, please refer Table 6.4 above).

6.4.5. Access to market information and the amount of *Teff* supplied to the market

According to Antonaci, Demeke et al. (2015) up-to-date information, including different market prices of both commodities and inputs, and their intra-seasonal variation, allows farmers to make more profitable decisions on production activities. Thanks to market information, farmers can better plan planting and storage decisions, finding appropriate markets for their produce and gain from profitable trade deals.

In this regard, in a focus group discussion, a study participant from Tahtai Maichew district highlighted the following.

> Most of the farmers get information from other farmers who have sold *Teff* crops. But if this is not available, the farmers must check for the price by going to the market in person. Otherwise, we have no other method of market orientation with the exception of a few farmers who get information from the radio (Study participant_1).

Another study participant from Lomie district said the following in relation to the access to market information.

> In addition to a personal search for information from market and peers, mobile and extension workers are the source of market information for farmers (Study participant_35).

A study participant from Shenkora na Minjar district also stated the following in relation to the access to market information.

> Our sources of market information are mobile, cooperatives and extension agents (Study participant_61).

By supporting the above arguments, a key informant from the Halaba zone stated the following concerning the access to market information.

> Farmers get market information from other farmers, traders, development agents, mobile and radio (KII Halaba_1).

From the above discussion, we can realize that farmers do have multiple options for accessing market information including personal search in the market, peer farmers, traders, mobile, extension workers and cooperatives.

In this regard, survey respondents were asked whether they have access to market information, source of information and the reliability of the information. As a result, 228 (91.94%) respondents do have access to market information prior to sales while only 20 (8.06%) respondents do not have access to market information. When we see the major source of market information, about 74 (29.84%) respondents stated traders (retailers and wholesalers) are the major source of market information followed by 48 (19.35%) respondents mobile as the major source of market information. Radio, cooperatives and extension agents are chosen as the major source of market information by 38 (15.32%) respondents, 33 (13.31%) respondents and 16 (6.45%) respondents, respectively. The other source of market information for the remaining 19 (7.66%) respondents include television, experts from the district office, brokers, assemblers and others such as NGOs, family, etc (for the details, please refer Table 13 in the annex).

Efforts were also made to identify the major problems of access to market information and as a result, about 16 (6.45%) respondents do not have a problem in accessing market information. However, about 93 (37.50%) respondents say “there is no reliable source of information” as the major problem of market information, 39 (15.73%) respondents say “it is not timely” as the major problem of market information, 22 (8.87%) respondents say “irregularity” as the major problem of market information. Other marketing information related problems are “inconsistency” chosen by 21 (8.47%) respondents and 57 (22.98%) respondents say a combination of the problems as their major problems to market information. The survey result also indicates that respondents with market information supply more *Teff* crops (810.33 kg per household per year) to the market as compared to respondents without market information (760.00 kg per household per year).

In order to compare the amount of *Teff* crops supplied to the market among the respondents with market information and without market information, a Chi-square test was used. The Chi-square test result shows that there is no significant difference among the respondents (x^2= 1.809, P= 0 .613) as indicated in Table 6.6 below.

Table 6.6: Access to market information and the amount of *Teff* supplied to the market

Access to market information	Category of *Teff* supplied to the market				Mean and SD	
	No *Teff* supply at all	Less than 1000 kg of *Teff* supply	From 1000 kg up to 2000 kg of *Teff* supply	From 2000 kg up to 3000 kg of *Teff* supply	Mean	SD
	Count	Count	Count	Count		
No	1	12	7	0	760.00	447.68
Yes	9	137	65	17	810.33	669.49
Total	**10**	**149**	**72**	**17**	**806.27**	**653.86**

Chi-square = 1.809 **Df = 3** **Sig. =0 .613**

Source: Survey result, 2018

Similarly, when we measure the strength of the linear association between access to market information of the respondents and the amount of *Teff* supplied to the market through Pearson correlation, the result is r = 0.021; p =0.742 (please refer Table 23 in the annex). This indicates that though it is not significant there is a positive and weak relationship among access to market information and *Teff* supplied to the market and this is like other researchers’ findings such as Antonaci, Demeke et al. (2015).

6.4.6. Distance to market, cost of transport and the amount of *Teff* supplied to the market

If the distance is closer from residence to the market, the lesser would be the transportation cost and time spent by farmers (Tegegn 2013). Other researchers such as Hailu, Weersink et al. (2015) also found that producer prices over distance travelled decline in line with transportation costs.

In a discussion with study participants, a respondent from Tahtai Maichew district stated the following in relation to the means of the transport facilities they use to bring their *Teff* crops to the market.

> If the transport route is available, the farmers use freight vehicles. However, most farmers use donkey and mule as a means of transportation. Few farmers carry their product by themselves to market (Study participant_10).

A respondent from Lomie district stated the following about the transport facilities they use to bring their *Teff* crops to the market.

> Farmers transport their crops from rural areas to asphalt or road by using donkeys and mules and then use vehicles to transport to town markets. We use human labour if the amount of *Teff* is small such as less than 25 kg, pack animals up to two quintals and tracks for more than two quintals (Study participant_24).

A respondent from Shenkora na Minjar district stated the following in relation to the transport facilities they use to bring their *Teff* crops to the market.

> We use a combination of pack animals and vehicles. Farmers use pack animals to transport their Teff crops to Kebele market and vehicles to Woreda market (Study participant_61).

A respondent from Halaba zone stated the following concerning the mode of transport used to transport their *Teff* crops to the market.

> We often take it through a cart pulled by our donkey. Some of us do have own carts and some don't and those who do not own it try to rent a cart from the owners of the carts (Study participant_80).

From the above discussions, we can learn that the farmers located around the main roads use freight cars. However, those who are away from the road use their pack animals such as donkeys and mules to transport their *Teff* crops to market. They also use human labour if the amount of *Teff* crops is small such as less than 25 kg. In this regard, in the Halaba zone, the farmers often use a cart pulled by donkeys.

When we see the means of transport used to travel to the market from the survey respondents about 87 (35.08%) respondents say on foot, 67 (27.02%) use pack animals, 78 (31.45%) respondents public transport, 6 (2.42%) respondents use motorbike or cycle, and the remaining 10 (4.03%) respondents use the combination of foot and vehicle. This result is similar to earlier research findings of Antonaci, Demeke et al. (2015) that state human labour, donkey, animal cart, and hand cart were used as a means of transport by farmers.

When we come to the survey result, on average respondents travel about 6.37 kilometres to the nearest major market in their area with a standard deviation of 5.15. About 173 (69.76%) respondents travel less than 10 kilometres, 72 (29.03%) respondents travel from 10 kilometres up to 20 kilometres and the remaining 3 (1.21%) respondents travel more than 20 kilometres. The highest *Teff* supply (1517.74 kg) is observed for Lomie district that travels less than 10 km. The ANOVA test for the average distance to the market in kms among the four districts indicates that there is a significant difference for Halaba zone as compared to Tahtai Maichew and Shenkora na Minjar districts (P-value < 0.05) (for the details, please refer Table 6.7 below).

About 68 (27.42%) respondents take them less than one hour to reach the market and 131 (52.82%) respondents take them from one up to two hours. About 45 (18.15%) respondents take them from two up to three hours while the remaining 4 (1.61%) respondents take more than 3 hours to reach the market. The ANOVA test for the average required time to reach the market among the four districts were compared and the results indicate that there is a statistically significant variation for Tahtai Maichew as compared to Shenkora na Minjar and Lomie districts (P-value < 0.05) (for the details, please refer Table 6.7 below).

A question was also raised to the respondents in relation to access to the road to the nearest market. About 246 (99.19%) respondents stated that there is access to the market. When we see the type of road transport, about 27 (10.89%) respondents say it is dirt, 58 (23.39%) respondents say it is gravel and 104 (41.94 %) respondents say it is asphalt. The remaining 57 (22.98%) respondents say it is a combination of dirt, gravel, and asphalt.

In relation to the round-trip cost per person, no transportation cost is observed for 128 (51.61%) respondents as they might use their foot and/ or pack animals for transportation. About 82 (33.06%) respondents incur up to Birr 10.00 per person, about 41 (16.53%) respondents spent from

Birr 10.00 up to Birr 20.00 and one (0.04%) respondent incurs about Birr 30.00. When we see the transportation cost for *Teff* crops the yearly average transportation cost is Birr 74.63 per household with a standard deviation of 123.07. About 47 (18.95%) respondents incur up to Birr 100.00 for transportation, about 37 (14.92%) respondents incur from Birr 100.00 up to Birr 200.00 and the remaining 36 (14.52%) respondents incur above Birr 200.00 for transportation of *Teff* crops (for the details, please refer to refer Table 16 in the annex). The opinion of the respondents towards the cost of transportation was also assessed. As a result, about 20 (8.07%) respondents say it is cheap, about 46 (18.55%) respondents say it is fair, about 94 (37.90%) respondents say it is expensive and the remaining 88 (35.48%) do not have an opinion on the issue.

The ANOVA test for the average cost of transport to the market among the four districts was compared and the result indicates that there is a significant difference in the average cost of transport to the market for Lomie district as compared to the other three districts (P-value < 0.05). Moreover, there is a significant difference in the average cost of transport to the market for the Halaba zone as compared to the Tahtai Maichew and Shenkora na Minjar districts (P-value < 0.05) (for the details, please refer Table 6.7 below).

The survey result also indicates that respondents who travel from 10 km up to 20 km supply more *Teff* crops (1,015.97 kg per respondent) to the market as compared to other respondents. This result is like the previous findings that state the closer the residence of the household to the market centre, the more likely is the farmer to involve in *Teff* marketing as it reduces transportation cost and time spent (Minten, Tamru et al. 2013).

When we measure the strength of the linear association between the travelled distance to the market and the amount of *Teff* supplied to the market through Pearson correlation, $r = -0.003$; $p = 0.965$. This indicates that as the distance travelled to the market increases, though it is not significant, the supply of *Teff* crops to the market decreases. This is like the earlier finding of Husmann (2015) which states distance from markets negatively influences market participation.

Table 6.7: Comparison of *Teff* distribution related explanatory variables by district

Teff distribution related variables	Name of districts				All respondents	ANOVA	
	Tahtai Maichew	Shenkora na Minjar	Lomie	Halaba zone			
	Mean and SD	Mean and SD	Mean and SD	Mean and SD		F	Sig.
Distance to market in km	6.05_a±3.54	4.61_a±4.61	$6.38_{a,b}$±4.98	8.44_b±6.43	6.37±5.15	6.203	.000
Required time to reach the market in hour	2.42_a±1.81	1.89_b±0.81	1.68_b±0.50	$1.92_{a,b}$±0.66	1.98±1.10	7.065	.000
Cost of transport	13.90_a±24.59	19.03_a±61.61	167.52_b±155.88	98.06_c±128.10	74.63±123.07	29.241	.000
Timing of selling	2.48_a±1.62	2.56_a±.95	4.90_b±2.49	3.58_c±1.88	3.38±2.06	22.894	.000
Storage capacity	19.81_a±19.56	69.27_b±57.73	73.03_b±59.36	60.24_b±69.84	55.59±58.68	12.236	.000
Price per kg	20.42_a±7.47	20.95_a±1.67	20.54_a±4.27	18.83_a±3.05	20.19±4.68	2.494	.061
Teff supply in kg	137.98_a±103.38	895.16_b±385.68	1410.48_c±707.75	781.45_b±486.98	806.27±653.86	75.547	.000

Source: Survey result, 2018

6.4.7. Price determination and the amount of *Teff* crops supplied to the market

Since the adoption of the new economic policy in 1991 in Ethiopia, agricultural markets have been reformed and prices of commodities are determined through market mechanisms (Association 2004). However, the report of Ethiopian Economics Association (Association 2005) revealed that due to the weak bargaining power of producers and harvest fluctuations, the *price free* notion of markets has been found to affect producers. Food price movements are scrutinized by consumers and governments, as food expenditures continue to represent an important share of household budgets, especially in developing countries (OECD/Food and Nations 2015). Changes in price might have negative effect on the productivity of farmers and eventually, on their food self-sufficiency and food security status and in such cases monthly cereal price variability in the country is not only among the highest in the world but has even worsened since 2000 (Gabre-Madhin and Mezgebu 2006; Getnet 2008).

A question was raised to the study participant and key informant on how price is determined in the market and whether the farmers are satisfied with the price. An FGD participant from Tahtai Maichew district stated the following.

> *Teff* is the most expensive of all the other crops that farmers produce, especially if it is white *Teff*. It is considered as the main source of income for the farmers. When we come to the question whether it is fair or not, the price is determined by the seller and buyer through negotiation and farmers benefit from it. Its high price and its scarcity in the market make it hard for customers to afford. I don't think the price is fair for buyers in general (Study participant_17).

The FGD participant from Lomie district described the problem of price determination as follows.

> The problem with farmers is that they sell in bulk immediately after harvest when the price has gone down. They do not store it until the price is back to its normal value and they run out of supply when the price becomes expensive. Therefore, the farmers are not benefiting as they are just selling their produce immediately after harvest to fulfil their livelihood requirements (Study participant_23).

A study participant from Shenkora na Minjar district stated the following about the price determination in the market and associated problems in price determination.

> It is the traders who set the price. If the traders don't buy with the price they set, there is nothing the farmers can do. Farmers face the problem that they may return home without selling their product (Study participant_43).

Another study participant from Shenkora na Minjar district stated the following by supporting the free market notion as important for the farmers.

> I strongly believe that the free market is important for farmers. If the price goes down, the farmer has the right not to sell his/her product. Most of the time the price is fair, but sometimes it fluctuates (Study participant_51).

Another FGD participant from the Halaba zone said the following.

> It depends on the time of sale. If you sell immediately after harvest, the price could be low and if you wait till April and May, the price could be high. The price for *Teff* crops is also fluctuating (Study participant_68).

A key informant from Lomie district stated the following concerning the unfair price in the market.

> I think farmers don't get fair prices in the market. The problem is that traders talk to one another and fix the price as they wish (KII Lomie_2).

A key informant from wholesalers in Addis Ababa stated the following about the price determination of *Teff* crops in the market.

> The price depends on the type of the *Teff* quality. I have almost all types of *Teff*. I have white *Teff*, but often I am demand oriented. Whatever my customer wants, I buy and provide. I am the one who sets the price based on how much I bought it. As a trader, I conducted a market survey. If there is more supply, the price goes down and when there is less supply it goes up. We call each other to talk over the price and share information with the other traders as well (KII Wholesaler_6).

A key informant from the Ministry of Trade and Industry highlighted the following in relation to the price determination in marketplaces.

> It is the farmer who set the price. If farmers don't agree on the price, they let it stay. The price is determined on a daily basis, and it is not permanent or fixed. It fluctuates on a daily basis. Sometimes, it increases and decreases based on the production and supply of *Teff* crops. There is even a difference between the price that is set in the morning and in the afternoon. In general, the price of *Teff* has an increasing trend from year to year and even within a year. Sometimes when *Teff* production is low due to bad weather, the supply might decrease, and the price might increase due to shortage of supply. Usually, smallholder producers do sell their *Teff* crops immediately after harvest (December or January) and thus get lower prices as there is excess supply in the market. The government has no interference in the *Teff* market because of its free market policy (KII Federal MoTI_2).

From the above discussions, we can understand that *Teff* is a cash crop for the farmers and its market value is higher as compared to other cereal crops. The price depends on the time of sale and the quality of the *Teff*. Usually, smallholder producers do sell their *Teff* crops immediately after harvest (December or January) and thus get lower prices as there is excess supply in the market. The government has no interference in the *Teff* market as it is following a free-market economy and farmers are also free to sell their crops. The price of *Teff* has an increasing trend from year to year and even within a year. In principle the price is determined through negotiations in the market and the farmers do have the right not to sell their crops. Sometimes, the traders talk to each other and fix the price of *Teff* crops. If the traders don't buy with the price they set, there is nothing the farmers can do. Farmers face the problem that they may return home without selling their *Teff* crops.

When we come to the survey result, about 10 (4.03%) respondents were not involved in selling *Teff* crops in 2010 E.C (2017/18). As indicated in Table 6.8 below, about 150 (60.49%) respondents do sell *Teff* crops within three months after harvest with the average price of Birr 21.00 per kg. About 66 (26.61%) respondents do sale their *Teff* crops from three to six months after harvest with average price Birr 21.01 per kg and 18 (7.26%) respondents do sale their *Teff* crops from six to nine months after harvest with average price Birr 21.22 per kg. Only 4 (91.61%) respondents do sell their crops after nine months with an average price of Birr 22.07 per kg. This indicates that as the number of months after harvest increases, the average price of *Teff* supplied to the market increases. However, the research result indicates that more than 60.49% of the respondents do sell their *Teff* crops within three months after harvest with low prices (for the details, please refer Table 6.8 below). This result is like the previous research output of Getnet (2007) which states despite their perception of low producer prices in December, January and February, most farmers sell their marketable *Teff* during these months, mainly for cash income generation to settle annual land use tax bills and outstanding loans on commercial fertilizer. It is also similar to the research result of Kebebew Assefa et al. (2013) that states about 85% of *Teff* is sold during the months of December and January mainly due to liquidity requirements to cover various expenses such as credit, social obligations, school fees, clothing, and the like.

When we see the price of *Teff* crops by district, the highest is Birr 20.95 per kg for Shenkora na Minjar district. Birr 20.54 per kg for Lomie district, Birr 20.42 per kg for Tahtai Maichew district and Birr 18.83 per kg for Halaba zone. Such difference in price could be as the result of the quality of *Teff* and its demand in the market. The *Teff* crops of Shenkora na Minjar district are well known for its quality, and it is highly demanded in the market. The ANOVA test for the average price for one kg of *Teff* across the four districts shows that there is no significant statistical variation among all the districts (P-value > 0.05) (for the details, please refer Table 6.7 above).

Table 6.8: Timing of *Teff* marketing, supply of *Teff* crops to the market and price

Timing of sales	Number of respondents		Mean and SD	*Teff* supplied to the market in kg per year	Average price of *Teff* per kg
	n	%			
No involvement in selling *Teff* crops	10	4.03 %	Mean	0.00	0.00
			SD	0.00	0.00
Up to three months after harvest	150	60.49 %	Mean	680.03	21.00
			SD	532.17	2.15
From three to six months after harvest	66	26.61 %	Mean	1,013.64	21.01
			SD	699.87	2.36
From six up to nine months after harvest	18	7.26 %	Mean	1,280.56	21.22
			SD	738.27	2.41
9 months and above after harvest	4	1.61 %	Mean	2,000.00	22.07
			SD	522.81	1.87
Total	**248**	**100 %**	**Mean**	**806.27**	**20.19**
			SD	**653.86**	**4.68**

Source: Survey result, 2018

When we see the types of *Teff* crops supplied to the market, the total supply of *Teff* crops by the respondents is about 199,955 kg. From this total marketable supply, about 147,285 kg (73.66%) is *Magna Teff* (super white *Teff*) and the remaining 52,670 kg (26.34%) is white *Teff*. Neither red nor mixed *Teff* is supplied to the market by the respondents in 2010 E.C (2017/18). A total of 238 (95.97%) respondents supplied *Teff* crops to the market. About 171 (68.95%) respondents supplied *Magna Teff* while the remaining 67 (27.02%) respondents supplied white *Teff* to the market. When we see the average price for kg for the two types of *Teff* crops it is about Birr 21.21 per kg for *Magna Teff* and Birr 19.72 per kg for white *Teff* making total revenue of Birr 4,162,567.25 to the respondents. On average, the revenue from sale of *Teff* crops is Birr 16,784.75 per household.

When we see the place where farmers sale their *Teff* crops, about 22 (8.87%) respondents sale their crops at farm gate to assemblers and brokers with average price of 21.90 per kg, about 69 (27.82%)

respondents do sale their crops within *Kebele* market with average market value of Birr 20.65 per kg and 144 (58.06%) respondents sale their crops in the district market with average price of Birr 21.03 per kg. Only 3 (1.21%) respondents do sell their *Teff* crops at the zonal market with an average price of Birr 23.61 per kg. This indicates that most farmers sell their crops within the district market, and they get better prices if they sell their *Teff* crops at the zonal market. When we see the average price for the total respondents it is Birr 20.19 per kg. It is the highest for Shenkora na Minjar district (Birr 20.95 per kg) followed by Lomie district (Birr 20.54 per kg) and then Tahtai Maichew district (Birr 20.42 per kg). The lowest price is observed for the Halaba zone (Birr 18.83 per kg) (for the details, please refer to Table 11 in the annex).

The ANOVA test for the for the average timing of sales of *Teff* crops in the market among the four districts were compared and the result indicates that there is a significant difference in the average timing of sales to the market for the Halaba zone district as compared to the other three districts (P-value < 0.05). Moreover, there is statistically significant variation in the average timing of sales of *Teff* crops in the market for Lomie district as compared to the Tahtai Maichew and Shenkora na Minjar districts (P-value < 0.05) (for the details, please refer Table 6.7 above).

When we measure the strength of the linear association between the timing of sales and the total *Teff* supplied to the market and price per kg through Pearson's correlation, r = 0.456** (correlation is significant at the 0.01 level (2-tailed)) for total *Teff* crops supplied to the market and r = 0.321** (correlation is significant at the 0.01 level (2-tailed)) for average price of *Teff* crops per kg. These all indicate that there is a positive and significant relationship between timing of sales and total *Teff* crops supplied to the market and average price of *Teff* crops per kg. The result is like the previous research findings of some researchers such as Tadesse and Guttormsen (2011) which states prices are usually lower during harvest period.

6.4.8. Membership in cooperative marketing and the amount of *Teff* supplied to the market

Farmers' organizations link farmers to inputs, outputs and credit markets (Bernard and Taffesse 2012). Other researchers such as Tadesse and Guttormsen (2011) also recommended the importance of cooperatives in breaking the self-centred mentality and creating awareness towards established *Teff* supply chains characterized by win-win cooperation among chain actors.

In this regard, discussions were undertaken with the focus group participants (FGDs) and key informants in relation to the contribution and limitations of cooperatives in creating a sustainable market for the farmers. Accordingly, the study participants from Tahtai Maichew district described their opinion hereunder.

> There are three cooperatives in our Kebele; one is saving and credit cooperatives, the second is *Teff* producer cooperative (for improved seed provision) and the third is multipurpose cooperatives. The producer cooperative is the only supplier of improved seed in our district and the farmers take a good advantage of it. Earlier, farmers took their products to the market and dumped them for a cheap and unfair price. However, last year the producer cooperative bought our entire product for a better price (Study participant_7).

The other study participant from the same district also stated the following.

> Most of the farmers weren't involved in cooperatives in the past. The reason was that there were some problems within the cooperative societies in relation to the transparency of financial issues and management of the resources of cooperatives and farmers have had less trust in the cooperatives. But now we have managed and solved the problem through discussion and the cooperative has promised to buy our *Teff* crops by providing a price in the market plus 2% and we have reached agreement, which has made all the farmers happy (Study participant_21).

A study participant from Lomie district stated the following in relation to the role of marketing cooperatives in their areas.

> Sometimes cooperatives provide market information to their members, otherwise they do not have roles in marketing. However, some farmers are selling their crops to cooperatives, but most farmers do sell their crops to traders (Study participant_39).

A key informant from Lomie district stated the following in describing the limited role of marketing cooperatives.

> Cooperatives don't have a visible role in *Teff* marketing. However, they support the farmers by supplying sugar and edible oil, fertilizer, and other inputs such as chemicals. However, they have never been involved in *Teff* marketing and the tie between cooperatives and farmers is not as strong. The cooperative that we have in our area has not yet begun purchasing *Teff* crops from farmers (KII Lomie_1).

A study participant from Shenkora na Minjar district also said the following in relation to the role of cooperatives marketing in their areas.

> Sometimes cooperatives purchase *Teff* from farmers during the harvest period and sell it later at a better price. Then the dividend is divided to members based on their contribution (Study participant_44).

A key informant from Shenkora na Minjar district stated the following in describing the limited role of marketing cooperatives.

> The involvement of cooperatives in *Teff* marketing in our area is almost non-existent. They don't have a role in improving the market as they buy the product at a lower price than the traders. This makes the farmers move away from cooperatives and sell their crops to traders or consumers (KII Shenkora na Minjar_1).

Similarly, a study participant from the Halaba zone said the following.

> The multipurpose cooperatives sometimes purchase *Teff* from members and supply to local consumers in towns (Study participant_78).

From the above discussions, we can learn that cooperatives do not have a visible role in *Teff* marketing apart from providing market information to their members. They are focusing on the distribution of input and supply of industrial goods to the farming community. Some farmers are selling their *Teff* crops to cooperatives during harvest time at a cheap price and in return get a dividend after the crop is sold at a better price later. The research results also revealed that as cooperatives don't provide a better price and most of the farmers prefer to sell their crops to traders or consumers. However, in Tahtai Maichew district efforts are made by the local government to introduce marketing cooperatives and linking with major buyers. As a result, an agreement is reached between farmers and cooperatives to provide a price in the market plus 2%. There were also concerns in the transparency of financial issues and management of resources of cooperatives which is now solved through discussions.

When we see the survey result, about 131 (52.82%) of the respondents are members of marketing cooperatives. Though the non-members supply more *Teff* crops (895.56 kg per household) to the markets, the members of marketing cooperatives get a better price in the market (Birr 20.82 per kg) as compared to non-members (Birr 19.47 per kg) (for the details, please refer Table 6.9 below). This could be the result of the bargaining power of cooperatives. Similarly, as the experience of membership in cooperatives increases, respondents get a better price for their *Teff* crops. Such results are like the previous research findings of Gelo, Muchapondwa et al. (2017) and Gelo, Muchapondwa et al. (2019) that state farmers organizations tend to increase farmers' bargaining power, reduce transaction costs and render economies of scale.

Table 6.9: Membership in cooperatives marketing and supply of *Teff* and price

Membership in marketing cooperatives	Number of respondents		*Teff* supplied to the market in kg per year per household		Average price of *Teff* crops per kg	
	n	**%**	Mean	SD	Mean	SD
None members	117	47.18%	895.56	656.13	19.47	4.28
Members	131	52.82%	726.53	643.88	20.82	4.94
Total	**248**	**100%**	**806.27**	**653.86**	**20.19**	**4.68**

Source: Survey result, 2018

When we measure the strength of the linear association between membership in marketing cooperatives and the amount of *Teff* supplied to the market and price through Pearson correlation, it is weak and a negative correlation with r = -0.129* (correlation is significant at the 0.05 level (2-tailed)) for total *Teff* crops supplied to the market and which indicate non-members supply more *Teff* to the market as compared to members. The correlation for membership and price is weak but positive and significant correlation with r = 0.144* (correlation is significant at the 0.05 level (2-tailed)). This indicates members of marketing cooperatives get better prices as compared to non-members. This supports previous studies of Tadesse and Guttormsen (2011) that state cooperatives create awareness towards established *Teff* supply chains characterized by win-win cooperation among chain actors.

6.4.9. Storage facilities and the amount of *Teff* supplied to the market

Absence of required storage facilities leads to local price reduction at harvest time because all the poor farmers are forced to sell their produce during harvest period to generate income necessary for their livelihoods (Burney and Naylor 2012). *Teff* crops are produced in rural areas far away from towns where they are mostly consumed by urban households. Until the crops are consumed by the producers or supplied to the market, the crops are stored in storage called *Gotera* and plastic sacks as major packaging material from which crops are taken either to market or milling plants to get grinding services.

In this regard, a question was raised to the survey respondents whether they have storage facilities (*Gotera*) and the capacity of such storage facilities. Though it differs in size, all the respondents have storage facilities within their residence. About 156 (62.90%) respondents store their crops up to three months, 69 (27.82%) respondents store their crops from three up to six months and the remaining 23 (9.28%) respondents store their crops for more than six months.

When we see the storage capacity of the respondents, on average it is 5,559 kg per household with a standard deviation of 5,868. About 139 (56.05%) respondents own stores with the capacity of less than 5,000 kg, about 51 respondents own stores with the capacity of 5,000 kg up to 10000 kg and the remaining 58 respondents own stores with the capacity of 10,000 kg and above. The average *Teff* supply to the market is high for the respondents with a storage capacity of 10,000 kg or above (for the details, please refer Table 6.10 below). This indicates that farmers with higher storage capacity supply more *Teff* crops to the market, do have the opportunity to get better prices and earn more revenue as compared to farmers with small storage capacity. Our finding is like the previous research result of Atinkut, Bedri et al. (2017) that state long-term storages are intended to earn profits from future price increases.

The highest storage capacity (73.03 quintal) is observed for Lomie district respondents and the least storage capacity (19.81 quintal) is observed for Tahtai Maichew district. The ANOVA test for the average storage capacity among the four districts were compared and the result indicates that there is a significant difference in the storage capacity for Tahtai Maichew district as compared to the other three districts (P-value < 0.05) (for the details, please refer Table 6.7 above).

A question was also raised to the respondents in relation to the major storage problems and 27 (10.89%) respondents said that they don’t have any problem. About 142 (57.26%) respondents said insects and rats are the major problems of storage, about 40 (16.13%) respondents said poor ventilation as the major problem, about 34 (13.71%) respondents inappropriate location of store as the major problem and the remaining 5 (2.01%) respondents said small size of storage as the major storage problems.

Table 6.10: Storage capacity and the amount of *Teff* crops supplied to the market

Category of storage capacities	Category of *Teff* supplied to the market				*Teff* supplied to the market in kg per year per household	
	No *Teff* supply	Less than 1000 kg	From 1000 kg up to 2000 kg	From 2000 kg up to 3000 kg		
	Count	Count	Count	Count	Mean	SD
Up to 5000 kg	10	97	31	1	556.37	499.09
From 5000 kg up to 10000 kg	0	30	17	4	997.45	623.19
10000 kg and above	0	22	24	12	1,237.07	731.47
Total	**10**	**149**	**72**	**17**	**806.27**	**653.86**

Chi-square= 44.210 **df= 6** **Sig. = 0.001**

Source: Survey result, 2018

In order to compare the amount of *Teff* crops supplied to the market among the different categories of storage capacities, Chi-square test was used. The Chi-square test result shows that there is a significant difference among the respondents (x^2= 44.210, df= 6 and p= 0.001) as indicated in Table 6.10 above. Similarly, when we measure the strength of the linear association between storage capacities and *Teff* crops supplied to the market through Pearson correlation, it is positive and significant with r = 0.405** (correlation is significant at the 0.01 level (2-tailed)). This implies that there is a positive and significant relationship between storage capacity and total *Teff* crops supplied to the market. Our finding is similar to previous research results of Atinkut, Bedri et al. (2017) that state long-term storages are intended to earn profits from future price increases.

6.4.10. Government policy and the amount of *Teff* supplied to the market

In Ethiopia, steps taken to liberalize markets in the 1990s and promote fertilizer and seed packages have yet to generate payoffs in terms of higher cereal yields, lower food prices, or reduced dependency on food aid (Spielman, Byerlee et al. 2010). As per the conclusions of Bonger, Gabre-Madhin et al. (2002), interventions and policies to improve grain markets can be grouped into four main areas: interventions related to infrastructure, institutions, regulatory policies, and capacity-strengthening. In this regard, discussions were undertaken with the focus group participants (FGDs) and key informants about the government policy and its contribution and limitations in creating a sustainable market for the farmers.

In a focus group discussion, a study participant from Tahtai Maichew district highlighted the following concerning the role of the government.

> The existing free-market policy does support the transaction of *Teff* crops in the market as it provides freedom for farmers in setting the price of his/her own products. Since the policy gives liberty for the farmer to get profit from his/her product, we believe the policy is in the farmer's best interest. Farmers do need a lot of support from the government such as equal and peaceful market opportunities for all farmers. Above all, farmers need road infrastructure. This is because not only human beings need access to the road but also mules and donkeys need a better road to transport products to the market. Therefore, infrastructure and loan provisions are needed from the government (Study participant_22).

Another study participant from Lomie district highlighted the following about the role of the government in *Teff* marketing.

> The government has no interference in the *Teff* market as its policy is a free-market economy. The role of the government is regulating illegal trade (Study participant_38).

A key informant from Lomie district also said the following in relation to the role of the government in *Teff* marketing.

> The government doesn't intervene in the market to determine the price of *Teff* crops like the Derg regime because of its free-market policy. However, the government must monitor the collusion of traders in fixing the price of *Teff* crops (KII Lomie_2).

A key informant from the Halaba zone also highlighted the following concerning the role of the government in *Teff* marketing.

> I think the government is supporting *Teff* production like provision of technical support and access to inputs to farmers but its involvement in marketing is very limited except organizing cooperatives or unions (KII Halaba_1).

An expert from the Ministry of Trade and Industry stated the following about the free-market economy the government is following.

> Free market has a very broad definition and the policy that a country implements also matters in this regard. So, the meaning of free market can be interpreted in the context of how much wealth one is allowed to accumulate and since there is no limit set by the government, the market can be said to be free. Any farmer can produce as much as s/he can and can sell it without a limitation and intervention from the government or another third party. Also, the farmers are provided with market linkage services from the federal and regional offices and thus we can say that the market is free, and the price is being set through negotiations (KII Federal MoTI_2).

Similarly, an expert from the Ministry of Agriculture and Rural Development said the following concerning the policy and strategy of the government in creating a sustainable market for *Teff* producers.

> The fact that the market is free benefits everyone because it provides the opportunity of buying and selling and other terms and conditions of the contract including the price and quality of the crops to be decided by the buyers and sellers in the market. It provides better competition opportunities. The benefit of free-market is that it does not limit the right of farmers, traders, or consumers in buying and selling decisions. The government has a supportive role including developing national marketing policies and strategies, establishing a legal framework, developing market infrastructures such as roads, marketplaces, providing training, organizing marketing cooperatives and regulatory issues. Otherwise, the government doesn't interfere in the market to fix the price of commodities unless it is subsidized through its budget such as petroleum products, sugar, edible oil, and flour mill (KII Federal MoARD_1).

Contrary to the above views, a trader from Addis Ababa stated the following concerning the problems of illegal traders.

> The free market has killed our business as there are illegal sellers and brokers without a proper license and storage. They get a lot of benefits as they have no rent to pay for a warehouse and most customers buy *Teff* from such illegal traders as they sell it at a lower price as compared to traders with license and with storage facilities. There are only 280 traders with storage. However, the number of traders is assumed to be around 2000. The ones with the store have gone bankrupt and sold out their business. However, the farmers are benefited because they sell their product either way (KII Wholesaler_3).

Another key informant (trader) from Addis Ababa also stated the following about the problems faced during business transactions in *Teff* marketing.

> We get *Teff* from the farmers following the governmental procedure, which is working through a license. There were a lot of problems in the years 2007E.C to 2009E.C and the main problem was that the Oromia region's license was not valid in Addis Ababa. When we went and asked the concerned governmental bodies, their response was that we are only permitted to sell in Oromia and that was a big problem for us. However, this problem has been solved even though we see illegal traders and brokers who participate in *Teff* marketing using trucks. They sell the product and go back to the regions. If they could have delivered it straight to the legal traders, without reaching illegal brokers, the price could have been fair (KII Wholesaler_4).

From the above discussions, we can understand that the government is following a free-market economy. The existing free-market policy provides freedom for farmers in setting the price of his/her products and it is believed the policy is in the farmers' best interest. The farmers, traders and consumers are free to buy and sell *Teff* crops at anytime and anywhere and the price is being set through negotiations. Any farmer can produce as much as s/he can and can sell it without a limit and intervention from the government or other third parties. The government has a supportive role including development of national marketing policies and strategies, establishing a legal framework, development of market infrastructures such as roads, marketplaces, providing training, organizing marketing cooperatives and regulatory issues. However, the issue of licensing and illegal trade and brokers are the major problems in *Teff* marketing that need the attention of the government. The government should also monitor the illegal trade and collusion of traders in fixing the price of *Teff* crops through strengthening its regulatory mechanisms.

A question was raised to the survey respondents to assess the perception of respondents towards the efforts of the government in creating a favourable and enabling environment for *Teff* production and distribution. Accordingly, about 177 (71.37%) respondents said it is a "favourable environment" and about 30 (12.10%) respondents said it is an "unfavourable environment" while the remaining 41 (16.53%) respondents are not interested in providing their opinion on this issue. Respondents who assume "unfavourable environment" register low in terms of *Teff* supplied to the market (375.00 kg per household) while respondents who assume "favourable environment" register higher in terms of *Teff* supplied to the market (870.20 kg per household) (for the details, please refer Table 6.11 below). This is like the previous study of Bonger, Gabre-Madhin et al. (2002) that state government interventions and policies can improve grain markets.

Table 6.11: Government policy and the amount of *Teff* supplied to the market

Opinion on government policy	Number of respondents		*Teff* supplied to the market in kg per year per household	
	n	%	Mean	SD
Unfavourable	30	12.10%	375.00	363.12
Favourable	177	71.37%	870.20	645.14
No opinion	41	16.53%	845.85	744.23
Total	**248**	**100%**	**806.27**	**653.86**

Source: Survey result, 2018

6.5. Model specification for *Teff* supplied to the market

6.5.1. Multiple regression

Multiple regression was used to analyze the effects of the independent variables on the dependent variable. It is used when we want to predict the value of a variable based on the value of two or more other variables (Miller and Cameron 2011). The variable we want to predict is called the dependent variable (or sometimes, the outcome, target or criterion variable). The variables we are using to predict the value of the dependent variable are called the independent variables (or sometimes, the predictor or explanatory variables) (Miller and Cameron 2011).

Multiple regression allows us to determine the overall fit (variance explained) of the model and the relative contribution of each of the predictors to the total variance explained (Maharjan and Joshi 2011). In this regard, it describes how much of the variation in the total *Teff* supplied to the market can be explained "as a whole", but also the "relative contribution" of each independent variable in explaining the variance. Similarly, Azeb et al. (2017) used multiple regression models to examine the demographic, socioeconomic, and institutional factors that are associated with market participation through *Teff* supplied to the market. This model is chosen because it helps to identify factors that determine the quantity of *Teff* supplied to the market.

A model specification error can occur when one or more relevant variables are omitted from the model or one or more irrelevant variables are included in the model. If relevant variables are omitted from the model, the common variance they share with included variables may be wrongly attributed to those variables, and the error term is inflated. On the other hand, if irrelevant variables are included in the model, the common variance they share with included variables may be wrongly attributed to them. Model specification errors can substantially affect the estimate of regression coefficients. There are various methods of checking model specifications such as link tests that help one to test for possible factors as being excluded and omitted variables test to test for potential factors to be included in the model. When we come to our multiple linear regression model, a link test has been conducted. The result of the link test shows that the hatsq coefficient was found to be statistically insignificant (p-value = 0.35 > 0.05), hence the model is correctly specified. Furthermore, the omitted variable test was conducted on the model proposed and the Ramsay

Regression Specification Error Test (RESET) (F=5.51, P-value=0.003), which shows that there are no more relevant variables that were excluded from the proposed model.

In the classical regression model, each estimate gives the partial effect of a coefficient with the effects of other X variables being controlled.

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + +\beta_9 X_9 + \beta_{10} X_{10} + \beta_{11} X_{11} + \beta_{12} X_{12} + \beta_{13} X_{13} + \beta_{14} X_{14} + \beta_{15} X_{15} + \beta_{16} X_{16} + \beta_{17} X_{17} + \beta_{18} X_{18} + \beta_{19} X_{19} + \beta_{20} X_{20} + \beta_{21} X_{21}$$

Where:

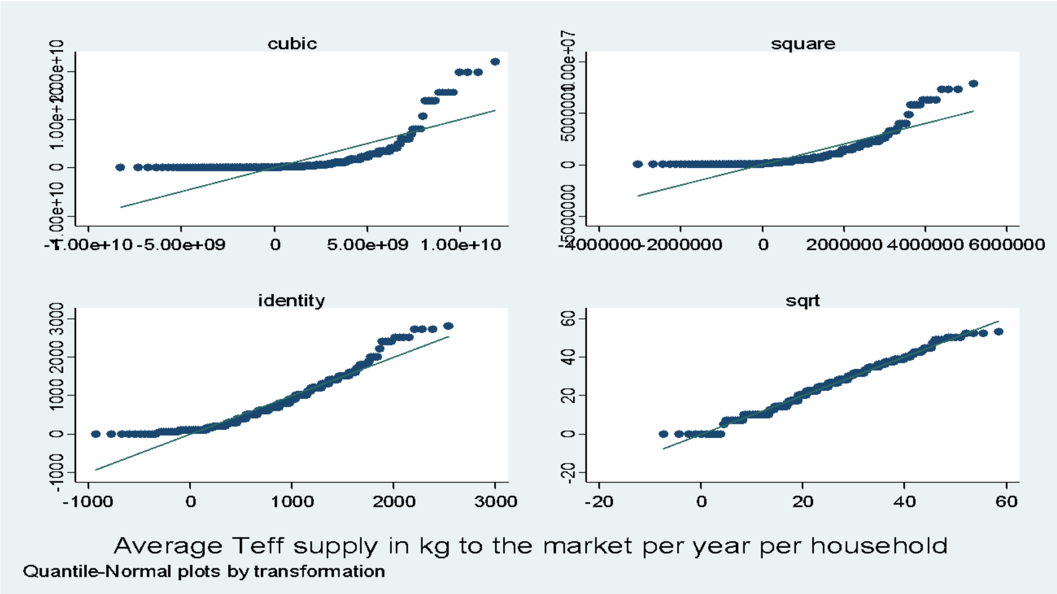
- Y=Amount of *Teff* supplied to the market in kg
- α = Intercept (constant)
- β_1 to β_{21}= Regression coefficients (It represents the mean change in the response variable for one unit of change in the predictor variable while holding other predictors in the model constant).
- X_1 to X_{21} = Explanatory variables

The different assumptions considered while using the model are discussed hereunder.

- **Normality test:** For the proposed model, the Shapiro-Wilks test is W= 0.78, df = 248, P-value < 0.0001, hence not normal. Thus, of all transformations on the response variable that ensures normality, the square root transformation of the *Teff* production was undertaken that made normally distributed (Shapiro-Wilks W = 0.9823, P-value = 0.154> 0.05), hence the square root transformed response variable become normally distributed.
- **Multicollinearity test**: The selected independent variables were checked for potential multicollinearity problems using the Variance Inflation Factor (VIF) tests. The result showed that the VIF for all predictors is less than 10 indicating that there were no multicollinearity problems in the data (for the details, refer Table 24 in the annex).
- To validate the assumptions mentioned above, the relevant tests were considered including scatter plots and partial regression plots, histogram, Normal P-P plot and Normal Q-Q plot, correlation coefficients and Tolerance/VIF values, case wise diagnostics and studentized deleted residuals.
- To ensure the normality of the data for *Teff* supplied to the market, different options of transformations were considered and the square root is the best option for linearity of the

data and it is considered to determine how well a regression model fits the data (for the details, please refer figure 6.2 below).

Figure 6.2: Transformation of *Teff* supplied to market (Normal plots by transformation)



Source: Survey result, 2018

6.5.2. Results of Coefficient of Determination (r^2)

R can be considered as a measure of the quality of the prediction of the dependent variable; in this case, *Teff* is supplied to the market and indicates a goodness level of prediction. The "R Square" represents the R^2 value (also called the coefficient of determination), is the proportion of variance in the dependent variable that can be explained by the independent variables. It is about 0.963 (96.3%) and it is the proportion of variation accounted for by the regression model (please refer Table 6.12 below for the details).

6.5.3. Multiple regression results

For linearity purposes, we have been using the square root of total *Teff* supplied to the market. While we develop the model, we have to use the coefficients to predict the total *Teff* supplied to the market from the different independent variables that can be obtained from the coefficients as indicated in Table 6.12 below.

Table 6.12: Results of multiple regression

Model Summary			
R	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
.981[a]	.963	.960	2.48533

ANOVA[a]					
	Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Regression	36514.566	21	1738.789	281.501	.000[b]
Residual	1395.967	226	6.177		
Total	37910.533	247			
Dependent Variable: sqrt of the amount of *Teff* supplied to the market (transformed)					

Coefficients[a]

Independent variables	**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
	B	**Std. Error**	**Beta**		
(Constant)	-.147	1.374		-.107	.915
Shenkora na Minjar district (SM)	2.750	.550	.096	4.995	.000
Lomie district (LOM)	1.190	.579	.042	2.056	.041
Halaba zone (HALA)	3.716	.578	.130	6.433	.000
Male (GENDER)	3.655	.578	.102	6.321	.000
Age (Age)	.000	.014	.000	-.031	.976
Family size (FAMI)	-.054	.095	-.008	-.574	.566
Number of dependents (DEPEND)	-.058	.143	-.006	-.403	.687
Not attending school (NOSCHO)	-.449	.373	-.017	-1.202	.231
Elementary school (ELEM)	-.113	.658	-.002	-.172	.864
High School (HS)	-.491	1.307	-.005	-.375	.708
Teff consumption (TCONSU)	-.014	.001	-.220	-10.31	.000
Membership in marketing cooperatives (MARCOOP)	-.898	.407	-.036	-2.205	.028
Distance to Market (DIST)	.052	.039	.022	1.325	.186
Travel time (TRATIME)	.098	.164	.009	.594	.553
Total cost of transport (TRANS)	-.002	.002	-.022	-1.038	.300
Price of *Teff* crops per kg (PRICE)	.395	.038	.149	10.428	.000
Market information (MINFO)	-.956	.622	-.021	-1.537	.126
Storage capacity (STOR)	-.002	.003	-.010	-.676	.500
Selling time (SALETIME)	.056	.099	.009	.570	.570

Role of the government (GOV)	.000	.005	.000	.026	.979
Teff production (TPROD)	.017	.000	1.015	35.763	.000

a. Dependent Variable: sqrt of the amount of *Teff* supplied to the market (transformed)

Source: Survey result, 2018

Where Y is the square root of the amount of *Teff* supplied to the market and the interpretation of the coefficient parameter estimates of the factors refers to the variable of transformed response of the amount of *Teff* supplied to the market.

Referring Table 12.6 above, the regression model for the *Teff* supply is described hereunder.

Y = -0.147 + 2.750 SM + 1.190 LOM+ 3.716 HAL + 3.655 GENDER -0.014 TEFCONS -0.898 MARCOOP + 0.395 PRICE + .017 TPROD

6.5.4. Statistical significance

Multiple regression was run to predict total *Teff* supplied to the market from the different independent variables. The F-ratio in the ANOVA Table 7.12 above tests whether the overall regression model is a good fit for the data. The table shows that the independent variables statistically and significantly predict the dependent variable, F = 281.501, $p < .05$, $R^2 = 0.963$ (i.e., 96.3 % the regression model is a good fit of the data). Among 21 variables, in addition to the significant difference among districts, three variables (*Teff* production in kg, price of *Teff* and gender) are found positively and statistically significant to the prediction (P-value < 0.05) of total supply of *Teff* crops to the market while two variables (*Teff* consumption and membership in cooperative marketing) are negatively and statistically significant to the prediction (P-value < 0.05) of total amount of *Teff* supplied to the market.

6.5.5. Explanation on the results of multiple regression model

For linearity purposes, we have been using the square root of total *Teff* supplied to the market. While we develop the model, we must use the square of the coefficients so that the general form of the equation to predict *Teff* supplied to the market can be obtained from the coefficients for each variable.

Districts: The regression analysis indicates that there is statistically significant difference at 95% level in determining *Teff* production among the four districts.

Gender: In our assumption we stated that men are likely to sell more due to their natural ability to bargain, negotiate and enforce contracts (Cunningham, McGinnis et al. 2008). In our regression analysis, gender is found to be positively affecting (statistically significant at 95% level) in determining the amount of *Teff* supplied to the market in the study areas. As a result, being a male can increase the volume of *Teff* supplied to the market by 9.06% as compared to female counterparts. This result is like the findings of Martey, Al-Hassan et al. (2012) that argued males tend to be more aware of marketing channels because they are more networked socially and undertake most agricultural activities.

Price of *Teff* crops: In our assumption, we stated that the price of *Teff* crops positively affects the amount of *Teff* supplied to the market. In the regression analysis, the price of *Teff* crops is found to be positively affecting (statistically significant at 95% level) in determining the amount of *Teff* supplied to the market in the study areas. As a result, an increase in the price of *Teff* crops by one Birr per kg increases the amount of *Teff* supplied to the market by 3.95% per household. Given the size of 'beta' (the 'standardized' regression coefficient), an indication of the share the factor has in the determination of the amount of *Teff* supplied to the market, it appears that price has an impact of 0.149 which is next to *Teff* production. Our findings is like the research outputs of Azeb et al. (2017) that state there is a positive and significant relationship between price and *Teff* supplied to the market and it indicates that as the price of *Teff* at market rises, the quantity of *Teff* sold at the market also rises, which in turn increases the quantity of *Teff* sold per household per year.

***Teff* production in kg:** *Teff* production is one of the variables that positively and significantly affect the amount of *Teff* supplied to the market. In the regression analysis, *Teff* production is found to be positively affecting (statistically significant at 95% level) in determining the amount of *Teff* supplied to the market in the study areas. An increase of one kg of *Teff* production increases the amount of *Teff* supplied to the market by 1.7%. Given the size of 'beta' (the 'standardized' regression coefficient), an indication of the share the factor has in the determination of the amount of *Teff* supplied to the market, it appears that *Teff* production has the greatest impact (1.015) as compared to other variables. This indicates that households who produce more quantity of *Teff* had also supplied more to the market. This result is like the previous findings of Azeb et al. (2017) that state a unit increase in the quantity of *Teff* produced has caused an increase of 0.367 quintal of marketable *Teff*.

***Teff* consumption**: Food consumption in SSA has recently been supported by imported food. Population has been growing at a faster rate compared to food production in developing countries. In this regard, Nicolas et al. (2012) found that the average growth rate of imported food to be 5% while average growth rate in food production and food export to be 2% and 1%, respectively. This is because the population has been growing at a faster rate compared to food production. In such cases, *Teff* consumption was expected to have a negative impact on *Teff* supplied to the market. In the regression analysis, an increase of one person increases *Teff* consumption in the household and reduces the amount of *Teff* supplied to the market by 1.4%. Thus, *Teff* consumption is found to be negatively affecting (statistically significant at 95% level) in determining the amount of *Teff* supplied to the market.

Membership of marketing cooperative: In our assumption, we stated that membership in cooperatives marketing positively affects the amount of *Teff* supplied to the market. In the regression analysis we found that the coefficient for the membership in cooperatives marketing to be negative. This implies that *Teff* producers prefer to supply to the market by themselves rather than through marketing cooperatives. The result of the survey indicates that the supply of *Teff* crops by non-members is 10.2% higher than members of marketing cooperatives. Our finding is against the results of previous research findings which state farmers prefer to sale though farmers' organizations as they tend to increase farmers' bargaining power, reduce transaction costs and render economies of scale (Gelo, Muchapondwa et al. 2017; Gelo, Muchapondwa et al. 2019).

6.6. Problems of *Teff* distribution

To identify the major problem of *Teff* distribution and marketing, discussions were undertaken with FGD participants and key informants in all districts. As a result, a study participant from Tahtai Maichew said the following.

> The market chain is too long and the farmers are not benefited as much as they deserve to be. The biggest market problem that we have is that we pay a high amount of tax when we want to sell *Teff* crops. The tax is two hundred birr per quintal when a farmer wants to sell his/her Teff crops and this is a big problem for farmers (Study participant_13).

A study participant from Lomie district said the following in relation to market problems.

> There are problems with the scale and in some cases adulteration (mixing with others) of *Teff* crops (Study participant_40).

A study participant from Shenkora na Minjar district said the following about the market problems.

> The price is fixed by the traders and thus farmers face the problem that they may return home without selling their product (Study participant_43).

A study participant from the Halaba zone said the following about the market problems.

> Lack of proper scale and price fluctuations are the main problems in *Teff* marketing (Study participant_74).

A key informant from Lomie district said the following concerning the problems of *Teff* marketing.

> Actually, the traders are fixing the price for *Teff* crops in the market. Though the farmers do have the right to reject the price set by traders, the farmer is usually the price-taker. Some traders store *Teff* for a long time to manipulate the price and the market so that they sell it when it gets expensive. This makes the market unstable (KII Lomie_2).

A key informant from Addis Ababa highlighted the following about the problems of *Teff* marketing.

> The farmers do not directly contact the consumers or traders as there are illegal traders and brokers in between. There are government offices responsible for addressing this issue. However, they are not working as expected. The other problem is inflation of price of *Teff* crops when the demand gets high. If the production improves, I think that the problem will be solved (KII Wholesaler_1).

Another key informant from Addis Ababa also stated the following in relation to the major problems of *Teff* marketing.

> There are sometimes market instabilities, and it is hard to make the market stable all the time. It is often hard to decide on the market or the farmers. The farmers have information on the price of *Teff* and the price is left for competition (KII Wholesaler_3).

A key informant from Addis Ababa also highlighted the following about the problems of *Teff* marketing.

> The government and district level authorities have tried to get rid of illegal traders and brokers who buy and sell directly from freight. But the job has not been consistent and effective (KII Wholesaler_6).

A key informant from Tigrai region also stated the following in relation to the problems of *Teff* marketing.

> The major marketing problems are long value chains from farmers to consumers, the absence of strong marketing cooperatives and lack of transport facilities from remote areas to urban areas (Tigrai expert_1).

A key informant from the Ministry of Trade and Industry also stated the following concerning the problems of marketing.

> The market chain for *Teff* crops is too long. This makes the illegal traders and brokers part of the chain and without adding value they are getting financial benefits. On the other side, the farmers are not getting benefits as much as they deserve to be (KII Federal MoTI_2).

From the above discussions with FGD participants and key informants, we can identify the major *Teff* marketing problems as follows. The existence of illegal traders and brokers in the *Teff* value chain, poor monitoring of the illegal traders from government authorities, price is fixed by traders and usually the farmers are price takers, absence of strong marketing cooperatives, fluctuations and inflation of price of *Teff* crops price, lack of proper scale, traders store *Teff* for long time to manipulate the price (hoarding), lack of transport facilities to remote areas, high of tax rates and adulteration (mixing with others).

As per the discussion with FGD participants and key informants, the major problems of *Teff* distribution of Halaba zone are lack of fixed market at *Kebele* level, fluctuation of price of *Teff* crops, kilogram cheating and limited market opportunity. Fluctuation of the price for *Teff* crops is the major problem for Lomie district while lack of market linkage is the major problem of marketing for Tahtai Maichew district. Mixing a variety of *Teff* crops (adulteration), low-quality control mechanisms and lack of strong cooperatives are the major problems of Minjar na Shenkora district.

On the other side, the survey respondents were asked to identify the major five problems that affect *Teff* distribution in their localities. Accordingly, in the Halaba zone, the problem of middlemen (traders), low price of *Teff* crops in the market, lack of market information, poor market linkage by the government and problem of finance were identified as the major problems for *Teff* distribution. Similarly, in Lomie district, poor market linkage by the government, low price of *Teff* crops in the market, problem of finance, long channel of market and the problem of middlemen (traders) were identified as the major problems for *Teff* distribution. In Shenkora na Minjar district the major five problems of *Teff* distribution are identified to be the problem of middlemen (traders), low price of *Teff* crops in the market, problem of finance, lack of market information and poor market linkage by the government. Likewise, the five major problems identified by Tahtai Maichew district respondents are poor market linkage by the government, low price of *Teff* crops in the market, transportation problem, loading-unloading problems and the problem of finance (long channel of market or low bargaining power of producers).

Poor market linkage by the government, low price of *Teff* crops in the market and problem of finance are mentioned by all the districts as a major problem of *Teff* distribution. The problem of middlemen (traders) was mentioned as a major problem by three districts. Lack of market information and long channels of the market were mentioned as a major problem by two districts. When we see the overall problems of *Teff* distribution for all the districts, problem of middlemen (traders) is ranked 1^{st} (49.19% of the respondents), poor market linkage by the government ranked 2^{nd} (47.98% of the respondents), low price of *Teff* crops in the market ranked 3^{rd} (44.76% of the respondents), problem of finance ranked 4^{th} (39.52% of the respondents) and lack of market information ranked 5^{th} (34.27% of the respondents). The other problems as mentioned by survey respondents are long channel of market, transportation problem, low bargaining power of producers, storage problems, loading-unloading problems, adulteration problems, absence of standardized grading systems, absence of quality control mechanisms, problem of brokers and illegal trade, scaling problems, lack of market for *Teff* products, problem of infrastructure and marketing policy and regulation related problems.

When we see the share of the distribution problems at the district level, the highest problem (41.14%) is observed for the Lomie district followed by Tahtai Maichew district (30.47%). The share of Shenkora na Minjar district is about 17% while the share of Halaba zone is 11.39% which is the least among the district. This shows that the distribution problems are highly observed in Lomie and Tahtai Maichew districts.

Summary

This chapter summarizes the findings and data for the third research objective. It tries to explore the features of *Teff* marketing and identify factors affecting the distribution of *Teff* in the market.

In this regard, the major findings of *Teff* supplied to the market and the factors affecting the performance of producers are presented hereunder. Some of the major findings are summarized and presented as follows.

From the study at hand, we can learn that a free-market economy is the basic economic policy for the country. Farmers do sell their *Teff* crops at anytime and anywhere without limit but they mostly prefer *Kebele* or district markets. As per the opinion of the study participants, the free market is good as it makes the farmers, traders and consumers freely negotiate, buy, and sell their *Teff* crops without limit. From the survey study, we can understand that producers, intermediaries or commission agents, assemblers, brokers, wholesalers, retailers, and consumers are involved in the *Teff* value chain. Farmers sell their *Teff* crops to people living in towns including public servants, workers, retailers, and cooperatives mostly. Farmers do also sell their *Teff* crops in the local market to traders, urban dwellers such as civil servants and workers.

Farmers simply sell *Teff* by themselves and what they need to do is travel to the nearer market. The total sales volume of all the respondents is about 199,955 kg (147,285 kg of *Magna Teff* and 52,670 kg of white *Teff*). From the survey result, we can see that farmers do sell their *Teff* crops mainly to wholesales. In this regard, about 110,870 kg (55.45% of the total volume of marketed *Teff* crops) goes to wholesalers. About 50,035 kg (25.02% of the total volume of marketed *Teff* crops), about 17,785 kg (8.89% of the total volume of marketed *Teff* crops) and about 14,115 kg (7.06% of the total volume of marketed *Teff* crops) are distributed to cooperatives, retailers, and urban consumers, respectively. The remaining 7,150 kg (3.58% of the total volume of marketed *Teff* crops) is distributed to *Injera* bakers (processors), rural consumers, brokers, assemblers, and millers. On the other hand, the survey result revealed that the involvement of illegal brokers in the marketing of *Teff* crops is affecting the business negatively.

From the survey result, we can see that male-headed households on average supply about 846.75 kg of *Teff* crops to market per year while female-headed households supply about 551.47 kg of *Teff* crops to market per year. The survey result also indicates that the average annual consumption of cereal crops is 912.58 kg per household with a standard deviation of 409.01.

The amount of *Teff* supplied to the market is highest (952.37 kg per household) for those respondents who do not attend schools as compared to literates. The Chi-square indicates that there is a difference in the amount of *Teff* crops supplied to the market among the illiterate and literate respondents whereby illiterates are supplying more *Teff* as compared to literates and this result is against previous studies. On the other hand, the survey result indicates that respondents with market information supply more *Teff* crops (810.33 kg per household per year) to the market as compared to respondents without market information (760.00 kg per household per year).

Respondents on average travel about 6.37 kilometres to the nearest major market in their area with a standard deviation of 5.15. Farmers located around the main roads use freight cars. However, those who are away from the road, use their pack animals such as donkeys and mules, human labour and carts to transport their *Teff* crops to market.

About 150 (60.49%) respondents do sell *Teff* crops within three months after harvest and thus get lower prices as there is excess supply in the market. The price of *Teff* has shown an increasing trend from year to year and even within a year. In principle, the price is determined through negotiations in the market and the farmers do have the right not to sell their crops. However, the traders talk to each other and fix the price of *Teff* crops. If the traders don't buy with the price, they set there is nothing the farmers can do. Farmers face the problem that they may return home without selling their *Teff* crops.

When we see the types of *Teff* crops supplied to the market, the total supply of *Teff* crops by the respondents is about 199,955 kg. From this total amount, about 147,285 kg (73.66%) is *Magna Teff* (super white *Teff*) and the remaining 52,670 kg (26.34%) is white *Teff*. Neither red nor mixed *Teff* is supplied to the market by the respondents in 2010 E.C (2017/18). A total of 238 (95.97%) respondents supplied *Teff* crops to the market. About 171 (68.95%) respondents supplied *Magna Teff* while the remaining 67 (27.02%) respondents supplied white *Teff* to the market. When we see the average price for kg for the two types of *Teff* crops it is about Birr 21.21 per kg for *Magna Teff* and Birr 19.72 per kg for white *Teff* making total revenue of Birr 4,162,567.25 to the respondents from sale of *Teff* crops.

The survey result indicates that cooperatives do not have a visible role in *Teff* marketing apart from providing market information to their members. They are focusing on the distribution of input and supply of industrial goods to the farming community. About 131 (52.82%) of the respondents are members of marketing cooperatives. Though the non-members supply more *Teff* crops (895.56 kg per household) to the markets, the members of marketing cooperatives get a better price in the market (Birr 20.82 per kg) as compared to non-members (Birr 19.47 per).

When we see the storage capacity of the respondents, about 139 (56.05%) respondents own store with the capacity of less than 5,000 kg, about 51 (20.56%) respondents own store with the capacity of 5,000 kg up to 10000 kg and the remaining 58 (23.39%) respondents own stores with the capacity of 10,000 kg and above. The result of the survey indicates that farmers with higher storage capacity supply more *Teff* crops to the market, do have the opportunity to get better prices and earn more revenue as compared to farmers with small storage capacity.

The government has no interference in the *Teff* market as it is following a free-market economy and farmers are also free to sell their crops. The existing free-market policy of the government provides freedom for farmers in setting the price of his/her products and it is believed the policy is in the farmers' best interest. The farmers, traders and consumers are free to buy and sell *Teff* crops at anytime and anywhere and the price is being set through negotiations. Any farmer can produce as much as s/he can and can sell it without a limitation and intervention from the government or other third parties. The government has a supportive role that includes the development of national marketing policies and strategies, establishing a legal framework, developing market infrastructures such as roads, marketplaces, providing training, organizing marketing cooperatives and regulatory issues.

Among 21 variables, three variables (*Teff* production in kg, price of *Teff* and gender) are found positively and statistically significant to the prediction (P-value < 0.05) of total supply of *Teff* crops to the market while two variables (*Teff* consumption and membership in cooperative marketing) are negatively and statistically significant to the prediction (P-value < 0.05) of total amount of *Teff* supplied to the market.

Though the types and severity of problems of *Teff* distribution differ among districts, the major marketing problems are the existence of illegal traders and brokers in the *Teff* value chain and poor monitoring of the illegal traders from government authorities. Usually, farmers are price takers and the prices are fixed by traders (collusion of price), absence of strong marketing cooperatives, fluctuations and inflation of price of *Teff* crops price, lack of proper scale, traders store *Teff* for long time to manipulate the price (hoarding), lack of transport facilities to remote areas, high tax rates and adulteration (mixing with others) are mentioned as major problems. Poor market linkage by the government, low price of *Teff* crops in the market and problem of finance are mentioned by all the districts as the major problem of *Teff* distribution. The problem of middlemen (traders) was mentioned as a major problem by three districts. Lack of market information and long channels of the market were mentioned as a major problem by two districts.

CHAPTER SEVEN: EFFECTS OF LOCAL AND GLOBAL *TEFF* PRODUCTION AND DISTRIBUTION TO THE LIVELIHOOD OF SMALLHOLDER FARMERS

7.1. Introduction

This chapter presents the findings of both qualitative and quantitative study results on the local and global effects of *Teff* production and distribution to the livelihoods of smallholder farmers in study areas. In this regard, it tries to answer the fourth objective of the research that focuses on the effects of *Teff* production and distribution to the livelihood of smallholder farmers. As presented in the conceptual framework, the contribution of *Teff* to the livelihood of smallholder producers is seen from consumption of *Teff* crops by the household and from an income generated from the sale of *Teff* crops in the market. The effect of the global demand for *Teff* crops on production and distribution is also presented.

7.2. Effects of local *Teff* production to the livelihood of smallholder farmers

7.2.1. Importance of *Teff* production to the livelihood of smallholder farmers

The use of *Teff* for Ethiopians is basically as source food. It is one of the most prominent foods for humans and animals and serves as the major source of income for farmers. Considering its importance to society, an expert from the Ministry of Agriculture and Rural Development highlighted the following.

> *Teff* has various benefits. Culturally, it is one of the most respected crops. In rural areas, it is used for ceremonies and the farmers don't use it in every day of their livelihood. They use it during ceremonies and festivities such as serving special guests and weddings. Most of the time, farmers use it by mixing with other crops. Its values are not only for its grains but also its straw as a high-value crop for animals. It is preferable to feed cows and for farming oxen. It has a high nutrient content that two-third of the protein that Ethiopians get is from this crop. Therefore, it has important value as a source of protein for the population. It is also an indicator of the economic status of a family (Federal MoARD_1).

In an FGD, the socio-economic importance of *Teff* to the society was discussed and a participant from Tahtai Maichew district stated the following.

> One of the advantages of *Teff* is its positive impact on health. Firstly, doctor advice for people to feed red *Teff* as a soup so that the body generates more blood and thus it has medical benefits.

> Secondly, white *Teff* has a great market demand and it is profitable. Farmers can solve their socio-economic obligation by selling it (Study participant_1).

In support of the above argument, another FGD participant from Shenkora na Minjar district stated the following.

> *Teff* is important as food for people. Its straw is also used to feed cattle. It is also an important source of income for farmers. Its straw can also generate income and in some cases be used for building houses (plastering) by combining it with soil and sand. *Teff* is good for health, good to eat but hard to find (Study participant_53).

In relation to the traditional health benefits, FGD participants from the Halaba zone highlighted the following.

> Traditionally, *Teff* is preferred to other crops because those who feed it have better blood circulation. Particularly, red *Teff* is believed to be medicinal for mothers who gave birth, and they are advised to drink it in the form of a soup. It is also important for children in the form of local bread. People think that it has valuable vitamins (Study participant_84).

From the FGD discussions, we can see that the first use of *Teff* crop is as the major source of food for people in the form of staple food such as *Injera*, bread and soup in all study areas. The second use of *Teff* is for its straw stalks which are used as fodder for cattle and as an additional source of income for farmers if the straw is marketed. Thirdly, nutritionally, it is good to eat and as a source of protein for the people. Fourthly, with its medicinal use it is recommended for improved blood circulation; increased blood; lactating mothers and child feed. Traditionally, it is believed to help people in blood circulation especially for mothers who gave birth and children for growth. The fifth major use is for its economic benefit as it is a major source of cash income for the farmers. It has a high demand in the market and a very good market price as compared to other crops and thus it is used as a major source of income for farmers. Sixth, it is an indicator of the economic status of a family. In this regard, as a cash crop, the commercialization has given rise to high profits and improved the quality of life of farmers. Seventh, culturally, *Teff* is used during ceremonies and festivities such as serving special guests and weddings. Lastly, in some cases, farmers use a straw for building houses (plastering) in combination with soil and sand. This result is like the findings of other scholars such as Berhane, Paulos et al. (2011) which states *Teff* is a commercial crop mainly because of the high price and it is nutritionally rich with a high level of iron and calcium and has the highest amount of protein among cereals consumed in Ethiopia. It ranks low on the glycemic index (making it suitable for consumption by Type II diabetics) as it is gluten-free and has high fiber content (McGuire 2015).

On the other hand, from the discussion, we can understand that it is hard to produce *Teff* as it demands more care and labour as compared to other cereal crops. This result is similar to previous research findings of Cheng, Mayes et al. (2017) that state *Teff* is a very tiny cereal which is produced in a very drudgery system and has several problems in its production and postharvest management.

7.2.2. Consumption of *Teff* and its contribution to the livelihood of farmers

Teff is primarily used as the major food staple and eaten in the form of *Injera*. Despite having significantly lower yields than most cereal crops, *Teff* has been dedicated to its production by smallholder producers (Roseberg, Norberg et al. 2005; CSA 2011). *Teff* can also be stored for many years without being seriously damaged by common storage insect pests (FAO 2015).

In this regard, discussions were undertaken with the focus group participants (FGDs) and key informants. A question was asked to the respondents about the primary purpose of growing *Teff* crops in their areas and a study participant from Tahtai Maichew district stated the following.

> The primary purpose of growing *Teff* is feeding households and it is also used as a major source of income for the households. The hay of *Teff* is also used for animal feeding (Study participant_14).

Another study participant from Shenkora na Minjar district also stated the following in relation to the primary purpose of producing *Teff* crops.

> We use it for both consumption and market. Most farmers change their lives by selling *Teff* and it is the main cash crop (Study participant_59).

A study participant from the Halaba zone also stated the following in relation to the primary purpose of growing *Teff* crops.

> The primary purpose of *Teff* production in our area is for marketing purposes and generating income from it and thus farmers produce *Teff* mainly for the market (Study participant_71).

In describing the consumption of *Teff* crops, a key informant from the Ministry of Agriculture and Rural Development stated the following.

> It is known that most of the crops are produced by the rural community and smallholder farmers. Coming to *Teff*, this crop is mainly grown for cash rather than for consumption. Since it has a high value in the market, the farmers just sell it in the market so that they can buy other crops. They use it during festivities and ceremonies. Therefore, the primary purpose of producing *Teff* crops in rural areas is to generate income rather than for consumption (KII Federal MoARD_1).

Similarly, a key informant from the Ministry of Trade and Industry raised the following issues in relation to the primary purpose of producing *Teff* crops.

> Often farmers produce *Teff* for the market, even though they also use it for consumption by mixing it with other crops. This is because there is high demand in the market and it enables farmers to get better price and revenue as compared to other cereal crops (KII Federal MoTI_2).

From the above discussions, two views are raised by the study participants. Most of the study participants raised the issue that farmers are producing *Teff* crops for both consumption and market purposes. The other view is that as *Teff* is a cash crop, the prior reason for producing *Teff* is for market and next to it is for consumption. From the above discussions, we can say that the primary purpose of producing *Teff* is for the market and farmers consume it by mixing it with other crops. In this regard, from the ideas of the study participants, we can see that there is high demand in the market for *Teff* crops and it enables farmers to get a better price as compared to other crops. It is also the major source of income for the farmers and the farmers change their lives by selling *Teff*. Its hay is also used for animal feeding. This result is similar to the findings of some scholars that state *Teff* is one of the most important preferred cereal crops of Ethiopia, both in terms of food and nutrition security and its high price in the market makes it an attractive cash crop for farmers (Crymes 2015; FAO 2015). It is also similar to other researchers who stated despite having significantly lower yields than most cereal crops, *Teff* has been dedicated to its production by smallholder producers (Roseberg, Norberg et al. 2005; Assefa 2015).

The average *Teff* production for all survey respondents is 1104.13 kg per household with a standard deviation of 757.39. From the survey result, we can see that the average *Teff* consumption per household for all respondents is about 297.26 kg per household per year with a standard deviation of 197.52. This indicates that the respondents on average consume about 26.92% of their *Teff* crops. When we see the consumption of *Teff* separately for each district, the highest *Teff* consumption is observed for Lomie district respondents (449.84 kg per year per household) followed by Shenkora na Minjar district (321.77 kg per year per household) and Tahtai Maichew district (287.90 kg per year per household). The least consumption is observed for the Halaba zone (129.52 kg per year per household). The result of the comparison of the *Teff* consumption among the districts indicates that there is variation among the farmers.

From the survey result, we can also see that *Teff* is used by the respondents for household consumption. The average consumption of cereal crops is 76.05 kg per household per month. If we compare the consumption of *Teff* in relation to other cereal crops as indicated in Table 7.1 and Table 7.2 below, *Teff* crop is the most-consumed crop covering 32.54% from the total cereal crops with an average consumption of 24.75 kg per month per household. The survey result shows that the average *Teff* consumption of rural farmers is about 58 kg per person per year (297.26 kg per year per household for an average of 5.12 family size). Moreover, *Teff* is found to be the first in terms of volume of consumption (24.75 kg per month per household for an average of 5.12 family size) as compared to other cereal crops. This shows that *Teff* is highly consumed by rural households and it is the most preferable means of livelihood for rural farmers.

Maize is the second most consumed crop covering 25.61% of the total cereal crops (with an average consumption of 19.48 kg per month per household) and wheat is the third most consumed cereal crop covering 20.81% (with an average consumption of 15.83 kg per month per household). Sorghum, small millet and barley follow the next ranks with average monthly consumption of 8.44 kg, 7.28 kg and 0.28 kg, respectively (for the details, please refer to Table 7.1 below).

Table 7.1: Monthly consumption of cereal crops by district

District	Mean and SD	Consumption of cereal crops in kg per month per household							Monthly consumption per person
		Teff	**Maize**	**Wheat**	**Sorghum**	**Small millet**	**Barley**	**Total cereal crops**	
Halaba	Mean	10.73	35.16	2.58	8.47	27.34	0.00	84.27	14.38
	SD	8.56	24.21	9.53	13.20	14.79	0.00	46.46	7.40
Lomie	Mean	37.45	9.95	30.89	0.00	0.00	0.08	78.37	17.96
	SD	17.33	14.95	13.95	0.00	0.00	0.64	27.10	8.08
Shenkora na Minjar	Mean	26.82	0.73	24.92	15.44	1.61	0.00	69.52	17.91
	SD	11.99	4.03	17.41	19.07	9.09	0.00	31.35	9.61
Tahtai Maichew	Mean	24.00	32.06	4.92	9.84	0.16	1.05	72.03	14.24
	SD	14.59	19.96	8.07	13.85	1.27	3.75	26.35	4.60

Total	**Mean**	**24.75**	**19.48**	**15.83**	**8.44**	**7.28**	**0.28**	**76.05**	**16.12**
	SD	**16.47**	**22.69**	**17.69**	**14.52**	**14.49**	**1.94**	**34.08**	**7.81**

Source: Survey result, 2018

When we see the monthly average consumption of cereals at the district level, respondents of Halaba zone on average consume about 84.27 kg per month per household, while the two major cereal crops used for consumption are maize (35.16 kg per month per household) and small millet (27.34 kg per month per household). In Lomie district, the monthly average cereal consumption is about 78.37 kg per month per household, and the two major cereal crops used for consumption are *Teff* crops (37.45 kg per month per household) and wheat (30.89 kg per month per household). In Shenkora na Minjar district the monthly average cereal consumption is about 69.52 kg per month per household and the two major cereal crops used for consumption are *Teff* crops (26.82 kg per month per household) and wheat (24.92 kg per month per household). In Tahtai Maichew district, the monthly average cereal consumption is about 72.03 kg per month, and the two major cereal crops used for consumption are maize (32.06 kg per month per household) and *Teff* crops (24.00 kg per month per household). From this, we can understand that *Teff* is the major cereal crop used for consumption and means of livelihood for the respondents in the three districts, while it is not in the Halaba zone. Wheat is the major crop used for household consumption in Lomie and Shenkora na Minjar districts, while Maize is the major crop used for consumption in Halaba zone and in Tahtai Maichew district. Small millet is also the major crop used for consumption in the Halaba zone. Due to the higher family size (6.1 persons per household), the consumption for cereal crops is the highest (about 84.27 kg per month per household) for the respondents of the Halaba zone as compared to other districts.

On the other hand, the monthly average of cereal crops for consumption per person for all respondents is 16.12 kg per person. The monthly cereal crops consumption per person is high (17.96 kg per person) for Lomie district as compared to other districts while the least monthly cereal crops consumption per person (14.24 kg per person) is for Tahtai Maichew district (for the details, please refer Table 7.1 above).

The result of the research also indicates that *Teff* is used as the major food staple and is the most preferred food for consumption by farmers. This shows the importance of *Teff* crops for the livelihood of the farming community. Despite earlier research findings, nowadays, *Teff* is consumed by rural farmers as well. It is found to be the first in terms of volume of consumption (24.75 kg per month per household) among other crops which indicates that it is the most preferable crop for consumption by the rural farmers (for the details, please refer to Table 7.2 below). This result is against earlier findings of Roseberg, Norberg et al. (2005) that state *Teff* crop is the most preferred cereal among better-off households, especially in urban areas.

The ANOVA test for the average yearly consumption of *Teff* crops across the four districts shows that there is a significant statistical difference for the Halaba zone from all the other three districts (P-value < 0.05). Moreover, there is a statistical variation for the yearly average consumption of *Teff* for Lomie district as compared to Tahtai Maichew and Shenkora na Minjar districts (P-value < 0.05) (for the details, please refer Table 7.4 below). Similarly, there is a statistical variation in relation to monthly consumption of cereals per person. In this regard, the average monthly consumption of cereal crops per person for Tahtai Maichew is statistically different from that of Shenkora na Minjar and Lomie districts (P-value < 0.05). However, the ANOVA analysis for the monthly average consumption of cereal per household indicates that there is no statistical difference among the four districts (P-value > 0.05) (for the details, please refer Table 7.4 below).

Table 7.2: Monthly consumption of cereal crops in kilogram per household

Types of cereal crops	**Average monthly consumption of cereal crops in kg per household**		**Percent from total cereal crops**	**Rank**
	Mean consumption	**SD**		
Teff	24.75	16.47	32.54	1st
Maize	19.48	22.69	25.61	2nd
Wheat	15.83	17.69	20.81	3rd
Sorghum	8.44	14.52	11.09	4th
Small millet	7.28	14.49	9.57	5th
Barley	0.28	1.94	0.37	6th
Rice	0.00	0.00	0.00	
Other cereal crops	0.00	0.00	0.00	
Total cereal crops	**76.05**	**34.08**	**100.00**	

Source: Survey result, 2018

7.3. Financial contribution of *Teff* marketing to the livelihood of smallholder farmers

7.3.1. Profitability analysis of *Teff* marketing

a. Revenue from *Teff* marketing

When we see the survey result in relation to the revenue from *Teff* marketing, about 85 (34.27%) respondents generate less than Birr 10,000.00 from marketing of *Teff* crops and about 68 (27.42%) respondents generate from Birr 10,000.00 up to Birr 20,000.00 from marketing of *Teff* crops. Only 41 (16.53%) respondents generate total revenue of Birr 30,000.00 and above from marketing of *Teff* crops. When we see the revenue from *Teff* marketing at district level, all the respondents of Tahtai Maichew district generate less than Birr 10,000.00 from marketing of *Teff* crops and this could be because of low *Teff* production (427.02 kg per household) of the district as compared to other districts. From the 41 respondents who generate total revenue of Birr 30,000.00 and above from marketing of *Teff* crops, 33 respondents are from Lomie district as it is the highest *Teff* producing district (1861.29 kg per household) as compared to other districts (for the details, please refer Table 7.3 below). The result of the survey is similar to the report of the Central Statistical Authority of Ethiopia which states that Oromia and Amhara regional states are the major *Teff* producer regional states and the major source of *Teff* crops for the market (CSA 2017/18). Our finding is also similar to the research output of Fikadu et al. (2019) that state Oromia region is the most important *Teff* producing area in the country; and its share in total national production is estimated to be as high as 48%. The second highest region is Amhara region with 39%. The rest regions are relatively less important.

Table 7.3: Category of revenue from the sale of *Teff* crops by district

Category of revenue from sale of *Teff* crops	Name of district				Total	
	Halaba	Lomie	Shenkora na Minjar	Tahtai Maichew	Count	Percent
No revenue at all	1	2	0	7	10	4.03
Up to Birr 10,000.00	19	5	7	55	86	34.68
From Birr 10,000.00 up to Birr 20,000.00	28	11	29	0	68	27.42
From Birr 20,000.00 up to Birr 30,000.00	10	11	22	0	43	17.34

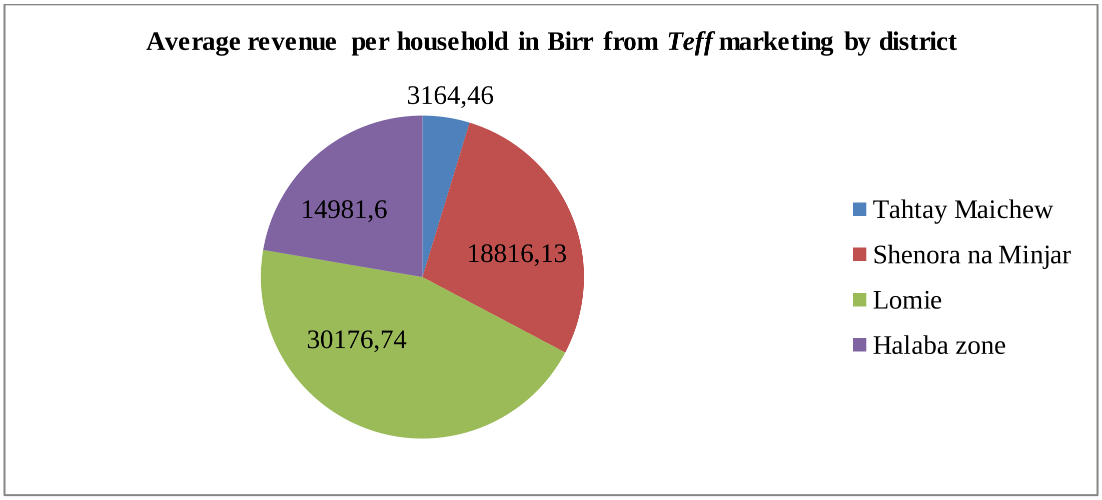
From Birr 30,000.00 up to Birr 40,000.00	2	18	2	0	22	8.87
Birr 40,000.00 and above	2	15	2	0	19	7.66
Total	**62**	**62**	**62**	**62**	**248**	**100.00**

Source: Survey result, 2018

The average revenue generated from sale of *Teff* crops for all the respondents is Birr 16,784.73 per household per year with a standard deviation of 14,039.58. If we see the average revenue generated from sale of *Teff* crops by district, the highest is for Lomie district (Birr 30,176.74 per year per household) followed by Shenkora na Minjar district (Birr 18,816.13 per year per household) and Halaba zone (Birr 14,981.60 per year per household). The average revenue generated from sale of *Teff* crops is observed to be the least for Tahtai Maichew district (Birr 3,164.46 per year per household). The result of the survey is like the report of the Central Statistical Authority of Ethiopia which states that Oromia and Amhara regional states are the major *Teff* producer regional states and the major source of *Teff* crops for the market (CSA 2017/18). The ANOVA test for the average revenue generated from *Teff* marketing across the four districts shows that there is a significant statistical variation among Tahtai Maichew, Shenkora na Minjar and Lomie districts (P-value < 0.05). Moreover, there is a statistically significant variation in average revenue generated from *Teff* marketing for Halaba zone as compared to Lomie and Tahtai Maichew districts (P-value < 0.05) (for the details, please refer table 7.4 below).

The contribution of *Teff* to the livelihood of rural farmers can be seen from two sides. First, as cash crop, it is the source of income for the farmers and though there is a difference among districts, farmers on average get revenue of Birr 16,784.73 per household per year (please refer table 7.4 below). Second, despite earlier research findings, nowadays, *Teff* is consumed by rural farmers as well. It is found to be the first in terms of volume of consumption (24.75 kg per month per household) or (about 32.54% from the total cereal crops; please refer table 7.2 above) among other crops which indicate that *Teff* is the most preferable means of livelihood by the rural farmers.

Figure 7.1: Average revenue per household in Birr from *Teff* marketing by district



Source: Survey result, 2018

b. Costs of *Teff* production

When we see the cost of *Teff* production by types of expenditure, the cost of fertilizer (Birr 2,023.43 per household) takes the lead followed by land fee/rent for *Teff* production (Birr 1,901.318 per household) and cost of labour (Birr 1,150.00 per respondent). This result is similar to the research findings of Kebebew Assefa et al. (2013) that state DAP and Urea fertilizers contributed for the highest share of cost of production for *Teff* and these two fertilizers together attributed for 36% and 38% of the total costs of *Teff* production in Ada and Dejen, respectively. The other costs are costs for pesticide (Birr 400.39 per household) and costs of seed (Birr 330.46 per household). The remaining Birr 170.64 per household is the cost for the hiring of oxen, transportation, cost of manure, energy, machinery renting, loading-unloading and cost of storage. This indicates that the five major costs of *Teff* production are the cost of fertilizer, land fee/rent, cost of labour, costs for pesticide and costs of seed.

Table 7.4: Comparison of the means for *Teff* consumption, marketing and income variables by district

List of independent variables	District of the respondents				Total respo
	Tahtai Maichew	Shenkora na Minjar	Lomie	Halaba zone	
	Mean and SD	Mean and SD	Mean and SD	Mean and SD	
Teff consumption in kg per year	287.90$_a$±175.16	321.77$_a$±144.18	449.84$_b$±207.70	129.52$_c$±102.02	297.26±19
Total cereal crops consumption in kg per month per household	72.03$_a$±26.35	69.52$_a$±31.35	78.37$_a$±27.10	84.27$_a$±46.46	76.05±34
Monthly consumption of cereal crops per person	14.24$_a$±4.60	17.91$_b$±9.61	17.96$_b$±8.08	14.38$_{a,\,b}$±7.40	16.12±7
Revenue from *Teff* marketing	3164.46$_a$±2336.11	18816.13$_b$±8274.92	30176.74$_c$±15852.19	14981.60$_b$±9724.78	16784.73±1
Total cost of *Teff* production	2520.87$_a$±1762.86	3502.60$_a$±2359.74	6177.65$_b$±5469.62	3265.90$_a$±1888.50	3866.76±3
Net income from sale of *Teff* crops	643.59$_a$±2012.96	15313.52$_b$±8938.93	23999.10$_c$±16740.16	11715.69$_b$±8755.71	12917.98±1
Total revenue of the household per year	28092.32$_a$±19223.59	41765.00$_b$±19833.73	54402.90$_c$±26281.73	40532.42$_b$±25329.6	41198.16±2
Total expense of the household per year	21604.37$_a$±8249.20	21915.23$_a$±11846.50	30539.95$_b$±15539.90	17282.98$_a$±8547.79	22835.63±1
Net income of the household per year	6487.95 $_a$±17011.25	19849.77$_b$ ±20230.18	23862.9 $_b$±19272.14	23249.4 $_b$±22456.98	18362.53±2

Source: Survey result, 2018

If we see the costs of *Teff* production by district, it is the highest (Birr 6,177.65 per household per year) for Lomie district followed by Shenkora na Minjar district (Birr 3,502.60 per household per year) and Halaba zone (Birr 3,265.90per household per year). The least cost of *Teff* production (Birr 2,520.87 per household per year) is observed for Tahtai Maichew district. The ANOVA analysis of the cost of *Teff* production across the four districts shows that the average cost of *Teff* production for the farmers found in Lomie district is statistically different from the remaining three districts (P-value < 0.05) (for the details, please refer Table 7.4 above and Table 19 and Table 20 in the annex).

c. Profitability of *Teff* crops

To determine the profitability of *Teff* marketing among smallholder farmers, household-level information regarding the details of the costs of *Teff* production (as indicated in Table 19 and Table 20 in the annex) was collected and analyzed in relation to the revenue generated from *Teff* marketing. Accordingly, about 10 (4.03%) respondents were not involved in *Teff* marketing in 2010 E.C. About 27 (10.89%) respondents incur a loss and they are not profitable while about 211 (85.08%) respondents generate a positive net income which indicates the profitability of their involvement in *Teff* production and marketing. In this regard, about 51 (20.56%) respondents earn a net income of less than Birr 5,000.00 from their involvement in *Teff* production and marketing, about 33 (13.31%) respondents earn a net income of Birr 5,000.00 up to Birr 10,000.00, about 39 (15.73%) respondents earn a net income of Birr 10,000.00 up to Birr 15,000.00 and the remaining 88 (35.48%) respondents earn a net income of Birr 15,000.00 and above (for the details, please refer Table 7.5 below).

Table 7.5: Category of net income from *Teff* crops by district

Category of net income from *Teff* crops	**Name of districts**				**Total**	
	Halaba	**Lomie**	**Shenkora na Minjar**	**Tahtai Maichew**	**Total**	**%**
Not involved in sale of *Teff* crops	1	2	0	7	**10**	**4.03**
Negative (net loss)	1	3	2	21	**27**	**10.89**
Up to Birr 5,000.00	11	5	3	32	**51**	**20.56**
From Birr 5,000.00 up to Birr 10,000.00	15	3	13	2	**33**	**13.31**

From Birr 10,000.00 up to Birr 15,000.00	17	7	15	0	**39**	**15.73**
Birr 15,000.00 and above	17	42	29	0	**88**	**35.48**
Total	**62**	**62**	**62**	**62**	**248**	**100**
Chi-square = 172.1		**df= 15**		**P < 0.001**		

Source: Survey result, 2018

To compare the amount of net income from marketing of *Teff* crops among the districts, Chi square test was used. The Chi-square test result shows that there is statistically significant difference among the respondents (x^2= 172.1, df= 15 and P< 0.001) as indicated in Table 7.5 above. This indicates that there is a significant difference among the districts in generating net income from marketing of *Teff* crops.

Generally, we can see that, as the cost of *Teff* production increases, the revenue from sales of *Teff* crops increases. When we see the strength of the linear association between household expenditure for *Teff* production and revenue from the sale of *Teff* crops through Pearson correlation, it is positive with the correlation of 0.306^{**} (correlation is significant at the 0.01 level (2-tailed)) which supports our assumption. This indicates that there is a positive and significant relationship between the cost of *Teff* production and revenue from *Teff* crops. The highest net income is Birr 55,310 per respondent. Though the net income differs among districts, the average net income for all respondents is Birr 12,917.98 per household (for the details, please refer table 7.5 above). The result is like the findings of Kebebew Assefa et al. (2013) that state the profitability difference from *Teff* marketing ranges from 26% to 43% among different places. The ANOVA test in relation to the average net income from *Teff* marketing indicates that there is a statistically significant difference for the farmers found in Tahtai Maichew, Shenkora na Minjar and Lomie districts (P-value < 0.05). Moreover, there is statistically significant variation in average net income from *Teff* marketing for Halaba zone as compared to Tahtai Maichew and Lomie district farmers (P-value < 0.05) (for the details, please refer table 7.4 above).

7.3.2. Contribution of *Teff* marketing to the total revenue

a. Contribution of *Teff* to the total revenue of smallholder households

Agriculture is a risky but important source of income in developing countries. Economic studies suggest that agricultural income is particularly important for the world's poor, most of whom are rural (Bezemer and Headey 2008; Loening, Rijkers et al. 2008). Agricultural incomes fluctuate with the weather and commodity prices. These income fluctuations are converted into consumption shocks (Kazianga and Udry 2006). Agricultural growth can promote growth in food production that can raise real incomes for the poor by reducing food prices (Diao, Hazell et al. 2010). On the other hand, agricultural production is often greatly constrained by volatility (especially rain-fed farming) and could yield limited benefits to the poor, especially if land inequality is high (Headey 2013).

In Ethiopia, farmers engaged in multiple farming activities to earn their revenues. In this regard, the survey findings indicate that about 241 (97.18%) of the respondents get their annual revenue from sales of crops and 149 (60.08%) respondents get their revenue from sales of live animals. About 91 (36.69%) respondents get their revenue from the sale of vegetables while 54 (21.77%) respondents get their revenue from sales of animal products. The other sources of revenue include daily wage for 32 (12.9%) respondents, chat selling for 26 (10.48%) respondents, remittance for 19 (7.66%) respondents, job employment for about 17 (6.85%) respondents, beekeeping, and honey production for 13 (5.24%) respondents and other farm activities. From the survey result, we can see that the average yearly total revenue per household is Birr 41,198.16 with a standard deviation of 24,587.04. The minimum average yearly revenue is Birr 4,000.00 while the maximum is Birr 101,500.00 (for the details, please refer Table 15 in the annex).

When we compare the average revenue generated from the different sources, about Birr 23,029.92 (55.90%) of the total revenue comes from sales of different crops. From the total revenue generated from sales of crops, about Birr 16,784.73 (72.88%) is the contribution of *Teff* crops. Sale of live animals generates average revenue of Birr 5,275.81 (12.81%) and sale of vegetables generates average revenue of Birr 4,271.77 (10.37%). The other farm activities and nonfarm activities (such as beekeeping, chat selling, selling beverages, salary, daily wage, remittance, and grants) contribute about Birr 8,620.66 (20.92%) of the total annual revenue of the households. From this, we can observe that sales of cereal crops contribute the highest share as a source of revenue.

When we see the revenue of the households per district it is the highest (Birr 54,402.90 per household per year) for Lomie district followed by Shenkora na Minjar district (Birr 41,765.00 per household per year) and then the Halaba zone (40,532.42 per household per year). The least revenue (28,092.32 per household per year) is observed for Tahtai Maichew district (please refer table 7.4 above). On the other hand, we can also see that the sale of *Teff* crops on average contributes about 40.74% of the total annual revenue of the sample households. Similarly, the contribution of *Teff* to the total revenue is highest for Lomie district (55.47%) and Shenkora na Minjar district (45.05%) while it is about 36.96 % for Halaba zone. Only about 11.26% is the contribution of *Teff* crops to the total revenue for Tahtai Maichew district (for the details, please refer Table 7.4 above and Table 7.6 below).

When we see the share of total revenue by district to the total revenue of all districts, the share of Lomie district (33.01%) is the highest from all districts followed by Shenkora na Minjar district (25.34%) and (24.60%) for Halaba zone. The least revenue (17.05%) is observed for Tahtai Maichew district (for the details, please refer Table 15 and Table 16 in the annex). The ANOVA test in relation to the average revenue of the households indicates that there is a statistical difference in Tahtai Maichew district farmers as compared to the other three districts (P-value < 0.05). Moreover, the average revenue for households of Lomie district is statistically different from that of Halaba zone and Shenkora na Minjar district (P-value < 0.05) (for the details, please refer table 7.4 above).

Table 7.6: Contribution of *Teff* crops to the total revenue by district

Name of districts	**N**	**Mean and SD**	**Total revenue of the household in Birr in 2010 E.C**	**Total revenue from sale of *Teff* crops in Birr in 2010 E.C**	**Contribution of *Teff* revenue to the total revenue in percent**
Halaba	62	Mean	40,532.42	14,981.60	36.96%
		SD	25,329.60	9,724.78	
Lomie	62	Mean	54,402.90	30,176.74	55.47%
		SD	26,281.73	15,852.19	
Shenkora na Minjar	62	Mean	41,765.00	18,816.13	45.05%
		SD	19,833.73	8,274.92	
Tahtai Maichew	62	Mean	28,092.32	3,164.46	11.26%
		SD	19,223.59	2,336.11	
Total	**248**	**Mean**	**41,198.16**	**16,784.73**	**40.74%**
		SD	**24,587.04**	**14,039.58**	

Source: Survey result, 2018

In order to compare the amount of the revenue generated from the sale of *Teff* crops among districts, Chi square test was used. The Chi-square test result shows that there is statistically significant difference (x^2= 212.234, p = 0.001) among the districts as indicated in Table 7.7 below. This clearly indicates that there is a statistically significant difference among the districts in terms of the revenue generated from *Teff* crops supplied to the market. Our findings support the argument of previous research findings which state as cash crops, *Teff* is the first choice of the farmers, and the production of surplus *Teff* crops have an important impact on the revenue of the farmers (Barrett 2008; Getnet 2007; Urgessa 2011)

Table 7.7: Comparison of total revenue from the sales of *Teff* crops among districts

Name of district	No revenue at all	Less than 10000 Birr	From Birr 10,000.00 up to Birr 20,000.00	From Birr 20,000.00 up to Birr 30,000.00	From Birr 30,000.00 up to Birr 40,000.00	Birr 40,000.00 and above
Halaba	1	19	28	10	2	2
Lomie	2	5	11	11	18	15
Shenkora na Minjar	0	7	29	22	2	2
Tahtai Maichew	7	55	0	0	0	0
Total	**10**	**86**	**68**	**43**	**22**	**19**

Chi-square=212.234 **df = 15** **Sig. = 0.001**

Source: Survey result, 2018

b. Total yearly expenditure of households

Households do have different types of expenditures such as expenses for food consumption of their families, perform agricultural activities and perform their social obligations. From the survey result (indicated in Table 17 in the annex), we can see that the average yearly expenditure per household is Birr 22,835.63. The minimum average yearly expenditure is Birr 4,700.00 while the maximum expenditure is Birr 77,000.00. All the respondents 248 (100%) do have expenditure for food consumption and closing expenses which contribute the highest share of expenditure. When we see the details of the expenditure, on average, households do use about Birr 13,045.02 (57.13%) for household food consumption, Birr 3,353.61 (14.69%) for closing, Birr 2,005.69 (8.78%) for labour expense and Birr 1,507.27 (6.60%) for utilities. The remaining expenditures are Birr 627.98

(2.75%) for transport, Birr 595.93 (2.61%) for entertainment, Birr 550.12 (2.41%) for animal feeding and Birr 1,150 (5.04%) for other costs like education, health, religious expenses, and payment of debts (for the details, please refer Table 17 and 18 in the annex).

When we see the expenditure of the households per district it is the highest (Birr 30,539.95 per household per year) for Lomie district followed by Shenkora na Minjar district (Birr 21,915.23 per household per year) and then Tahtai Maichew district (Birr 21,604.37 per household per year). The least expenditure (Birr 17,282.98 per household per year) is observed for the Halaba zone (for the details, please refer to Table 18 in the annex). When we see the average share of total expenditure to the total revenue generated by the households, it is about 55.43%. In this regard, the share of the total expenditure to the total revenue is highest for Tahtai Maichew district (76.90%) followed by Lomie district (56.14%) and then Shenkora na Minjar district (52.47%). The least share of the total expenditure to the total revenue (42.64%) is observed for the Halaba zone (for the details, please refer Table 7.8 below). When we see the share of total expenditure by district to the total expenditure of districts, the share of Lomie district (33.43%) is the highest from all districts followed by Shenkora na Minjar district (23.99%) and Tahtai Maichew district (23.65%).The least share of expenditure (18.92%) is observed for Halaba zone (for the details, please refer Table 7.4 above and Table 18 in the annex). The ANOVA analysis for the average expenditure of the households per year indicates that there is a statistically significant difference for the farmers of Lomie district as compared to the other three districts (P-value < 0.05). Similarly, the average net income of the household per year for the farmers of Tahtai Maichew district shows a significant statistical variation as compared to the other districts (for the details, please refer table 7.4 above).

Table 7.8: Share of total expenditure to total revenue by district

Name of districts	N	Mean and SD	Total revenue of the household in Birr in 2010 E.C	Total expenditure of the household in Birr	Share of total expenditure to the total revenue in percent
Halaba	62	Mean	40,532.42	17,282.98	42.64%
		SD	25,329.60	8,547.79	
Lomie	62	Mean	54,402.90	30,539.95	56.14%
		SD	26,281.73	15,539.90	
Shenkora na Minjar	62	Mean	41,765.00	21,915.23	52.47%

		SD	19,833.73	11,846.50	
Tahtai Maichew	62	Mean	28,092.32	21,604.37	76.90%
		SD	19,223.59	8,249.20	
Total	**248**	**Mean**	41,198.16	22,835.63	55.43%
		SD	24,587.04	12,344.20	

Source: Survey result, 2018

7.4. Effects of global *Teff* production and distribution to the livelihood

7.4.1. Potential for exporting *Teff*

Ethiopia being home of *Teff*, there is high potential for increasing productivity of the crop. *Teff* is an ancient cereal crop that provides the livelihoods for smallholder farmers, and it is among the most widely grown cereals in Ethiopia. The crop is a staple diet of most of the population, and it is the most widely planted one by farmers (Kebebew et al. 2013). According to Hyejin Lee (2018), currently, Ethiopia is the largest *Teff* producing country and the country adopted *Teff* as a staple crop. Kebebew et al. (2013) also argued that *Teff* is a strategic crop with the potential to enhance commercialization of smallholder agriculture and improve food security in Ethiopia.

Production of *Teff* has been growing over the last 15 years and remained competitive as witnessed by increase in acreage over the years (Kebebew et al. 2013). On the other side, the domestic demand is already substantially above supply, which explains the high price of *Teff* in recent years (Girma Alemu 2015). Similarly, Kebebew et al. (2013) argued that while production and productivity of the crop have increased over time, the demand has risen faster and so the price of *Teff* has gone up in recent years. According to Kebebew et al. (2013), *Teff* is likely to remain a favourite crop of the Ethiopian population and the crop is also gaining popularity as a healthy food in the western world. However, the *Teff* value chain in Ethiopia largely relies on traditional practices.

As per the argument of Seid (2011), *Teff* is a cereal crop cultivated primarily in Ethiopia. It is the major source of livelihood, and it is considered to have higher iron content than other cereals. What makes *Teff* grain even more attractive is the fact that it is a gluten free food. In line with the argument of Seid, Fekadu et at. (2019) suggested that *Teff* is the most value-added crop compared to other cereal crops and considering the number of benefits such as gluten free and unique nutritional values; the demand for *Teff* is increasing worldwide specially by health-conscious consumers. Nevertheless, *Teff* has shortcomings to become an income-generating global commodity for Ethiopian producers. Some of the shortcomings are low yields compared to other major cereals, high labour-input requirement, lack of infrastructure, and limited or inefficient market (Crymes 2015).

Teff contains high and unique nutritional values, which meet the needs of health-conscious consumers. With the growing interest in both a naturally gluten-free alternative to wheat flour and a nutrient-rich ingredient in the baby food industry, *Teff* is set to be the world's next ‘super-food’ and it is getting international attention (The Guardian, 2014). According to Fikadu et al. (2019), *Teff* is an untouched cereal crop at worldwide than other cereal crops like maize; wheat; sorghum and barley; however; it is a staple food grain in Ethiopia mainly used to make *Injera* as a traditional fermented Ethiopian pancake. In this regard, Bart Minten et al. (2013) concluded that *Teff* is one of the most important crops for farm income and food security in Ethiopia, and it is Ethiopia’s the second most important cash crop (after coffee), generating almost 500 million USD income per year for local farmers.

In January 2006, a policy that banned the export of *Teff* grain and *Teff* flour was enacted. According to Abraham (2015), the rationale behind the ban is to bring the domestic price of *Teff* to an affordable level and improve food security. Similarly, Crymes (2015) highlighted that while interpretations of the motivations behind the ban vary, consensus largely shows that the primary goal of the *Teff* export ban was to increase *Teff* production with the objective of addressing domestic food security and to ensure that this highly nutritious grain continued to meet domestic demand. A low domestic price of *Teff* benefits consumers, especially the rural and urban poor. Removing the export ban would likely increase the local price of *Teff* to a higher international level and it would hurt domestic consumers.

Following the imposing ban on raw *Teff* grain export; selling of processed form of *Teff* product has started to rise at national and global level as well as benefited many stakeholders involved in the process. Currently, the Ethiopian pancake (*Injera*) is found for sale in domestic and international markets (Fikadu et al. 2019). According to Crymes (2015), the government did not place a ban on the export of value added *Teff*, as *Injera*, it can be asserted that the export ban on

Teff has been basically ineffective in achieving the Ethiopian government's stated goal of ensuring food security for its citizens and protecting local *Teff* markets.

Although the government has put a ban on the export of *Teff* grain and *Teff* flour to protect local markets, *Injera* is still being exported to the international community to meet global niche market demands and the local farmers are not directly benefiting from this market and food and nutrition insecurity remain chronic issues facing the country (Crymes 2015). In this regard, Hyejin Lee (2018) argued that over the last several years, many local companies entered the *Injera* business to benefit from the growing market. Mama Fresh, for instance, is one of the largest local companies. The local companies export over 30,000 pieces of *Injera* daily to Washington and New York in the USA where large Ethiopian communities exist (Hyejin Lee 2018). According to the report of Kebebew et al. (2013) in 2005, about 30 thousand tons of *Teff* flour was exported, earning the country about 13.7 million USD. However, due to policy reasons, *Teff* flour export dropped in 2006 and only 3 million of USD was earned. According to the data from the customs authority, starting from 2008, Ethiopia has been exporting processed *Teff* especially in the form of fresh *Injera* and dry *Injera* ('dirkosh'), and the export of such products is steadily increasing (Kebebew et al. 2013). As per the argument of Crymes (2015), the export ban on *Teff* has effectively prevented Ethiopian farmers from fully participating in the growing global trade of *Teff*, while allowing Ethiopian bakers to fully benefit from the increasing international *Teff* product trade.

According to ATA (2011), after value addition, *Teff* can be considered as an important future export commodity, if the current efforts to increase production of *Teff* are successful. In this regard, Hyejin Lee (2018) highlighted that Ethiopia grows more than 90% of the *Teff* in the world; however, despite its largest production volume, the country is not capitalizing its own crop in the international market. As per the report of FAO (2015), following the export ban of *Teff* grain and flour, export volumes of *Injera* increased to 2.5 million kg in 2012, or 270% increase from the 2008 level. The exports of *Injera* in 2015 were estimated at around 10 million US dollars. The main *Injera* international market outlets were North America, Middle East, and Europe. The largest share (approximately 2.5 million US dollars) of *Injera* exports has gone into North America in the 2015 year (Fikadu et al. 2019). The United Arab Emirates (UAE) was the top destination of the *Injera* exports, absorbing over 65% of the volumes. The UAE was followed by the USA, Bahrain, and Sweden, each of which made up about 10% of the *Injera* exports FAO (2015).

However, the shelf life of *Injera* is not more than 4 days if it is kept under room temperature with the local preservation techniques. There is a need for conducting research to develop packaging techniques for preserving *Injera* to supply it for local and export markets (Mekonnen et al. 2012). Girma Alemu (I2015) also highlighted that while the Ethiopian government wants to promote export of agriculture outputs, it is however concerned about the potential price effect for local consumers by opening export markets for local cereals and it therefore does not allow *Teff* exports. He also argued that boosting the productivity of *Teff* would help local consumers by making *Teff* more readily available as well as provide potential surplus towards exports.

According to Gilbert (2008), in some villages of the U.S such as Idaho and Oklahoma, commercial farmers have been cultivating *Teff* to satisfy the growing demand to those seeking gluten free and to those Ethiopian and Eritrean immigrants. Supporting the argument of Gilbert, Fikadu et al. (2019) also highlighted that other countries such as the USA are increasingly participating in the *Teff* market. The reason could be driven by millions of Ethiopian immigrants' demand who remain attached to the cooking culture of their homeland. As per the report of Hyejin Lee (2018), at least 25 states including Idaho, Kansas and Nebraska are known to grow the crop. Their main purpose of production is forage for horses, cattle, and other livestock. Another purpose of the production is to cover the demand for the large Ethiopian diaspora communities in the USA.

According to the report of FAO (2013), there is a growing global demand for *Teff*, and other countries are capitalizing on this through the international trade of *Teff*. Many countries around the world have begun to produce and export *Teff*. The biggest international sellers of *Teff* include Canada, China, India, Netherlands, South Africa, United Kingdom, and the United States (FAO, 2013). While Ethiopia is the world's largest producer of *Teff* by volume, because of the export ban, it cannot currently benefit from this trade by exporting its indigenous crop. However, in the future; the demand for *Injera* might be exponentially increased due to its high nutritional values and gluten free grain crop (Fikadu et al. 2019). The existing increasing demand for *Teff* and its products on the international market ensures the future benefits of Ethiopia export.

Despite the standing export ban of the government, the domestic price of *Teff* remains high. The crop is a staple diet of most of the population (Kebebew et al. 2013). The high price is attributable to the rapid increase in domestic demand from the growing population, income, and urbanization

(Minten et al. 2016). Smuggling to neighbouring countries and increasing *Injera* exports are the other factors holding the *Teff* price high (FAO 2015). *Teff* is the highest-priced cereal grown in the country due to a long marketing chain with little or no value addition (Ermias et al. 2013). Thus, permitting exports without stimulating additional production can be a problem to domestic consumers and *Teff* exports should be considered when production has expanded sufficiently to bring down domestic prices (Girma Alemu 2015). According to Kebebew et al. (2013), *Teff* can be considered as an important future export commodity, if the current efforts to increase production of *Teff* are successful. The existing increasing demand for *Teff* and its products on the international market will ensure Ethiopian benefits. We also need to recognize the existence of huge demand in the domestic market that would be adversely affected by exports if productivity is not increased first (Kebebew et al. 2013).

Crymes (2015) highlighted the advantages of keeping an export ban on *Teff* in place to favour Ethiopian consumers and protect smallholder farmers, in certain respects, are significant. One of the advantages is that it signals that domestic food security focuses its priorities on food and nutrition security by supporting its poor consumers, for whom affordability and availability of *Teff* is almost a non-negotiable aspect of Ethiopian life. The export ban also discourages the manipulation of the local farmers by multinational companies' attempts to take control over the local farmers' seed supplies.

Crymes (2015) also highlighted the disadvantages of export ban such as exporting Ethiopian *Teff* could potentially increase concerns of inflation and rising commodity prices. A policy shift toward exporting Ethiopian *Teff* could potentially result in increasing prices even further, making *Teff* even more unaffordable in Ethiopia and thereby worsening conditions for Ethiopia's citizens. Exporting *Teff* could contribute to increased malnutrition, as Ethiopians would be forced to switch to cheaper, less nutritious substitutes such as sorghum, barley, or wheat as a staple cereal in their diet. Additionally, enabling international export of Ethiopian *Teff* grain could simply deplete domestic supply, if all or most of the domestic *Teff* production was used to supply international demand. Opening the doors to international trade in *Teff* would expose Ethiopia to additional risks while it would be vulnerable to foreign national or multinational companies' attempts to modify and patent its indigenous seed. Since *Teff* is used within the country in bulk, the government has banned the export of *Teff* crops since 2007 and thus the farmers and traders can't export it (Yihun, Haile et al. 2013; Crymes 2015). It is not that *Teff* has no demand for export, as a matter of fact, there is a high demand (Amentae, Tura et al. 2016). However, if *Teff* is exported, it can lead to food shortage and thereby inflation in the country.

According to Nega (2010), there is a possibility of misappropriation of genetic resources using plant breeders' rights laws if access is made without any benefit sharing arrangement. For example, a variety of *Teff* which is believed to be originated from Ethiopia and widely grown in the country mainly to make *Injer*a, a flat bread stable food in Ethiopia, has been taken from the country and protected by the plant variety right in the US by the *Teff* company without their being any benefit sharing to the country, the communities that have conserved and preserved the genetic resources (Nega 2010).

7.4.2. Results of FGD and key informants on *Teff* exporting

In relation to exporting *Teff* and its potential advantages and disadvantages was reviewed in the survey. The opinion of the FGD participants and key informants was assessed and analyzed as indicated below. In the FGD conducted at Tahtai Maichew district, a study participant stated the following concerning exporting *Teff* crops.

> It is not time for exporting now as productivity is low which couldn't satisfy even the local demand. In this regard, first, we have to think about improving productivity through the use of modern methods of farming. First, there needs to be enough surplus production before exporting *Teff* crops. Most farmers sell *Teff* at a fair price and thus they are benefited even if they sell it locally and there is no need for exporting now (Study participant_2).

Another study participant from Lomie district said the following considering the importance of exporting *Teff*.

> If we can produce more *Teff* crops, I think we can benefit from exporting and end up benefiting our country as well in terms of obtaining foreign currency. The farmers understand that their income can increase when sold internationally. However, we are producing a small amount of *Teff* crops with the backward method of farming (Study participant_26).

Another study participant from Shenkora na Minjar district said the following in relation to the importance of exporting *Teff*.

> We think that exporting *Teff* crops can benefit us as the dollar gives a better profit. If the production is improved, I think exports will benefit the country as well. But if we export without improving the productivity of *Teff* crops, it will create market crises in the local market (Study participant_62).

A key informant from the Halaba zone highlighted the following about exporting *Teff* and illegal export to other countries.

> There are rumours that *Teff* is exported illegally to neighbouring countries such as Eretria, Sudan, Djibouti, and Yemen by illegal brokers. It is the brokers who take advantage of it and it is illegal (KII Halaba_1).

A key informant from Addis Ababa highlighted the following about exporting *Teff* to other countries.

> We have the information that Injera is exported to other countries by international traders. First, there needs to be enough surplus production. Most farmers sell *Teff* because they have a fair amount of surplus. They sell it out to get income while they might feed themselves with other types of crop they produce. Since *Teff* is the backbone of the country's economy, it should never be exported without satisfying the local demand (KII Wholesaler_3).

Another key informant from Addis Ababa highlighted the following in relation to exporting *Teff* crops to the international community.

> *Teff* is not exported raw, but I think exporting red *Teff* can have benefits in bringing foreign currency for the country and better income for farmers and traders. I don't think that it creates chaos in the local market as the red type of *Teff* is the one that is needed for export, and it has limited demand in the local market (KII Wholesaler_1).

A development agent from Lomie district highlighted the following concerning mechanization of agriculture and the benefits from exporting *Teff* to other countries.

> I think there is a potential for exporting *Teff* since the ecology of our country is suitable for *Teff* production. There is *Teff* production in other places like South Africa, but our *Teff* is believed to have better content in iron and other nutrients. If we can mechanize our *Teff* production system though large-scale farming, we can gain surplus *Teff* and that can increase the potential of export. If we can boost the production, I think that exporting *Teff* will not bring harm in the local market and I think it is positive. If we can also add value to the product, it can open job opportunities for many people. If the production system is mechanized, it helps us earn foreign currency for the country as well (KII Lomie_2).

During the interview with the key informant from the Ministry of Trade and Industry, the following issues were raised from the expert.

> Even though the coverage of *Teff* production is wide, its productivity is still low. I think the production level is not yet developed. As an expert, in my opinion, it will be very wrong to export *Teff* because it will create a market crisis within the country, and I don't think it should be exported. Since our people often use it, if exported, the people of Ethiopia will run out of *Teff*. A processed *Teff* is exported, and it is encouraged by our government (KII Federal MoTI_2).

From the FGD and KII discussions at all levels, we can understand that there is a potential for exporting *Teff* since the ecology of our country is suitable for *Teff* production. *Teff* is considered as the backbone of the country's economy since our people often use it and it is the major source of income for the farmers. This result is similar to research output of Kebebew et al. (2013) and Hyejin Lee (2018) that state *Teff* is a staple diet of most of the population, it is the most widely planted by farmers, Ethiopia is the largest *Teff* producing country, and the only country to have adopted *Teff* as a staple crop.

Even though the coverage of *Teff* production is wide, its productivity is still low as farmers are producing it with a backward method of farming. From this, we can understand that the low production of *Teff* crops at the national level couldn't fully address even the local demand for *Teff* consumption. The result is similar to the findings of Crymes (2015) that state some of the shortcomings are low yields compared to other major cereals, high labour-input requirement, lack of infrastructure, and limited or inefficient market. As a result, it is hard to say that the production can go beyond domestic consumption now and we don't think that there is a surplus of *Teff* crops for export. The result is like the findings of Kebebew et al. (2013) that state that while production and productivity of the crop have increased over time, the demand has risen faster and so the price of *Teff* has gone up in recent years.

It is also noted that there is a high demand for *Teff* crops in the international market. If *Teff* is exported, the farmers can get better income from exporting it and they can be motivated to produce more *Teff* crops. The country can also benefit from earning foreign currency and it can open job opportunities for many people. However, if *Teff* is exported before fully addressing the domestic consumption, shortage of supply may occur in the local market, and this will have its negative impact on the domestic market such as inflation of *Teff* price. Our finding is similar to the research output of Girma (2015) which states permitting exports without stimulating additional production can be a problem to domestic consumers and *Teff* exports should be considered when production has expanded sufficiently to bring down domestic prices (Girma Alemu 2015). It is also like the findings of Crymes (2015) that highlighted exporting Ethiopian *Teff* could potentially increase concerns of inflation and rising commodity prices in local markets. Similarly, the result of our findings supports the idea of Crymes (2015) that highlighted the advantages of keeping an export ban on *Teff* in place to favour Ethiopian consumers and protect smallholder farmers in the areas of food and nutrition security by supporting its poor consumers, for whom affordability and availability of *Teff* is almost a non-negotiable aspect of Ethiopian life.

From the FGD and key informants, we can conclude that first it needs to stabilize the local market by improving productivity. If we can improve *Teff* productivity using modern farming techniques by the smallholder farmers and introducing mechanized farming, we can satisfy the local demand and exporting *Teff* will not bring a negative effect to the local market. Without improving the productivity of *Teff* crops first, we shouldn't think of exporting *Teff* crops. The result of our findings is like the research result of Kebebew Assefa et al. (2013) that concluded *Teff* can be considered as an important future export commodity, if the current efforts to increase production of *Teff* are successful.

From the FGD and key informants, we can understand that though the government is encouraging exporting of processed *Teff* (Injera and flour), there are also illegal brokers who export *Teff* crops to neighbour countries such as Eretria, Sudan, Djibouti and Yemen. This is similar to the report of FAO (2015) that state smuggling to neighbouring countries and increasing *Injera* export are the other factors holding the *Teff* price high. Moreover, *Teff* is the highest-priced cereal grown in the country due to a long marketing chain with little or no value addition (Ermias et al. 2013).

From the FGD and key informants, it is also recommended that red type of *Teff* has a little demand in the local market. If we export red *Teff* crops, it doesn't create chaos in the local market and the farmers, and the country can benefit from the export of red *Teff* crops. The result is similar to some authors which state *Teff* is getting wider appreciation in the global market and as gluten-free cereal, it is getting global attention and becoming one of the healthy grains (Amentae, Tura et al. 2016). Other scholars also said while Ethiopia is the world's largest producer of *Teff* by volume, because of the export ban, it cannot currently benefit from this trade by exporting its indigenous crop (Yihun, Haile et al. (2013); Crymes (2015)).

A question was raised to the survey respondents in relation to their access to information about the demand and opportunities for *Teff* crops at the global market. About 172 (69.35%) respondents do not have information while the remaining 76 (30.65%) respondents have information about the demand and opportunities for *Teff* crops in the global market. The source of such information was also identified. About 37 (14.92%) respondents said "radio" as the main source of information for global demand for *Teff* crops, 21 (8.47%) respondents said "television" as the main source of information for global demand, 10 (4.03%) respondents said "cooperatives" as the main source of information for global demand and 8 (3.23%) respondents said "extension agents" as the main source of information for global demand. However, no one respondent does know the whereabouts of the *Teff* exporters. Also, the respondents do not supply their *Teff* crops to exporters or involved in *Teff* export by themselves or through their cooperatives.

Summary

The chapter tries to answer the fourth objective of the research that focuses on the effects of local and global *Teff* production and distribution to the livelihood of smallholder farmers. As presented in the conceptual framework, the contribution of *Teff* to the livelihood of smallholder producers is seen from consumption of *Teff* crops by the household and from an income generated from the sale of *Teff* crops in the market. The results of the research indicate that *Teff* crops have multiple contributions to the rural farmers. In this regard, it is the major source of food for people, fodder for cattle, a major source of cash income for farmers, has very good market price as compared to other crops, source of protein for the people, its straw is used for building houses (plastering) and as a result it improved the livelihood of the farmers. The result of the research also indicates that *Teff* is used as the major food staple and is the most preferred food for consumption by farmers. This shows the importance of *Teff* crops for the livelihood of the farming community. Despite earlier research findings, nowadays, *Teff* is consumed by rural farmers as well. It is found to be the first in terms of volume of consumption (24.75 kg per month per household) among other crops which indicates that it is the most preferable crop for consumption by the rural farmers.

Farmers are producing *Teff* crops for both consumption and market purposes. The survey result indicates that about 238 (95.97%) respondents were involved in *Teff* marketing (sale of *Teff* crops) in 2010 E.C (2017/18) while the remaining 10 (4.03%) respondents didn't participate in *Teff* marketing in the same year. When we see the participation of smallholder farmers in *Teff* marketing in light of the average *Teff* supply to the market, it is about 806.27 kg per household with a standard deviation of 653.86. The supply of *Teff* to the market is about 73.02% of total *Teff* production while about 297 kg of *Teff* crops (26.90%) is used for household consumption. If we see the average *Teff* supplied to the market for each district separately, the highest supply is observed for Lomie district respondent (1,410.48 kg per year per household) followed by Shenkora na Minjar district (895.16 kg per year per household) and Halaba zone (781.45 kg per year per household). The least supply is observed for Tahtai Maichew district (137.98 kg per year per household).

The average revenue generated from sale of *Teff* crops for all the respondents is Birr 16,784.73 per household per year with a standard deviation of 14,039.58. If we see the average revenue generated from sale of *Teff* crops by district, the highest is for Lomie district (Birr 30,176.74 per year per household) followed by Shenkora na Minjar district (Birr 18,816.13 per year per household) and Halaba zone (Birr 14,981.60 per year per household). The average revenue generated from sale of *Teff* crops is observed to be the least for Tahtai Maichew district (Birr 3,164.46 per year per household). Though it differs among districts, the survey result indicates that the sale of *Teff* crops on average contributes about 40.74% of the total annual revenue of the households.

When we see the average share of total expenditure to the total revenue generated by the households, it is about 55.43%. Households used about Birr 13,045.02 (57.13%) of their income for household food consumption, Birr 3,353.61 (14.69%) for closing, Birr 2,005.69 (8.78%) for labour expense and Birr 1,507.27 (6.60%) for utilities. The survey result also revealed that about 27 (10.89%) respondents incur a loss (they are not profitable) from *Teff* marketing while about 211 (85.08%) respondents generate a positive net income which indicates the profitability of their involvement in *Teff* production and marketing. Though the net income differs among districts, the average net income for all respondents is Birr 12,917.98 per household. The contribution of *Teff* to the livelihood of rural farmers can be seen from two sides. First, as a cash crop, it is the source of income for the farmers and though there is a difference among districts, farmers on average get a net income of Birr 12,917.98 per household per year. Second, despite earlier research findings, nowadays, *Teff* crops are consumed by rural farmers as well. It is found to be the first in terms of volume of consumption (24.75 kg per month per household for an average of 5.12 family size) or (about 32.54% from the total cereal crops) among other crops which indicate that *Teff* is the most preferable means of livelihood by the rural farmers. This result shows that the average *Teff* consumption of rural farmers is about 58 kg per person per year. This shows that *Teff* is highly consumed by rural households and it is the most preferable means of livelihood for rural farmers.

The ANOVA test for the different independent variables such average consumption of *Teff*, average *Teff* supplied to the market, average revenue generated from the sale *Teff* crops, average costs of *Teff* production, net income from *Teff* marketing, average revenue of the household, average expenditure of the household indicate that there is a significant mean difference amount the four districts. However, there is no significant mean difference in relation to the average price for *Teff* crops per kg among the four districts. The findings support the argument of Barrett (2008) that state market participation is directly related to generating a marketable surplus, which in turn depends on the production of surplus *Teff* crops which has an important impact on the revenue of the farmers. It also supports the argument of Wolelaw (2005) that state producers who produce more output are expected to supply more crops to the market than those who produce less.

Since the ecology of our country is suitable for *Teff* production, there is a potential for exporting *Teff*. It is considered as the backbone of the country's economy since our people often use it and it is the major source of income for the farmers. Even though the coverage of *Teff* production is wide, its productivity is still low as farmers are producing it with a backward method of farming. The low production of *Teff* crops at the national level couldn't fully address even the local demand for *Teff* consumption. The result of the survey indicates that no producer is involved in exporting *Teff* crops as it is banned by the government. Although the government has put a ban on the export of *Teff* grain and *Teff* flour in an effort to protect local markets, *Injera* is still being exported to the international community to meet global niche market demands and the local farmers are not directly benefiting from this market. The study participants recommended that if we can improve *Teff* productivity through the use of modern farming techniques by smallholder farmers and introducing mechanized farming, we can satisfy the local demand and exporting *Teff* will not bring a negative effect to the local market.

CHAPTER EIGHT: SYNTHESIS OF THE FINDINGS, CONCLUSION AND POLICY IMPLICATIONS

8.1. Introduction

Chapter eight deals with synthesizing the findings and conclusion. It begins with a review of why this research was undertaken and then it summarizes and synthesizes the major findings from the study. Finally, it puts policy implications in relation to *Teff* production and distributions with the objective of improving the livelihood of the producers.

8.2. Background of the research

Teff (Eragrostis teff) is the most important cereal crop in terms of both production and consumption in Ethiopia (FAO 2015). About 6.7 million smallholder farmers have been engaged in *Teff* production in 2017/18 in Ethiopia, covering more than 3 million hectares of land and producing 52.8 million quintals (1 quintal = 100 kg, same as a standard bag) of *Teff* crops. The average national production is 1,748 kg per hectare (CSA 2018). This result is like previous findings of Gudeta (2002) which state the number of farmers involved in the input package and extension programs has increased and the productivity of *Teff* crop is increasing from time to time.

Among cereal crops, *Teff* covers the largest share of the cultivated area. On the consumption side, *Teff* is a daily staple food crop for over 50 million Ethiopians and accounts for 15% of total calories consumed. It is an attractive cash crop and a major source of income for the farmers. Some research indicates urban consumption is about 61 kilograms per year and 20 kilograms per capita per year for rural areas (Berhane, Paulos et al. 2011). *Teff* is also known for its high content of iron, and it is among the gluten-free cereal crops.

Some of the previous studies by researchers such as Hailu et al. (2015), Haileselassie et al. (2011), Ayalew et al. (2011), Alemu et al. (2018) and Getu (2014) focus on agricultural technologies, application of fertilizers, farmers' adoption level of row planting technology, technical efficiency in *Teff* production and production constraints. The focus of such researchers is on enhancing the productivity of *Teff* crops which is not the focus of the research at hand. Dijkstra et al. (2008) and Cheng et al. (2017) also center on the nutritional security and health aspects of *Teff* which is not the focus of the research as well.

Other studies such as Habtewold et al. (2017), Dalango et al. (2018), Gebremedhin et al. (2007) and Belayneh et al. (2019) focus on the determinants of smallholder farmers in market participation and *Teff* market supply in Jena-Bossa district, Dawro Zone and Ambo district, West Shoa Zone. Amentae et al. (2016) focus on exploring value chain and post-harvest losses of *Teff* in Bacho and Dawo districts of central Ethiopia. Demeke et al. (2013) and Assefa (2015) also focus on analysis of incentives and disincentives for *Teff* in Ethiopia. These all focus on the marketing aspect of *Teff* crops.

Though *Teff* production and distribution were practiced for decades in the study areas, it was not well supported by comprehensive research and thus, it remains a knowledge gap. The increasing demand for *Teff* crops is creating new prospects for smallholder farmers and thus, understanding the relative advantages and disadvantages of the different channels of distribution is important for making a rational decision at the household level. It is in line with this view that the study is conducted by characterizing *Teff* production and market participation of smallholders among different districts. The main aim of the study is to examine *Teff* production and distribution at the national levels and analyze its implications for the livelihood of the smallholder farmers in Ethiopia. The research at hand considers both *Teff* production and distribution and its contribution to the livelihood of smallholders that makes it different from the previous researchers. Geographically, it also differs from previous researchers and the research is undertaken in two districts from two major *Teff* producer areas (Oromia and Amhara regional states) and two districts from potential regions (SNAPPER and Tigrai regional states) with the focus of smallholder farmers. Comparisons of results among the four districts on each variable affecting *Teff* production and distribution and unveiling the results for each district make the research different from previous studies. Having first-hand information about *Teff* is essential to devise appropriate strategies aimed at promoting *Teff* production and market participation of smallholder producers.

A cross-sectional survey with a mixed approach considering both qualitative and quantitative research methods was used in this study. The sampling design that matches the selected research approach is multi-stage sampling whereby both purposive (non-probability sampling) and random sampling methods were used. Purposive sampling method was used to select top *Teff* producing regions, districts, *Kebeles*, sub-*kebeles,* key informants and FGD participants while the random sampling method was used to select survey respondents. The data collection tools used in this study includes a structured questionnaire survey, focus group discussions, key informant interviews, and literature/documentation review. The data were analyzed both qualitatively and quantitatively.

The total number of survey sample respondents is 248 (34 female-headed households and 214 male-headed households) with the same sample size of 62 sample respondents from each of the four districts of the major *Teff* producing districts (Halaba zone, Lomie, Shenkora na Minjar and Tahtai Maichew). In addition to the survey participants, a total of 84 (41 female-headed households and 41 male-headed households) participants were involved in eight focus group discussion (FDG) (4 male groups and 4 female groups) while 25 key informants were involved in an interview.

8.3. Synthesis of the findings

8.3.1. Socio-demographic characteristics of *Teff* producers and features of *Teff* production

Out of 248 heads of household survey respondents, 214 (86.29%) respondents constitute male-headed households, and the rest 34 (13.71%) respondents represent female-headed households. The mean age of the respondents is 45.88. About 135 (54.44%) of the respondents do not attend formal schools. Comparisons of all the sampled population about the marital status indicate that about 31 (12.50%) respondents are married with civil marriage, about 177 (71.37%) respondents are married with customary / traditional / church marriage and 22 (8.87%) respondents are widow /widower. On the other side, 9 (3.63%) respondents are divorced or separated, 8 (3.23%) respondents are single, and one respondent (0.4%) is living together but not married. The average family size of the respondents is 5.12 persons per household with a standard deviation of 1.91.

If we see the distribution of labour days among the major *Teff* production activities for 0.25 ha, weeding takes the highest share which is 11.70 (35.67%) labour days followed by harvesting that require 10.3 (31.40%) labour days. Threshing takes the next share of 4.5 (13.72%) labour days, ploughing takes 4.3 (13.11%) labour days and lastly planting needs 2 (6.10%) labour days from the allocated total labour days. When we see the source of the labour force for the different activities of *Teff* production, about 23.06 (70.3%) labour days are from family labour followed by 7.94 (24.21%) labour days from the hired labour force and the remaining 1.80 (5.49%) labour days from labour pooling systems. Though it differs among districts, the average ox ownership per household is 1.97 with a standard deviation of 1.29.

When we see the average *Teff* production per household in 2010 E.C. (2017/18) harvest period for the survey participants, it is about 1,104 kg. About 117 (47.18%) respondents produce less than 1000 kg, 95 (38.31%) respondents produce from 1,000 up to 2000 kg, 21 (8.47%) respondents produce from 2,000 up to 3,000 kg and the remaining 13 (5.24%) respondents produce 3,000 kg and above. The minimum *Teff* production per household is no production and the maximum is 3,200 kg per household. When we compare *Teff* production at the district level, about 60 (96.77%) respondents from Tahtai Maichew and 38 (61.29%) respondents from Halaba zone produce less than 1000 kg. Only 2 (3.23%) respondents from Tahtai Maichew and 24 (38.71%) respondents from Halaba zone produce more than 1000 kg. On the other side, about 56 (90.32%) respondents of Lomie district and 47 (75.81%) of Shenkora na Minjar district produce more than 1,000 kg. This indicates that respondents from Lomie district and Shenkora na Minjar district are producing more *Teff* crops as compared to Tahtai Maichew district and Halaba zone. This result is like the report of the Central Statistical Authority of Ethiopia which states that Oromia and Amhara regional states are the major *Teff* producer regional states (CSA 2017/18). Our finding is also similar to the research output of Fikadu et al. (2019) that state Oromia regional state is the most important *Teff* producing area in the country; and its share in total national production is estimated to be as high as 48%. The second highest region is Amhara regional state with 39%. The rest regional states are relatively less important.

The FGD and KII results indicate that *Teff* came from the ancient generation passing down to their generation. It is an indigenous crop to Ethiopia and has been produced for a very long time by the indigenous people. This result is like previous research findings which state Ethiopia is the native home of the Teff crop and it has been grown as a food crop in East Africa for thousands of years (Baye 2014). The survey result also indicates that the productivity of *Teff* is improving in the last five years as farmers produce *Teff* using modern techniques of production (use of fertilizers, improved seeds, chemicals, line sowing, etc), they get a better amount of *Teff* production. This result is also like the previous findings of Gudeta (2002) which state the number of farmers involved in the input package and extension programs has increased and the productivity of *Teff* crop is increasing from time to time.

The survey result also indicates that *Teff* crop is the major source of food for people in the form of staple food such as *Injera*, bread and soup in all study areas. Its importance also includes fodder for cattle, source of income for farmers as it is cash crop, good to eat and as a source of protein for the people, traditionally believed improving blood circulation, has a high demand in the market and a very good market price as compared to other crops and its straw is used for building houses (plastering) in combination with soil and sand. This result is like the findings of other scholars which states *Teff* is a commercial crop mainly because of the high price and it is nutritionally rich with a high level of iron and calcium and has the highest amount of protein among cereals consumed in Ethiopia (Berhane, Paulos et al. 2011). It ranks low on the glycemic index (making it suitable for consumption by Type II diabetics) as it is gluten-free and has high fiber content (McGuire 2015).

The result of the survey indicates that both men and women are involved in *Teff* production activities. Though it is difficult to clearly show the roles of women and men in *Teff* production activities, women are engaged in land preparation, weeding, and preparing food for the whole family while male are doing all farming activities (ploughing and land preparation, planting, harvesting and threshing). This finding is similar to previous research findings that state that women contribute about 46% of labour to agricultural activities and rural women spend their time in productive activities such as weeding, food processing, water, and fuel wood collection, assisting family farms, marketing and labour exchange for community services (Tegegne 2012).

The Chi square result of the demographic characteristics indicates that the test of statistical association of the variables such as sex, marital status and religion across the districts were found to be statistically significant (P-value < 0.05). Moreover, the means of the socio-demographic characteristics were also compared using ANOVA by district and variables family size, age, active labour force, dependents and status of education were found to be statistically significant (P-value < 0.05).

8.3.2. Explanatory variables affecting *Teff* productivity differentials among farmers

Most farmers depend on rain-fed agriculture and use mixed farming. Thus, both crop production and animal husbandry are commonly practiced. Crop yield per area (amount of crop harvested per amount of land cultivated) is the most commonly used indicator for agricultural productivity. Crop yields are inevitably affected by many factors, these are weather, soil fertility, amount of fertilizer used, input price, changes in farming practices, quality of seed varieties, and use of irrigation schemes (CSA 2017/18). Despite its low yield/ productivity relative to other cereals, *Teff's* contribution to the national economy cannot be overemphasized. *Teff* ranks first in total production and total cultivated crop land among other major cereals grown in Ethiopia. *Tiff's* land productivity, however, lags major cereals such as maize and wheat (Hailu, Weersink et al. 2015).

The survey result indicates that about 42.14%, 27.6% and 20.63% of *Teff* production are the contributions from Lomie district (Oromia regional state), Shenkora na Minjar district (Amhara regional state) and Halaba zone (SNNP regional state), respectively. The contribution of Tahtai Maichew district (Tigrai regional state) is only 9.67%. The result of the survey is similar to the report of the Central Statistical Authority of Ethiopia which states that Oromia and Amhara regional states are the major *Teff* producer regional states and major source of *Teff* crops as compared to other regions (CSA 2017/18). Our finding is also like the research output of Fikadu et al. (2019) that state Oromia region is the most important *Teff* producing area in the country; and its share in total national production is estimated to be as high as 48%. The second highest region is Amhara region with 39%. The rest regions are relatively less important. The explanatory variables that affect *Teff* productivity differentials across a group of farmers in the study areas are presented hereunder.

a. Gender and *Teff* production

The average *Teff* production of female-headed respondents is 782.35 kg per household while that of male-headed respondents is 1155.26 kg per household. As a result, the average *Teff* production of female-headed respondents is less than the average of *Teff* production for all respondents (1104.13 kg per household) by 29.14%. This result is like the results of some researchers such as Biénabe, Coronel et al. (2004) that state gender disparities systematically disadvantaged women in relation to the overall economic status as well as access to basic services and as a result woman have been considered as one of the food insecure vulnerable groups. Similarly, a public document named Ethiopia's agricultural sector policy and investment framework identified that gender disparities significantly impede women's empowerment and women shoulder a greater burden of rural poverty because of their vulnerable socio-economic position (Chanyalew, Adenew et al. 2010). In this regard, Agada and Evangeline (2014) argued that the agriculture sector is underperforming in many countries in part because women, who are often a crucial resource in agriculture and the rural economy, face severe constraints than men in accessing productive resources that reduce their productivity. Other researchers also observed that gender disparity disadvantaged women concerning the overall economic status as well as access to basic services and as a result, women have been considered as one of the food insecure groups (Cagatay 1998). Some researchers such as Keller and Mbewe (1991) and Mussema (2006) recommended that the positive contribution of females to agriculture needs policy attention on the promotion and empowerment of females through equal access to resources, technology, credit, and other facilities. This requires gender policy analysis at national level to identify the gap among men and women and thereby develop strategies for the promotion and empowerment of women through equal access to resources and technology.

b. Age composition of the respondents and *Teff* production

When we see the relationship of age structure with *Teff* production, young farmers (within the range of 18 to 35 years of age) produce 983.62 kg per household and older farmers (within the range of 36 to 65 years of age) produce 1,136.06 kg per household. On the other side, the highest *Teff* production per household is observed for the age group of 65 and above which is 1193.75 kg per household. The result of the survey is like the research output of some researchers such as Hofferth (2003) and Kidane, Alemu et al. (2005) that states the higher the age of the household head, the more stable the economy of the farm household as older people have relatively richer experiences of the social and physical environments as well as greater experience of farming activities.

c. Household family size and *Teff* production

The survey result indicates though it is small, there is a positive relationship between *Teff* production and family size of the sample respondents. This means that as family size increases, *Teff* production shows an increasing trend. However, there is no significant difference in *Teff* production among the respondents as the result of the difference of family size in the household. The result is against the study of some researchers that state there is a negative correlation between household size and food security as food requirements increase with the number of persons in a household (Paddy 2003; Hussein and Janekarnkij 2013; Obamiro, Doppler et al. 2003).

d. Economically active members and *Teff* production

The average number of labour days required to do all the activities of *Teff* production for 0.25 ha is estimated to be 32.80 labour days. This result is similar to previous research output such as Zeller, Diagne et al. (1998) and Gebreselassie (2006) that state producing *Teff* is labour-intensive farming practice. The survey result indicates that an active labour force in a household and investment in labour have a positive and statistically significant relationship with *Teff* production. This is like the previous result of Girma and Endrias (2015) which states that *Teff* production is the function of labour and availability of labour force is assumed to have a positive relationship with the volume of production. On the other hand, the research result shows that lack of interest of the youngsters to work on such tedious farming activities, migration of the active labour force to towns and high cost of labour are the main problems of farmers. This result is like the research findings of some scholars such as Berhe (2009) and FAO (2015) that state the production of *Teff* is labour-intensive and with limited access to technology, there are no large-scale *Teff* producers in Ethiopia.

e. Literacy of the head of the household and *Teff* production

When we compare *Teff* production in terms of literacy status of the respondent, those respondents who can "read only" are producing more *Teff* crops (1,567 kg per household) as compared to illiterate (1,219 kg per household). Those respondents who are "able reading and writing" produce the least (985 kg per household) as compared to "read only" or illiterate respondents. Except for Tahtai Maichew district, in all districts the illiterates are producing more *Teff* crops as compared to literates and this result is against the findings of other researchers such as Maxwell (2002), Girma and Endrias (2015), Akalu (2007) and Gessesse (2009) that state literacy increases the ability of farmers to gather and analyze relevant information for their products. The reason could be illiterate respondents might have more resources such as land holding, *Teff* cultivated land and oxen ownership as compared to literate ones.

f. Educational status of the head of the household and *Teff* production

The result of the survey indicates that there is variability in the average *Teff* production per household among the different categories of education. In this regard, the result of the analysis indicates that the mean difference is insignificant which shows that there is no significant difference in *Teff* production among the respondents due to the status of education. The result of the survey also shows that there is a negative and significant correlation but weak relationship between status of education and *Teff* production. This is against the findings of previous result of Abrha (2015), Gebrehiwot (2009) and Endale, Mengesha et al. (2014) that state education is found to have a significant and positive relationship in promoting agricultural production as it broadens farmers' skills and techniques of modern farming which enables them to perform farming activities wisely and efficiently. Similarly, Spielman (2008) also argued that educated households are expected to have better exposure to information that enhances agricultural production and thus they are also expected to be innovators in accepting new ways of doing things. The reason could be illiterate respondents having more resources such as land holding, *Teff* cultivated land and oxen ownership as compared to the literate ones.

g. Oxen ownership and *Teff* production

The average ox ownership per household is 1.97 with a standard deviation of 1.29. The result of the survey indicates that about 30 (12.1%) respondents don't own oxen while 50 (20.16%) respondents own only one ox. About 114 (45.97%) respondents own two oxen and 54 (21.78%) respondents own three or more oxen. From the study result, we can see that total *Teff* production per household increases for each increase of ox ownership. The findings of the research indicate that as the average oxen ownership increases by one ox, *Teff* production increases by 382 kg. Thus, our research finding is like the previous research results of Jayne, Mather et al. (2010) and Van der Veen and Gebrehiwot (2011) that state animal traction power enables households to cultivate greater areas of land and to execute agricultural operations timely.

h. Livestock ownership and *Teff* production

The average livestock ownership per household of the survey respondents indicates that about 1.97 for ox, 1 for a cow, 7.42 for chicken, 2.02 for sheep, 1.94 for goat and 1.34 for donkey. Only 6 (2.42%) respondents don't have access to livestock. Though there is a significant difference among the districts, the average monetary value of livestock ownership is Birr 50,509.22 per household. When we see the total *Teff* production per household in kg in relation to the monetary value of livestock, we can observe that as the monetary value of the livestock of livestock increases *Teff* production per household shows an increasing trend. When we measure the strength of the linear association between the market value of livestock ownership per household with *Teff* production, it is strongly and positively correlated. This indicates that there is a positive and strong relationship between the monetary value of livestock ownership and *Teff* production which is like the research findings of Abrha (2015) and Kidane, Alemu et al. (2005) that state livestock is important source of livelihood for farming households and it is used as a source of pulling power, source of cash income, source of supplementary food, and means of transport.

i. Farm equipment ownership and *Teff* production

Farm equipment are important farm tools for the cultivation of *Teff* crops. About 247 (99.60 %) respondents own farm equipment. When we see the average monetary valuation of farm equipment per household for all respondents, it is about Birr 1,115.28 per respondent. The survey result indicates that there is a positive and significant relationship between the monetary value of farm tools and *Teff* production which is similar to the findings of other researchers that state the existence of farm equipment (tools) are important for the cultivation of *Teff* crops (Dixon, Gibbon et al. 2001; Rigg 2006; Haileselassie, Araya et al. 2016; Swift 1989; De Haan 2012).

j. Total land holding and *Teff* production

Under subsistence agriculture, landholding size is expected to play a significant role in influencing farm households' food security. The research result shows that land is becoming a scarce resource in all the districts, and it is a big challenge, especially for the youth. The reason for such a challenge is the increasing trend of the population while the land is limited. Only parents do have land. The land is further divided into all the children and the portion of land is getting lesser and lesser due to such division of the existing farmland to the children. The youngsters couldn't get farmlands unless they were provided by their families. This is like the previous research finding of Ezra (2003) that states the continued decline in per capita landholding and environmental degradation are the two main challenges of agriculture in Ethiopia. Though there is a big difference among districts, the average landholding of all the respondents is 1.41 ha per household. From the survey result, we can see that the ownership and availability of land differ among respondents. In this regard, about 15 (6.05%) respondents do not have their own land and 233 (93.95%) of respondents have their own land with the mean land ownership of 1.01 ha per household. About 75 (30.24%)

respondents rented land with average land renting size of 0.25 ha, 53 (21.37%) respondents sharecropped land with an average land size of 0.13 ha and the remaining 12 (4.84%) respondents inherited land from their families with an average land size of 0.02 ha. This result is similar to the report of CSA and other researchers that state agriculture is predominantly smallholder where over 85% of farmers cultivate farms less than 2 hectares (Geda, Shimeles et al. 2009; CSA 2011). There is also a positive and significant difference in *Teff* production due to the total land holding among the districts. As land holding increases, *Teff* production also increases. This is like the result of previous research of Najafi (2003) which states food production can be increased extensively through the expansion of areas under cultivation.

k. *Teff* cultivated area and *Teff* production

The survey result indicates that from the total available average landholding (1.41 ha per household), on average about 0.77 ha (54.61%) is allocated for *Teff* production. From the survey result we can also observe that respondents who allocate more land for *Teff* production produce more *Teff* crops than other respondents. A unit increase of *Teff* cultivated land in ha, *Teff* production on average increases by 1,490 kg. This indicates that there is a positive and strong relationship between *Teff* cultivated land and *Teff* production and the correlation is statistically significant. This result is like the findings of other researchers who state that cultivated area has a direct and positive effect on *Teff* output (Dessalegn, Jayne et al. 1998; Abate, Shiferaw et al. 2015; Asrat, Belay et al. 2004; Stavi and Lal 2015).

l. Soil fertility and *Teff* production

As per the information of the study participants, the best soil for *Teff* production is clay field or red clay and it can be generalized that all the districts are suitable for *Teff* production. The survey result indicates that about 180 (72.58%) respondents consider their land as “highly fertile” and on average produce 1,369.86 kg per household. Similarly, about 50 (20.16%) respondents perceive their land as “average fertile” and on average produce about 473.00 kg per household. About 18 (7.26%) respondents consider their land as “poor fertile” and on average they produce 200.00 kg per household. The result of the survey also shows that there is a significant difference in *Teff* production among the respondents as the result of the quality of soil fertility. When we see the relationship between soil fertility and *Teff* production, we can find that there is a positive and significant relationship which is like the study result of and other researchers such as Sah (2002) and Haileselassie, Stomph et al. (2011) that state better land quality boosts crop production and farmers with better soil fertility produce more crops as compared to low soil fertility.

m. Availability of rainfall and *Teff* production

From the survey result we can learn that the weather in all districts is suitable for *Teff* production. However, fluctuation of rainfall and untimely rain negatively affect *Teff* production especially in the Halaba zone. From the survey, we can see that about 224 (90.32%) of the respondents assume that there was adequate rainfall during 2010 E.C. (2017/18) and on average produce 1,142.97 kg per household. The remaining 24 (9.68%) respondents assume there was no adequate rainfall during 2010 E.C. (2017/18) harvest period and on average produce 741.67 kg per household. The survey result also revealed that irrigation is not used for *Teff* production in all districts. Production of *Teff* crops is once per year during the rainy season and irrigation is practiced by the farmers for growing vegetables and some other crops such as maize. This requires further study on the development of policies and strategies focusing on *Teff* production through irrigation and water harvesting schemes at household level. The introduction and promotion of such irrigation and water harvesting schemes at household level enables farmers to produce twice per year which might double *Teff* production at national level. Looking into the overall relationship of adequacy of rainfall with *Teff* production, there is a positive and significant relationship. The result is like the result of other researchers such as Sen (1981) that state the potential to improve yields depends strongly on rainfall patterns.

n. Application of agricultural inputs and *Teff* production

The survey result indicates that the distribution of fertilizer is good in all districts and farmers are convinced that the use of inputs can boost *Teff* production. The awareness and utilization of chemical inputs and improved *Teff* seed among the respondents are very high. The average investment for input for all respondents is Birr 3,018.40 per household. This result is against previous research of Chanyalew, Adenew et al. (2010) that state the adoption of modern and intensive agricultural practices such as the use of chemical fertilizer and improved seeds are quite low in Ethiopia. When we see the linear association between investment for inputs and *Teff* production, it is positive with strong correlation. This indicates that the influence of households' investment on inputs in generating more *Teff* crops is strong and significant. This result supports the result of other researchers that state fertilization of farmland can boost agricultural production and influence the food security status of a household (Crawford, Kelly et al. 2003; Diao, Hazell et al. 2010; Chauvin, Mulangu et al. 2012). The main concern of the framers includes the increasing trend of prices for farm inputs from time to time, poor quality of the inputs and chemicals, use of blanket fertilizer for all types of land, improper use of inputs and chemical by farmers, the declining trend of using manure or composite and as the result the fertility of the soil is declining from time to time. Addressing such concerns requires the attention of the government, research institutions and stakeholders. For instance, developing area specific input packages and awareness creation on the utilization of inputs among farmers is recommended to address such problems.

o. Contact with extension agents and *Teff* production

From the survey result, we can understand that the extension package is very good. The development agents are trying to technically support and continuously supervise the work of the farmers. About 242 (97.58%) of the respondents get contact with extension workers within the 2010 E.C (2017/18) harvest period. When we see the relationship between contact with extension agents and *Teff* production it is positive and significant. This result is like the findings of other researchers such as Rehima, Belay et al. (2013) and Girma and Endrias (2015) that state visits by an extension agent had a significant and positive effect on the quantity of crops. On the other hand, the survey result identified some of the problems of extension workers such as lack of transparency in selecting farmers for training, extension workers not available when needed, inappropriate timing, lack of educational materials, inadequate technical support, not demand-driven support and capacity limitations. This result is similar to the findings of MoFED (2006) that state extension agents are hampered by tasks other than the provision of technical advice, namely input, and credit distribution. In this regard, according to the survey of MoFED and other researchers, most extension workers view their role primarily as distributing fertilizer and credit (Bonger, Ayele et al. 2004; MOFED 2006; Byerlee, Spielman et al. 2007; Curtis, Entsminger et al. 2008). However, the research result also indicates that although the development agents want to help the farmers in some cases, the farmers are not obedient to the policy of extension and some farmers are not practicing what the extension agents tell them.

p. Access to training and *Teff* production

The survey result indicates that extension workers and district level experts are providing training to the farmers on planting *Teff* crops in rows, handling moisture, soil and water conservation, and practical demonstrations at field levels and church gatherings. In this regard, about 203 (81.85%) respondents got training at least once in agriculture-related fields in the past two years (2009-10 E.C). When we measure the strength of the linear association between training days with *Teff* production, it is weak and negative. This implies that the relationship of farmers' training days to *Teff* production is loosely and negatively correlated which is against the findings of some researchers such as Fafchamps, Gabre-Madhin et al. (2005). This could be due to the lack of effective training program arrangements to farmers and poor follow up of the extension agents during implementation.

q. Access to credit and *Teff* production

From the survey result, we can learn that though there are limited opportunities to access loans, most farmers do not take loans. In the 2010 E.C (2017/18) harvest period, only 62 (25%) respondents took loans. The average amount of borrowed money is Birr 1,811.53 per household and on average about Birr 392.14 (21.65%) is allocated for *Teff* production. The reason for such a small amount of loan could be seen from two sides. From the farmers' point of view, fear of taking loans, lack of skills in managing loans, and problem of presenting collateral to the lending institutions as the major problems. From the financial institutions' side, the problems are high-interest rate, lengthy process, and no training is given to the beneficiaries on credit management. When we see the relationship between the amount of money allocated through credit to *Teff* production and *Teff* production it is positive, very weak, and insignificant. This implies that the strength of the association between the two variables is not strong, which is like the findings of some authors such as Carswell (2000) which state inflexible credit repayment procedures are widely reported as hindering smallholders' interest in farm credit.

r. Cooperative membership and *Teff* production

From the survey result, we can understand that the cooperatives are highly involved in the supply of fertilizer, inputs, and industrial goods to the farmers. About 216 (87.10%) of the respondents are members of at least one cooperative society while the remaining 32 (12.9%) are not the members of any cooperative societies. When we see the experience of membership in a cooperative, respondents on average have 10.33 years of experience. When we measure the strength of the linear association between the number of years of experience of membership in cooperatives and *Teff* production, it is positive and significant. This result is like the findings of other researchers' findings such as Spielman, Byerlee et al. (2010) and Rehima, Belay et al. (2013) that implies membership in cooperatives helps in promoting *Teff* production. It is also like the findings of other researchers that state farmers' organizations link farmers to inputs, outputs, and credit (Francesconi and Heerink 2010; Bernard and Taffesse 2012; Abebaw and Haile 2013).

s. Government policy and *Teff* production

When we see the views of the farmers concerning government policy, we can learn that the farmers are satisfied with the support of the government, especially in input supply and infrastructure. However, there are some complaints concerning the high cost of inputs, high-interest rates for loans and access to improve seed. Generally, even though there are some limitations, almost all the respondents appreciate the effort of the government in creating a favourable working environment for the rural community. When we see the access to the infrastructure of the survey respondents, about 193 (77.82%) of the respondents have access to potable water, 74 (29.83%) of the respondents have access to electricity and 217 (87.50%) of the respondents have access to mobile services. When we perceive the strength of the linear association between investment in utilities and *Teff* production, it is positive and significantly correlated. This indicates that there is a positive relationship between investment in infrastructure (utilities) and *Teff* production which is like the findings of other researchers such as Fulginiti and Perrin (1993), Wiebe, Soule et al. (2001) and Rashid and Dorosh (2009) that state public investments in infrastructure such as roads, utilities, and communications can increase agricultural production by lowering the cost of inputs at the farm level and increasing farmers' access to marketing opportunities.

The regression analysis of *Teff* production indicates that there is statistically significant difference among the four districts (at 95% level of significance). From the 21 explanatory variables included in the model, about nine (9) predictors are found to be positively and statistically significant at 95% level of confidence in determining *Teff* production in the study areas. These variables are:

three districts (Shenkora na Minjar, Lomie and Halaba zone) with p-value < 0.001, economically active labour force with p-value = 0.026, labour cost with p-value < 0.001, frequency of contact with extension workers with p-value = 0.036, monetary value of farm asset with p-value < 0.001, owned land in ha with p-value = 0.006, and rented land in ha with p-value < 0.001.

Though the types and severity of problems of *Teff* production differs among regions, some of the common problems to all districts are high cost of inputs, inadequate land supply especially young, backward method of farming, changing weather conditions, absence of technology such as sowing and harvesting machines, not adhering the advice of extension agents during the application of input to their farmland and the high labour demand for *Teff* production. This result is like the findings of some scholars that state the low productivity of *Teff* may reflect the low research and development investment in *Teff* seed improvement, a short history of *Teff* genotype improvement programs, limited resource for *Teff* research as well as lack of spill over from international research (Shita, Kumar et al. 2019).

8.3.3. Explanatory variables affecting *Teff* distribution differentials among farmers

In this thesis, distribution of *Teff* is primarily concerned with the physical movement of *Teff* to the market by smallholder farmers with the purpose of generating an income from selling *Teff* marketing. It tries to provide highlights on the distribution of *Teff* and actors in the value chain. It also reviews the explanatory variables affecting the amount of *Teff* supplied to the market such as demographic variables as indicated below.

a. Sex of the respondent and the amount of *Teff* supplied to the market

Male-headed households on average supply about 846.75 kg of *Teff* crops to market per household while female-headed households supply about 551.47 kg of *Teff* crops to market per household. This all shows that there is a difference between male-headed and female-headed respondents in relation to the amount of supply of *Teff* to the market. This result supports the argument of Conforti (2011) that state women face severe constraints than men in their access to productive resources that reduce their productivity. It is also similar to the research findings of Paddy (2003) that state men are likely to sell more due to their natural ability to bargain, negotiate and enforce contracts and Giziew (2019) that state males tend to be more aware of marketing channels because they are more networked socially and undertake most agricultural activities.

b. Age of the respondents and the amount of *Teff* supplied to the market in kilo grams

If we compare *Teff* crops supplied to the market, respondents within the range of 35 up to 65 ages supply the highest volume (821.87 kg per household) as compared to the young (18 up to 35) and elders (65 years and above). This could be because older people might have better experience in *Teff* marketing and long-standing customers as compared to the young ones. However, there is no significant difference in relation to the *Teff* supplied to the market by taking age as a variable. Our finding is against the findings of Tshiunza, Lemchi et al. (2001) that argued younger farmers better participate in the market as compared to older farmers. This could be due to the fact that older respondents might have experience in marketing, and they might have established relationships with customers for their *Teff* crops like that of younger respondents.

c. Family size and the amount of *Teff* supplied to the market

The result of the survey indicates that as the size of households increases, the trend for the consumption of cereal crops increases which is in line with our assumption. When we see the consumption of *Teff* crops among the different family sizes, it shows a variable trend. Though it is not significant, there is a positive but weak relationship between family size and *Teff* crops supplied to the market and thus, as family size increases, the trend for supply of *Teff* crops increases which is against the findings of Efa, Degye et al. (2017) that state smallholder farmers' decision to participate in *Teff* market is determined significantly and negatively by family size. The reason could be that respondents with higher family size tend to be market-oriented and thus they sell their *Teff* crops to generate more income rather than consuming it as it is the main cash crop for the households.

d. Education of the respondents and the amount of *Teff* supplied to the market

The amount of *Teff* supplied to the market is highest (952.37 kg per household) for those respondents who do not attend schools as compared to literates while the least supply (615.56 kg per respondent) is observed for the respondents whose educational status is from grade 9 to grade 12. This indicates that illiterates are scoring better supply than the literates and this is against the findings of Abraha (2015) which states education broadens farmers' skills and techniques of modern farming which enables them to perform farming activities wisely and diversification of household incomes which in turn would enhance households' food supply. Similarly, this result is against the study of Wongtschowski, Belt et al. (2013) that state education plays a key role to achieve success in running their farms as sustainable and profitable businesses. The reason could be because illiterate respondents might own more of productive resources such as land and oxen and thus, they are producing and supplying more *Teff* crops than literate.

e. Access to market information and the amount of *Teff* supplied to the market

Farmers do have multiple options to access market information including personal search in the market, peer farmers, traders, mobile, extension workers and cooperatives. As a result, about 228 (91.94%) respondents do have access to market information prior to sales while only 20 (8.06%) respondents do not have access to market information. When we measure the strength of the linear association between access to market information of the respondents and the amount of *Teff* supplied to the market through Pearson correlation, it is weak but positive. This indicates that though it is not significant there is a positive relationship between access to market information and the amount of *Teff* supplied to the market and this is like the findings of other researchers such as Antonaci, Demeke et al. (2015) that state farmers with better access to market information are able to better plan planting and storage decisions, find appropriate markets for their produce, and gain from profitable trade deals.

f. Distance to the market, transport cost and *Teff* supplied to the market

From FGD and key informants, we learn that the farmers located around the main roads use freight cars. However, those who are away from the road, use their pack animals such as donkeys, mules and carts pulled by donkeys to transport their *Teff* crops to market. They also use human labour if the amount of *Teff* is small such as less than 25 kg. On average, farmers travel about 6.37 kilometres to the nearest major market in their area. In relation to the round-trip cost per person, no transportation cost is observed for 124 (50%) respondents as they might use their foot and/ or pack animals for transportation. When we measure the strength of the linear association between the distance to the market and the amount of *Teff* supplied to the market through Pearson correlation, the result is negative and weak. This indicates that as the distance travelled to the market increases, though it is insignificant, the supply of *Teff* crops to the market decreases. This is like the finding by Husmann (2015) which states distance from markets negatively influences market participation. When we see the transportation cost for *Teff,* the yearly average transportation cost is Birr 74.63 per household. In this regard, about 128 (51.61%) respondents do not incur a cost for transportation. About 47 (18.95%) respondents incur up to Birr 100.00 for transportation, about 37 (14.92%) respondents incur from Birr 100.00 up to Birr 200.00 and the remaining 36 (14.52%) respondents incur above Birr 200.00 for transportation of *Teff*.

g. Price determination and the amount of *Teff* crops supplied to the market

From the discussions with FGD and key informants, we understand that *Teff* is a cash crop for the farmers and its market value is higher as compared to other cereal crops. The price depends on the time of selling and *Teff* quality. Usually, smallholder producers do sell their *Teff* crops immediately after harvest (December or January) and thus get lower prices as there is excess supply in the market. The government has no interference in the *Teff* market as it is following a free-market economy and farmers are free to sell their crops. The price of *Teff* has an increasing trend from year to year and even within a year. In principle the price is determined through negotiations in the market and the farmers do have the right not to sell their crops. However, the wholesalers talk to each other and fix the price of *Teff* crops. If the traders don't buy with the price they set, there is nothing the farmers can do. Farmers face the problem that they may return home without selling their *Teff* crops.

The survey result also indicates that about 150 (60.49%) respondents do sell *Teff* crops within three months after harvest with the average price of Birr 21.00 per kg. About 66 (26.61%) respondents do sale their *Teff* crops from three to six months after harvest with average price of Birr 21.01 per kg and 18 (7.26%) respondents do sale their *Teff* crops from six to nine months after harvest with average price Birr 21.22 per kg. Only 4 (91.61%) respondents do sell their crops after nine months with an average price of Birr 22.07 per kg. This result is like the research result of Kebebew Assefa et al. (2013) that state in the Ada area, about 75% of the *Teff* produced is supplied to the market, and of this about 85% is sold during the months of December and January mainly due to liquidity requirements to cover various expenses such as credit, social obligations, school fees, clothing, and the likes.

The total supply of *Teff* crops by the respondents is about 199,955 kg. When we see the types of *Teff* crops supplied to the market, about 147,285 kg (73.66%) is *Magna Teff* (super white *Teff*) and the remaining 52,670 kg (26.34%) is white *Teff*. Neither red *Teff* nor mixed *Teff* is supplied to the market by the respondents in 2010 E.C (2017/18). A total of 238 (95.97%) respondents supplied *Teff* crops to the market. About 171 (68.95%) respondents supplied *Magna Teff* while the remaining 67 (27.02%) respondents supplied white *Teff* to the market. When we see the average price for kg for the two types of *Teff* is about Birr 21.21 per kg for *Magna Teff* and Birr 19.72 per kg for white *Teff*. This generates total revenue of Birr 4,162,567.25 to the respondents from sale of *Teff* crops with the average revenue of Birr 16,784.75 per household. When we measure the strength of the linear association between the timing of sales, the total *Teff* supplied to the market and price per kg through Pearson correlation, they are positive and significant. These all indicate that there is a positive and significant relationship between timing of sales and total *Teff* crops supplied to the market and price of *Teff* crops per kg. The result is like the research findings of Tadesse and Guttormsen (2011) that states prices are usually lower during harvest period.

h. Membership in cooperative marketing and *Teff* supplied to the market

From FGD and key informants, we have come to know that cooperatives do not have a visible role in *Teff* marketing apart from providing market information to their members. They are focusing on the distribution of input and supply of industrial goods to the farming community. Some farmers are selling their *Teff* crops to cooperatives during harvest time at a cheap price and in return they get dividends after the crop is sold at a better price later. The survey result indicates that about 131 (52.82%) of the respondents are members of marketing cooperatives. Though the non-members supply more *Teff* crops (895.56 kg per household) to the markets, the members of marketing cooperatives get a better price in the market (Birr 20.82 per kg) as compared to non-members (Birr 19.47 per). This could be the result of the bargaining power of cooperatives. Similarly, as the experience of membership in cooperatives increases, respondents get a better price for their *Teff* crops. Such results are like the research findings of Gelo, Muchapondwa et al. (2017) and Gelo, Muchapondwa et al. (2019) that argued farmers' organizations tend to increase farmers' bargaining power, reduce transaction costs, and render economies of scale. The result is also similar to the findings of Tadesse and Guttormsen (2011) that state cooperatives create awareness towards established *Teff* supply chains characterized by win-win cooperation among chain actors.

i. Storage facilities and the amount of *Teff* supplied to the market

Though it differs in size, all the respondents have storage facilities within their residence. The average capacity of the store is 5,559 kg per household. About 156 (62.90%) respondents store their crops up to three months, 69 (27.82%) respondents store their crops from three up to six months and the remaining 23 (9.28%) respondents store their crops for more than six months. Farmers with higher storage capacity supply more *Teff* crops to the market and do have the opportunity to get better prices as compared to farmers with small storage capacity. The survey result indicates there is a positive and significant relationship between storage capacity and total *Teff* crops supplied to the market and thus our finding is like the results of Atinkut, Bedri et al. (2017) that state long-term storages are intended to earn profits from future price increases.

j. Government policy and the amount of *Teff* supplied to the market

From FGD and key informants, we understand that the government is following a free-market economy. The existing free-market policy provides freedom for farmers in setting the price of his/her products and it is believed the policy is in the farmers' best interest. The farmers, traders and consumers are free to buy and sell *Teff* crops at anytime and anywhere and the price is being set through negotiations. Any farmer can produce as much as s/he can and can sell it without a limitation and intervention from the government or other third parties. The government has a supportive role including development of national marketing policies and strategies, establishing a legal framework, developing market infrastructures such as roads, market places, providing training, organizing marketing cooperatives, and regulatory issues. However, the issue of licensing and illegal trade and brokers are the major problems in *Teff* marketing that need the attention of the government. It is recommended that the government should monitor illegal trade and the collusion of traders in fixing the price of *Teff* crops through strengthening its regulatory mechanisms. From the survey result, about 177 (71.37%) respondents said the government established a "favourable environment" and registered higher in terms of *Teff* supplied to the market (870.20 kg per household). About 30 (12.10%) respondents said it is "unfavourable environment" and register low in terms of *Teff* supplied to the market (375.00 kg per household) while the remaining 41 (16.53%) respondents are not interested to provide their opinion on this issue and on average they supply about 845.85 kg per household. This is like the previous study of Bonger, Gabre-Madhin et al. (2002) that state government interventions and policies can improve grain markets.

Among 21 variables, in addition to the significant difference among districts, three variables (*Teff* production in kg, price of *Teff* and gender) are found positively and statistically significant to the prediction (P-value < 0.05) of total supply of *Teff* crops to the market. Two variables (*Teff* consumption and membership in cooperative marketing) are negatively and statistically significant to the prediction (P-value < 0.05) of total amount of *Teff* supplied to the market.

Though the types and severity of problems of *Teff* distribution differ among districts, the major marketing problems are the existence of illegal traders and brokers in the *Teff* value chain and poor monitoring of the illegal traders from government authorities. Usually, farmers are price takers and the prices are fixed by traders (collusion of price), absence of strong marketing cooperatives, fluctuations and inflation of price of *Teff* crops price, lack of proper scale, traders store *Teff* for long time to manipulate the price (hoarding), lack of transport facilities to remote areas, high tax rates, and adulteration (mixing with others) are mentioned as major problems in *Teff* marketing. Poor market linkage by the government, low price of *Teff* crops in the market and problem of finance are mentioned by all the districts as the major problem of *Teff* distribution. The problem of middlemen (traders) was mentioned as a major problem by three districts. Lack of market information and long channels of the market were mentioned as a major problem by two districts.

8.3.4. Effect of local and global *Teff* production and distribution to the livelihood of smallholder farmers

a. Effects of local *Teff* production and distribution to the livelihood of farmers

Agriculture in Ethiopia constitutes the source of livelihood for the majority of the rural population and creates the largest share of employment. In this regard, Etana and Tolossa (2017) argued that agriculture constitutes the source of livelihood, and the largest share of employment for most of the rural population in Ethiopia. As per the report of Asfaw, Tolossa et al. (2010), the agricultural sector is dominated by smallholder households, and it is a viable means of generating income for the farmers.

From the FGD and key informants, we can learn that a free-market economy is the basic economic policy for the country. In this regard, farmers do sell their *Teff* crops at anytime and anywhere without limit, but they mostly prefer *Kebele* or district markets. As per the opinion of the study participants, the free market is good as it makes the farmers, traders and consumers freely negotiate, buy and sell their *Teff* crops without limit. This result is like the findings of Abraha (2008) which states the present government, which took power in 1991 enforced new economic reform (free market) in 1991. On the other side, the involvement of illegal brokers in the marketing of *Teff* crops is affecting the business negatively.

Further, from the discussions with FGD and key informants, we can learn that producers, commission agents, assemblers, brokers, wholesalers, retailers and consumers are involved in the *Teff* value chain. The producers are responsible for *Teff* production; the assemblers are responsible for collecting *Teff* crops from producers and delivering it to wholesalers. The wholesalers further sell *Teff* crops to retailers and then to consumers. The study result indicates that due to the low volume of sales and high cost of transportation, usually, farmers do not supply their crops to the major towns by themselves, but rather sell their crops in the local market. Brokers are also involved in market facilitation (linking producers to wholesalers). The result of our finding is like the research result of Girma Alemu (2015) that states different entities are involved in *Teff* marketing such as farmer trader, local/regional collectors, regional assemblers, regional retailers, regional wholesalers, urban wholesalers, and urban retailers. As per the discussion with the key informants, the involvement of illegal brokers and the existing long market chain are the major challenges in relation to the distribution of *Teff* crops. This finding supports the previous result of Gabre-Madhin (2001) that state brokers have an intermediary role of matching geographically dispersed buyers and sellers, and, in return, they receive a fixed commission.

From the discussions with FGD and key informants, we can learn that farmers sell their *Teff* crops to people living in towns including urban dwellers, public servants, retailers, and cooperatives mostly. Farmers do also sell their *Teff* crops in the local market to traders. Farmers simply sell *Teff* crops by themselves and what they need to do is travel to the nearer market. Sometimes, the farmers do sell their *Teff* crops to cooperatives and unions (in Halaba zone and Tahtai Maichew district) and agricultural agencies for seed distribution, especially in Halaba zone. From the discussions with FGD and key informants, we can understand that urban dwellers and civil servants are the main clients of the wholesalers. However, occasionally, institutions like millers, *Injera* bakers, regional *Teff* traders, and public hospitals purchase *Teff* crops from the wholesalers. Our finding supports the previous research result of Demeke and Di Marcantonio (2019) that state *Teff* is the most preferred cereal among better-off households, especially in urban areas, making it an attractive cash crop for farmers.

Wholesalers in Addis Ababa do not have direct contact with the farmers. Rather they receive from regional brokers and traders who bring *Teff* crops from regions to wholesalers on a commission basis. As the actors in the market chain increases, the profit margin for each actor will bring a burden to the end users. Neither the *Teff* producers benefit from such a long chain. From the discussion, we also learn that some farmers from Oromia regional states do bring their *Teff* crops to wholesalers in Addis Ababa which is similar to the report of CSA (CSA 2011). It recommended that government organs responsible for linking farmers with end-users by organizing cooperative marketing at the local level should work hard to shorten the chain of *Teff* marketing that benefits both the producers and consumers. This result is like the previous research findings that elaborate the importance of cooperatives in creating win-win cooperation among chain actors and thereby bring higher economic returns to households (Bernard, Taffesse et al. 2008; Mussema, Kassa et al. 2015; Woldu and Tadesse 2015).

The survey result indicates that about 238 (95.97%) respondents were involved in *Teff* marketing (sale of *Teff* crops) in 2010 E.C (2017/18) while the remaining 10 (4.03%) respondents didn’t participate in *Teff* marketing in the same year. The survey result also shows that farmers are producing *Teff* crops for both consumption and market purposes. This result is like the findings of some scholars such Crymes (2015) and report of FAO (2015) that state *Teff* is one of the most important preferred cereal crops of Ethiopia, both in terms of food and nutrition security, and its high price in the market makes it an attractive cash crop for farmers. It also supports the argument of some authors such as Roseberg, Norberg et al. (2005) and Assefa (2015) who stated despite having significantly lower yields than most cereal crops, *Teff* has been dedicated to its production by smallholder producers.

About 93 (37.5%) respondents sale their *Teff* crops primarily to wholesalers, 66 (26.61%) respondents sale their *Teff* crops primarily to cooperatives, 39 (15.73%) respondents’ sale their

Teff crops primarily to urban consumers and 27 (10.89%) respondents sale their *Teff* crops primarily to retailers. The remaining 13 (5.24%) respondents do sell their *Teff* primarily to rural consumers, *Injera* bakers, brokers, millers, and assemblers. About 10 (4.03%) respondents didn't participate in *Teff* marketing.

In terms of sales volume, the respondents do sell their *Teff* crops to different actors in the *Teff* value chain. From the survey result, we can see that farmers do sell their *Teff* crops mainly to wholesales. In this regard, about 110,870 kg (55.45 %) of the total volume of marketed *Teff* crops go to wholesalers. About 50,035 kg (25.02 % of the total volume of marketed *Teff* crops), about 17,785 kg (8.89% of the total volume of marketed *Teff* crops) and about 14,115 kg (7.06% of the total volume of marketed *Teff* crops) are distributed to cooperatives, retailers and urban consumers, respectively. The remaining 7,150 kg (3.58% of the total volume of marketed *Teff* crops) is distributed to *Injera* bakers (processors), rural consumers, brokers, assemblers and millers. This result shows that the major clients of farmers are wholesalers, cooperatives, retailers and urban consumers who take about 192,805 kg (96.42%) of the total supply of *Teff* crops to the market.

The average *Teff* production for all survey respondents is 1104.13 kg per household with a standard deviation of 757.39. The average sales volume for all respondents is 806 kg per respondent with a standard deviation of 654. This result is like the findings of Efa Gobena Tura et al. (2017) that state the average marketed surplus for households that participated in the *Teff* market is 8.51 quintals (851 kg) per household. About 297 kg (26.90%) of *Teff* crops is used for household consumption and the remaining 0.86 kg of *Teff* (0.08%) is for seed. However, there is a big difference among the districts in terms of sales volume. The sales volume for Lomie district is 1,410.48 kg per household, the sales volume for Shenkora na Minjar district is 895.16 kg per household, the sales volume for Halaba zone is 781.45 kg per household and the sales volume for Tahtai Maichew district is 137.98 kg per household.

From the analysis of actors in the value chain, we can see that farmers are involved in marketing as producers of *Teff* crops and thus they are part of the *Teff* value chain. Even though the farmers consume more *Teff* crops as compared to other crops, about 73.02% of the total *Teff* production is supplied to the market. This result is like the findings of Girma Alemu (2015) that state about 70% of the total *Teff* production is marketed at Bacho district of West Shoa Zone of Oromia regional state. The finding is also like the findings Azeb et al. (2017) which state about 82.27% farmers used *Teff* as the source of income in addition to home consumption.

From the survey result, we can see that the average *Teff* consumption per household for all respondents is about 297.26 kg per household per year with a standard deviation of 197.52. This indicates that the respondents on average consume about 26.92 % of their *Teff* crops. The average consumption of cereal crops is 76.05 kg per household per month. *Teff* crop is the most-consumed crop covering 32.54% from the total cereal crops with an average consumption of 24.75 kg per month per household. Maize is the second most consumed crop covering 25.61% of the total cereal crops (with an average consumption of 19.48 kg per month per household) and wheat is the third most consumed cereal crop covering 20.81% (with an average consumption of 15.83 kg per month per household). Sorghum, small millet and barley follow the next ranks with average monthly consumption of 8.44 kg, 7.28 kg and 0.28 kg, respectively. The result of the research indicates that *Teff* is used as the major food staple and is the most preferred food for consumption by farmers. This shows the importance of *Teff* crops for the livelihood of the farming community. This result is against earlier findings of Roseberg, Norberg et al. (2005) that state *Teff* is the most preferred cereal among better-off households, especially in urban areas.

The average revenue generated from sale of *Teff* crops for all the respondents is Birr 16,784.73 per household per year with a standard deviation of 14,039.58. If we see the average revenue generated from sale of *Teff* crops by district, the highest is for Lomie district (Birr 30,176.74 per year per household) followed by Shenkora na Minjar district (Birr 18,816.13 per year per household) and Halaba zone (Birr 14,981.60 per year per household). The average revenue generated from sale of *Teff* crops is observed to be the least for Tahtai Maichew district (Birr 3,164.46 per year per household). The result of the survey is similar to the report of the Central Statistical Authority of Ethiopia which states that Oromia and Amhara regional states are the major *Teff* producer regional states and the major source of *Teff* crops for the market (CSA 2017/18). Our finding is like the research output of Fikadu et al. (2019) that state Oromia region is the most important *Teff* producing area in the country and its share in total national production is estimated to be as high as 48%. The second highest region is Amhara region with 39%. The rest regions are relatively less important.

From the survey result, we can see that the average yearly revenue per household is Birr 41,198.16 with a standard deviation of 24,587.04. When we compare the average revenue generated from the different sources, about Birr 23,029.92 (55.90%) of the total revenue comes from sales of different crops. Sale of live animals generates average revenue of Birr 5,275.81 (12.81%), and sale of vegetables generates average revenue of Birr 4,271.77 (10.37%). The other farm activities and nonfarm activities (such as beekeeping, chat selling, selling beverages, salary, daily wage, remittance and grants) contribute about Birr 8,620.66 (20.92%) of the total annual revenue of the households. From this, we can observe that sales of cereal crops contribute the highest share as a source of revenue for farmers. There is a significant difference among the districts in terms of the revenue generated from *Teff* supplied to the market.

Though it differs among districts, the survey result indicates that the sale of *Teff* crops on average contributes about 40.74% of the total annual revenue of the households. Our findings support the argument of previous research findings of Barrett (2008), Getnet (2007) and Urgessa (2011) that state that as cash crops, *Teff* is the first choice of the farmers, and the production of surplus *Teff* crops has an important impact on the revenue of the farmers. The survey result also revealed that about 27 (10.89%) respondents incur a loss (they are not profitable) from *Teff* production and marketing while about 211 (85.08%) respondents generate a positive net income which indicates the profitability of their involvement in *Teff* production and marketing. Though the net income differs among districts, the average net income for all respondents is Birr 12,917.98 per household. Our findings support the argument of previous research findings which state that as cash crops, *Teff* is the first choice of the farmers, and the production of surplus *Teff* crops has an important impact on the revenue of the farmers (Barrett 2008; Getnet 2007; Urgessa 2011).

The average yearly expenditure per household is Birr 22,835.63. On average, households used about Birr 13,045.02 (57.13%) for household food consumption, Birr 3,353.61 (14.69%) for closing, Birr 2,005.69 (8.78%) for labour expense and Birr 1,507.27 (6.60%) for utilities. The remaining expenditures are Birr 627.98 (2.75%) for transport, Birr 595.93 (2.61%) for entertainment, Birr 550.12 (2.41%) for animal feeding, and Birr 1150 (5.04%) for other costs like education, health, religious expenses, and payment of debts.

The contribution of *Teff* to the livelihood of rural farmers can be seen from two sides. First, as a cash crop, it is the source of income for the farmers and though there is a difference among districts, farmers on average get an income of Birr 12,917.98 per household per year. Second, despite earlier research findings, nowadays, *Teff* is consumed by rural farmers as well. It is found to be the first in terms of volume of consumption (24.75 kg per month per household) or (about 32.54% from the total cereal crops) among other crops which indicate that *Teff* is the most preferable means of livelihood by the rural farmers.

b. Effects of global *Teff* production and distribution to the livelihood of farmers

Ethiopia is the largest *Teff* producing country, and the only country to have adopted *Teff* as a staple crop (Hyejin Lee 2018). Kebebew et al. (2013) also argued that *Teff* is a strategic crop with the potential to enhance commercialization of smallholder agriculture and improve food security in Ethiopia. Since the ecology of our country is suitable for *Teff* production, there is a potential for exporting *Teff*. It is considered as the backbone of the country's economy since more than 50 million people often use it and it is the major source of income for the farmers. It is a major source of livelihood, and it is considered to have higher iron content than other cereals. What makes *Teff* grain even more attractive is the fact that it is a gluten free food. According to Fikadu et al. (2019) *Teff* is an untouched cereal crop worldwide than other cereal crops like maize, wheat, sorghum and barley; however, it is a staple food grain in Ethiopia mainly used to make *Injera* as a traditional fermented Ethiopian pancake. In this regard, Bart Minten et al. (2013) concluded that *Teff* is one of the most important crops for farm income and food security in Ethiopia, and it is Ethiopia's the second most important cash crop (after coffee), generating almost 500 million USD income per year for local farmers.

Although the government has put a ban on the export of *Teff* grain and *Teff* flour to protect local markets, *Injera* is still being exported to the international community to meet global niche market demands and the local farmers are not directly benefiting from this market and food and nutrition insecurity remain chronic issues facing the country (Crymes 2015). In this regard, Hyejin Lee (2018) argued that over the last several years, many local companies entered the *Injera* business to benefit from the growing market. Mama Fresh, for instance, is one of the largest local companies. The local companies export over 30,000 pieces of *Injera* daily to Washington and New York in the USA where large Ethiopian communities exist (Hyejin Lee 2018). According to the report of Kebebew et al. (2013) in 2005, there were about 30 thousand tons of *Teff* flour exported, earning the country about 13.7 million USD. However, due to policy reasons, *Teff* flour export dropped in 2006, and only 3 million of USD was earned. Starting from 2008, Ethiopia has been exporting processed *Teff* especially in the form of fresh *Injera* and dry *Injera* ('dirkosh'), and the export of such products is steadily increasing (Kebebew et al. 2013).

As per the report of FAO (2015), following the export ban of *Teff* grain and flour, export volumes of *Injera* increased to 2.5 million kg in 2012, or 270% increase from the 2008 level. The exports of *Injera* in 2015 were estimated at around 10 million US dollars. The main *Injera* international market outlets were North America, Middle East and Europe. The largest share (approximately 2.5 million US dollars) of *Injera* exports has gone into North America in the 2015 year (Fikadu et al. 2019). The United Arab Emirates (UAE) was the top destination of the *Injera* exports, absorbing over 65% of the volumes. As per the argument of Crymes (2015), the export ban on *Teff* has effectively prevented Ethiopian farmers from fully participating in the growing global trade of *Teff*, while allowing Ethiopian bakers to fully benefit from the increasing international *Teff* product trade. However, in the future, the demand for *Injera* might be exponentially increased due to its high nutritional values and gluten free grain crop (Fikadu et al. 2019).

From the FGD and KII discussions at all levels, we can understand that there is a potential for exporting *Teff* since the ecology of our country is suitable for *Teff* production. *Teff* is considered as the backbone of the country's economy since our people often use it and it is the major source of income for the farmers. This result is like the research output of Kebebew et al. (2013) and Hyejin (2018) that state *Teff* is a staple diet of most of the population, it is the most widely planted by farmers, Ethiopia is the largest *Teff* producing country, and it has adopted *Teff* as a staple crop.

Even though the coverage of *Teff* production is wide, its productivity is still low as farmers are producing it with a backward method of farming. From this, we can understand that the low production of *Teff* crops at the national level couldn't fully address even the local demand for *Teff* consumption. This result is similar to the findings of Kebebew et al. (2013) that state that while production and productivity of the crop have increased over time, the demand has risen faster and so the price of *Teff* has gone up in recent years.

From the FGD and KII discussions, it is noted that there is a high demand for *Teff* in the international market. If *Teff* is exported, the farmers can get better income and they can be motivated to produce more *Teff* crops. The country can also benefit from earning foreign currency and it can open job opportunities for many people. The result of our findings supports the idea of Kebebew et al. (2013) that states in 2005, there were about 30 thousand tons of *Teff* flour exported, earning the country about 13.7 million USD. However, due to policy reasons, *Teff* flour export dropped in 2006, and only 3 million of USD was earned. Hyejin Lee (2018) also highlighted that Ethiopia grows more than 90% of the *Teff* in the world; despite its largest production volume, the country is not capitalizing its own crop in the international market. These all indicate that though there is high demand for *Teff* crops in the international market, due to the export ban, neither the farmers nor the country are benefiting from the international market.

The FGD and key informants highlighted that first it needs to stabilize the local market by improving the productivity of *Teff*. If we can improve *Teff* productivity through the use of modern farming techniques by the smallholder farmers and introducing mechanized farming, we can satisfy the local demand and exporting *Teff* will not bring a negative effect to the local market. Without improving the productivity of *Teff* crops first, we shouldn't think of exporting *Teff* crops. The result of our findings is like the research result of Kebebew Assefa et al. (2013) that argued *Teff* can be considered as an important future export commodity, if the current efforts to increase production of *Teff* are successful.

8.4. Contributions to economic and development theories and policies

8.4.1. Theoretical and empirical contribution

a. Empirical contribution:

In this thesis, we used a variety of data sets to understand the topic. Although previous studies mainly relied on quantitative data, this thesis adds to the wealth of knowledge through the use of qualitative findings from focus groups and key informant interviews. Most of the previous studies on Ethiopia used a quantitative approach. This study employs mixed methods. The result has been deeper insights into the production and distribution of *Teff*. The qualitative elements have unravelled ideas about the origins of *Teff*, development of *Teff*, importance of *Teff*, changes in *Teff* production, gender roles in *Teff* production, features of *Teff* production and distribution, contribution of *Teff* to the livelihood of farmers, views of producers with regard to *Teff* export, problems of *Teff* production and distribution and other similar issues. These insights would not have been gained had the study used only the quantitative research approach.

The quantitative approach helped identifying the socio-demographic characteristics of *Teff* producers in the study areas; unravel the variables affecting *Teff* production and distribution at household level, comparison of such variables among districts, calculating the volume of *Teff* production and supplied to the market, quantifying the use of inputs and chemicals for *Teff* production, calculating the cost benefit analysis of *Teff* farming, profitability of *Teff* marketing, contribution of *Teff* to revenue of the households, prioritizing *Teff* production and distribution problems, and other aspects of the issues. Therefore, the use of mixed methods strengthened the study.

c. **Theoretical contribution:**

Previous studies were conducted shifting theoretical context – emergence from socialist planning and within the transition of a free market economy. The theoretical contribution indicates that the implementation of agricultural programmes in a country with foundations in socialism is fraught with complexities. The shift to a free economy while needing to protect the livelihoods of farmers has entailed levels of state intervention while permitting free market elements acceptable in a society embedded in socialist practice.

8.4.2. Contribution to economic development

The findings of the research revealed that Ethiopia's *Teff* industry has the potential to contribute significantly to the country's economic development. This study provides evidence that *Teff* production and distribution contribute to incomes of the rural households. Economically, *Teff* is an attractive cash crop and the major source of income for the farmers. In this regard, more than six million farmers are engaged in *Teff* production. On the consumption side, *Teff* is a daily staple food crop for more than 50 million Ethiopians. It is also known for its high content of iron and it is among the gluten-free cereal crops. Consumer demands are rapidly changing as the buyers become more conscious of food quality and thus the increasing demand for *Teff* crops both at local and global market is creating new prospects for smallholder farmers. Since demand for *Teff* in the domestic market is very high, it can be viewed that improving the productivity of *Teff* is essential if the demands of a rapidly growing population are to be met and the export potential of *Teff* is to be fully realized.

Carrying out similar research at a larger scale may help to better understand the situation of the actors in the *Teff* value chain and marketing institutions practiced in Ethiopia. However, the result of this study can give insights regarding *Teff* production and distribution and their financial contributions to the livelihood of *Teff* producers. In this regard, domestic *Teff* production and market development should be one of the key determinants in creating, sustaining and promoting rural development and competitive advantage for the country.

8.4.3. Contribution to development theories

In Ethiopia, research on both *Teff* production and distribution is rare. There are some research works in the literature of *Teff* production such as studies of Hailu et al. (2015), Haileselassie et al. (2011), Ayalew et al. (2011), Alemu et al. (2018) and Getu (2014). However, the studies focus on the technical aspects of improving productivity of *Teff*. From marketing perspectives, some work in the literature on value chain of *Teff* is available such as research done by Habtewold et al. (2017), Dalango et al. (2018), Gebremedhin et al. (2007), Belayneh et al. (2019), Demeke et al. (2013) and Assefa (2015). However, so far, no scientific research work has been conducted on *Teff* production and distribution among four districts from different regions in terms of *Teff* production, its contribution to livelihood in terms of consumption, participation of farmers in the *Teff* market and its financial contribution to the livelihood of farmers.

In terms of methodological approach, the experience of the current study shows that such studies require a research design that allows rigorous analysis based on comprehensive quantitative and qualitative data collected. The methodological contribution of this study lies in its use of mixed methods for data collection and analysis. The study employed a combination of different data collection techniques, such as review of documents, focus groups discussions, in-depth interviews, and surveys. Similarly, different techniques were used for data analysis, including qualitative methods such as thematic content analysis and quantitative methods such as descriptive statistics and econometric models. It is argued that the use of mixed methods allowed a triangulation of data that enhanced the validity of the study. Hence, the methods employed in this study also contribute to the literature on qualitative and quantitative research.

This study is a first attempt in this direction and the applied knowledge it generates is useful to all stakeholders. It presents a detailed and comprehensive picture of *Teff* production and distribution, role of farmers in the *Teff* value chains, the constraints that hinder their performance along with proposals for potential improvements. From the viewpoint of developing countries, this study may be a unique contribution in light of development literature, because both *Teff* production and distribution are in their infancy. Thus, this study has a significant contribution to emerging literature on developing crop production and marketing that will be of significant use to academics, practitioners and development planners interested in crop value chains in developing countries. This contributes significantly to literature on the *Teff* industry in particular and cereal in general. Furthermore, the information generated by this study contributes to previously limited knowledge in the area.

The strength of our analysis lies in the fact that we focused on a particular crop (*Teff* production and distribution) and its influence on the performance of farmers. A comparative analysis of the four districts enabled us to identify a range of options for enhancing *Teff* production and distribution and to identify the binding constraints that are encountered in each case study area. It also contributes to development of literature by highlighting the role of farmers in cereal production and distribution of developing countries.

8.4.4. Contribution to policy

Development of the *Teff* crops has attracted the attention of government policy makers and planners in Ethiopia because of the export potential of the sector. Therefore, this study calls for the framing of a policy to overcome constraints hindering the development of the *Teff* industry and other cereal crops. The findings of this study make a significant contribution to framing policy related issues. The improvements suggested in this study can serve as major inputs in framing government policies and strategies for the cereal marketing in general and in *Teff* crop in particular. The study result enables policy makers to identify the important determinants of both *Teff* production and distribution and to realize the economic and welfare contributions which help facilitate the interaction among stakeholders.

The findings of this study highlighted that integrated policies and strategies are required to promote sustainable *Teff* production and distribution. The research at hand identified problems of *Teff* production as excessive and unregulated use of chemicals, high cost of inputs, inadequate land supply for the young, backward method of farming, changing weather conditions, absence of technology and not adhering to the advice of extension agents during the application of input. On the other side, the problems of *Teff* distribution are problem of monitoring of illegal trade, absence of strong marketing cooperatives, fluctuations, and inflation of price of *Teff* crops price, collusion of price by traders, lack of proper scale, traders store *Teff* for long time to manipulate the price (hoarding), lack of transport facilities to remote areas and adulteration (mixing with others). Those problems can be the evidence for the lack of integrated policy. Given these existing issues and future challenges, such as a rapidly increasing population, urbanization, changes in living standards and stringent international compliance requirements, government policies in general and agricultural policies in particular should be framed from a sustainable development viewpoint.

8.5. Conclusions

Teff (Eragrostis *Teff*) is one of the major cereal crops in Ethiopia. The country is the largest *Teff* producing country and has adopted *Teff* as a staple crop. Though *Teff* production and distribution were practiced for decades in the study areas, it is not well supported by comprehensive research. Having first-hand information about *Teff* production and distribution is essential to devise appropriate strategies aimed at enhancing its value chain especially for the producers. Hence, the main aim of the study is to examine *Teff* production and distribution at the national levels and analyse its implications to the livelihood of the smallholder farmers in Ethiopia. In this regard, the central research question of the study is "what are the effects of *Teff* production and distribution to the livelihood of rural farmers in Ethiopia?"

A cross-sectional survey with a mixed approach considering both qualitative and quantitative research methods was used in this study. The sampling design used was multistage sampling whereby both purposive (non-probability sampling) and random sampling methods were used. Purposive sampling method was used to select top *Teff* producing regions, districts, *Kebeles*, sub *Kebeles*, key informants and FGD participants while the random sampling method was used to select survey respondents. Primary data were collected from multiple sources using different tools. The data collection tools used in this study includes a literature review, structured questionnaire survey, focus group discussions and key informant interviews. A total of 248 survey respondents, 84 FGD participants and 25 key informants were involved in the study. The data were analyzed both qualitatively and quantitatively.

As *Teff* production and distribution is vast and complex involving many stakeholders, to get more information and insight to the subject the study utilizes both quantitative and qualitative data collection methodologies. A mixed method research design was used in this thesis as a procedure for collecting, analysing, and mixing both quantitative and qualitative data to understand the research problem. This method was selected on the assumption that it helps to gather enough information and data both in qualitative and quantitative aspects of the topic. In this regard, the purpose of using a mixed method in this thesis was to gather data that could not be obtained by adopting a single methodology and for triangulation so that the findings with a single approach can be substantiated with others.

In this thesis, efforts have been made to review both the theoretical and empirical literature. Since the research is about *Teff* production and distribution, and its effect on rural livelihoods in Ethiopia, the theoretical and empirical discussion focused on production, distribution, and livelihood approaches. Through theoretical literature review, we tried to identify and discuss theories related to the research, define concepts, identify variables, and state tentative hypotheses to be tested. We used empirical review to know what has been done and what has not been done in the area and this helped us in identifying the research gap/research problem to be addressed. The theoretical and conceptual foundations used in this thesis were used as a pathway for the analysis of *Teff* production and distribution, and its implications for the livelihood of smallholder farmers. In this regard, the theoretical and conceptual foundations were very useful in examining *Teff* production, distribution, and livelihood (consumption and income) variables. The relationship among the dependent and independent variables were analysed by taking the four districts as case study areas and the results among the districts were compared and presented using frequencies, percentages, means, standard deviation, t-test, and other statistical parameters.

Research on *Teff* production and marketing is not the first of its kind in Ethiopia. There is extensive work done in the area both by writers from Ethiopia and other scholars. What makes this research different is its effort to hook the production and distribution of *Teff* together and analyse the factors that determine the two sides of the value chain. In this regard, efforts were exerted to address the key research questions. Moreover, the depth of analysis and the way in which information has been triangulated makes this research different from most of the previous research conducted in the area thereby adding value to both its policy and practical significance.

The qualitative and quantitative data were presented in an integrated fashion and an attempt was made to integrate the views of farmers with data on the one hand and compare the findings of this research with previously conducted studies. The strength of the thesis is that all the findings have been presented logically following the research questions, and both conclusions and policy implications were drawn from the key findings. The contribution of this study can be seen from methodological approach and emerging development literature focusing on crop production and distribution that will be of significant use to academics and practitioners interested in crop value chains.

The insights gained from this study and the findings suggest the need for further research. The focus of this study was on farmers. The study assessed the performance of farmers in *Teff* production and distribution. However, further research is needed focusing on all the actors of the *Teff* value chain so that a full picture on the potentials and constraints of the *Teff* value chain can be studied. On the other hand, the livelihood approach is a broad concept that encompasses different capitals (Human, Physical, Natural, Social and Financial). However, the study focused on the financial capital aspect and thus, the details of the remaining capitals can be considered for further research within the *Teff* value chain.

Based on the empirical findings of this study, it would be important to conclude that *Teff* production and distribution have profound and far-reaching socioeconomic impacts on the lives of rural people. In addition, it is concluded that production of *Teff* crops has a promising role in increasing household income and providing better nutrition opportunities for the families. When we see the views of the farmers concerning government policy in relation to agriculture, we can learn that the farmers are satisfied with the support of the government, especially in extension services, input supply and infrastructure. However, there are some complaints concerning the high cost of inputs, limited access to improve seed, small land size, backward farming system, absence of farming technologies, and illegal trade. To tackle the observed gaps and improve the performance of *Teff* production and distribution, introducing modern ways of farming and irrigation schemes at the household level and strengthening the monitoring of illegal trade are recommended. Thus, the potential of *Teff* farming should be developed and encouraged by providing incentives with careful and planned investment on inputs and technologies and minimizing illegal trade.

8.6. Implications for practice

This concluding remark presents some implications of the thesis analysis for the development of policy and future research agenda in the areas of *Teff* production and distribution. The findings of *Teff* production and distribution have significant implications to policy and practice. Having reviewed the major findings of the empirical studies, the following policy implications are recommended.

a. Introducing modern ways of farming at the household level

The policy of the country centres on agriculture-led industrialization. Though the implementation is not as expected, it is good for agriculture. The policy paper needs to be transformed into practice at ground level. In such cases, the provision of inputs, improved seed, chemicals, the introduction of row planting and extension support is a good start; but the actual implementation requires devising integrated strategies and packaging systems at ground level that might help in transforming the productivity of *Teff* crops at the national level. This can be done by creating one window service system where the farmers get all the services in one place. They can get the services of suitable fertilizer for their land, access to improved *Teff* seeds, the best pesticide and even the advice of experts through a one window service system. With one window service, they can also get access to credit. It is also important to educate and train farmers so that they will have a positive attitude towards the modern agricultural system. This is in line with the diffusion model of production that state agricultural development is assumed to be based on devoting considerable resources to increasing the flow of information to farmers about new agricultural technology and new institutional arrangements and teaching tradition to bound farmers how to make more economically rational management decisions about the uses of resources they have access to. The route to agricultural development, in this view, is through more effective dissemination of technical knowledge and a narrowing of the productivity differences among farmers and among regions. Actually, in Ethiopia, currently, there is a new extension demonstration and training program of this model type.

b. Introducing irrigation schemes and small-scale agro industries

The farming system that we are using now is traditional by using human and oxen labours. The long-lasting solution for Ethiopia is to focus on modernizing the methods of *Teff* production by enhancing household level small-scale irrigation and introducing small-scale agro industries that can support the producers at ground level. Through expansion of small-scale irrigation, farmers can produce at least twice per year which can double *Teff* production at household level and thus the potential for exporting can be enhanced. The provision of simple and small-scale farm tools also helps in reducing the tedious and higher demand of labour for *Teff* production. Such household level irrigation and farm tools will ease the burden of work and farmers can be motivated to produce more *Teff* crops. This can be achieved through the High Payoff Input Model theory of production. In this conception, transformation of traditional agriculture is believed to be undertaken by investments aimed at increasing the availability and supply of modern high pay off inputs to farming activities. Peasants in Ethiopia are in traditional agricultural systems. They remained poor because there were only limited technical and economic opportunities to which they could respond. In this regard, it is hypothesized that investment in agricultural technology development and human capacity building could enable us to produce more productive technologies and productive farming people. This in turn could lead to generating new technologies, adopting the available ones to the economies of poor countries, and overcoming the problems of inappropriateness of the inputs produced in advanced countries.

c. Research on the productivity of *Teff* crop

The coverage of *Teff* production is wide; its productivity is still low as farmers are producing it with a backward method of farming. As a result, the low production of *Teff* crops at the national level couldn't fully address the local *Teff* consumption. Investing in research on improving *Teff* seed varieties and timely dissemination of quality *Teff* seed is very critical for the success of boosting *Teff* production. We need to improve the quality of the seed and enhance seed multiplication of brand value. The improved seeds need to be multiplied instead of using informal seed variation year after year. Currently, farmers are using blanket fertilizers for all their farmlands and it is advised to use a locally recommended fertilizer which needs further research for each potential area. Universities and agricultural research found in each region can contribute a lot in improving the quality of *Teff* seed and identifying locally recommended fertilizer for each potential area. This is in line with the new high pay-off inputs production model that give due attention to the capacity of public and private sector research institutions to produce new technical knowledge, the capacity of the industrial sector to develop, produce and market new technical inputs and the capacity of farmers to acquire new knowledge and use new inputs effectives.

d. Introducing large-scale mechanized farming focusing on export

The global opportunities for exporting *Teff* crops are increasing from time to time as it is chosen for its gluten-free cereal. However, the government of Ethiopia refrains from exporting it for its purely domestic food security reasons. The country can benefit a lot from exporting it such as earning foreign currency, farmers can be motivated to produce more *Teff* crops as they might get a better price and it can open job opportunities for many people. If we improve *Teff* productivity through the use of mechanized farming, we can satisfy the local demand and exporting *Teff* will not bring a negative effect to the local market. In this regard, the provision of incentives to *Teff* producers that produce for the international market are important issues that need the attention of the government. This is in line with the new high pay-off inputs production model that states the key to transforming a traditional agricultural sector into a productive source of economic growth is an investment designed to make modern, high-pay off inputs available to farmers in poor countries.

e. Strengthening marketing cooperatives

Unlike coffee and sesame cooperatives that are directly engaged in the global market, the marketing cooperatives are not strong enough to export *Teff*. Initially, the cooperatives can start providing services in many ways such as providing storehouses in their areas to members and provision of market information for farmers. They can also provide training to their members in relation to the value chain that they have and how they can sell their product. Creating strong marketing cooperatives can improve the bargaining power of farmers through cooperation and thereby shortening the long market chain that benefits both producers and end-users. These create a good opportunity for farmers to sell their *Teff* crops in an organized way and get a better price for their produce. The experience of coffee and sesame cooperatives and unions can be taken as best practice. However, marketing cooperatives need technical and financial support not only from the government but also from other stakeholders as well in building their capacities so that they will be competitive in local and international markets.

f. Standardization of *Teff* crops

When we are thinking of exporting *Teff,* we need to standardize the *Teff* grain type, colour of the crop and the nutritional value. We also need to have systems of labelling like net content, ingredients of the product, their special storage conditions, packaging, handling the product and other similar issues. In this regard, it needs to have certified producers and exporters so that not anyone can export it, but the ones who have licensee for exporting. If the productivity is improved, *Teff* can be exported to the global market considering the marketing standards, labelling and modern packaging system. This concept is in line with the modern food value chain theories in which modern food value chain (FVC) participants coordinate the supply chain through formal, well-documented contractual arrangements that feature predetermined product standards, volume requirements and purchase prices. Such tight coordination, together with access to a network of global and domestic suppliers, allows modern FVCs to offer a wide year-round assortment of fresh and processed/packaged food products.

g. Sustainable use of natural resources

Conventional agriculture generally promotes measures aimed at increasing productivity while at the same time maintaining sustainability. Increasing the production potential of these smallholders is one of the surest and the quickest ways of ending poverty. However, the need for increased productivity of smallholder farmers should be balanced with the concern for sustainability. Thus, the need for increased productivity of smallholder farmers should not be at the expense of environmental degradation and thus it needs to be balanced with the concern for sustainability, i.e. ensuring food security and ecological stability. This is in line with the sustainable livelihoods approach that seeks to develop an understanding of the factors that lie behind people's choices of livelihood strategies and then reinforce factors which promote choice and flexibility. In this regard, according to sustainable livelihoods approaches have been used and found useful in supporting systematic analysis of poverty and its causes, in a way that is holistic – hence more realistic – but also manageable; promoting a wider and better-informed view of the opportunities for development activities and their likely impact; and placing people and the priorities they define firmly at the centre of analysis and objective-setting. This approach gives respect for and recognition of local knowledge and local management of natural resources, and efforts to promote the capabilities of current generations without compromising the prospects of future ones are critical points. Consequently, economic, and environmental sustainability, adequate farmers' income, productive capacity for the future, improved food security and social sustainability are important elements of developing countries' agricultural development.

h. Strengthening the monitoring of illegal trade

The survey result indicates that the major challenges of the farmers are middlemen, illegal traders and poor market linkage by the government. In this regard, the government institutions shall develop systems of monitoring such malpractices.

REFERENCES

Ababa, A. (2006). "Ethiopia: Building on Progress a Plan for Accelerated and Sustained Development to End Poverty (PASDEP)."

Abate, T., B. Shiferaw, et al. (2015). "Factors that transformed maize productivity in Ethiopia." Food Security 7(5): 965-981.

Abdullah, M. and M. R. Hossain (2013). "A new cooperative marketing strategy for agricultural products in Bangladesh." World Review of Business Research 3(3): 130-144.

Abebaw, D. and M. G. Haile (2013). "The impact of cooperatives on agricultural technology adoption: Empirical evidence from Ethiopia." Food policy 38: 82-91.

Abera, H. B. (2008). Adoption of improved tef and wheat production technologies in crop-livestock mixed systems in northern and western Shewa zones of Ethiopia, University of Pretoria.

Abraham, R. (2015). "Achieving food security in Ethiopia by promoting productivity of future world food tef: A review." Adv Plants Agric Res 2(2): 00045.

Abrha, B. K. (2015). Factors affecting agricultural production in Tigrai region, northern Ethiopia.

Acharya, S. S. (2006). "Sustainable agriculture and rural livelihoods." Agricultural Economics Research Review 19(2): 205-217.

Adhana, A. H. (1991). "Peasant response to famine in Ethiopia, 1975-1985." Ambio: 186-188.

AfDB, O. (2011). "UNECA and UNDP (2011)." African Economic Outlook 2011.

Agada, M. and N. Evangeline (2014). "Constraints to increasing agricultural production and productivity among women farmers in sub-saharan Africa: Implications for agricultural transformation agenda." Nigerian Journal of Rural Sociology 15(2202-2019-833): 55-65.

Akalu, A. (2007). Vegetable market chain analysis in Amhara National Regional State: the case of Fogera woreda, South Gondar zone, Haramaya University.

Akop, G. (2015). “Development, Globalization and The Dependency Theory In South Caucasia. World Affairs.” The Journal of International Issues, Vol. 19, No. 3, pp. 108-117.

Alemayehu, S. (2000). "Government policy and dynamic supply response: a study of the compulsory grain delivery system." Ethiopian Journal of Economics 9(2).

Alemayehu S. (1993). Cereal Producers, Prices and the Supply of Manufactured Goods, in Ethiopian Journals of Economics Vol. 11 No. 1.

Alemayehu, T. (2001). "The impact of uncontrolled waste disposal on surface water quality in Addis Ababa, Ethiopia." SINET: Ethiopian Journal of Science 24(1): 93-104.

Alemu, D. (2011). "The political economy of Ethiopian cereal seed systems: state control, market liberalisation and decentralisation." IDS Bulletin 42(4): 69-77.

Alemu, D., B. Ayele, et al. (2012). "Cereals Availability Study in Ethiopia, 2008." Development of a Spatial Equilibrium Modeling Approach to Study the Impact of Policy Intervention on Cereals Availability.

Alemu, et al. (2002). "Agricultural Development Policies of Ethiopia since 1957." *South African Journal of Economic History*, Vol. 17/1-2, pp. 1-24, http://dx.doi.org/10.1080/10113430209511142.

Alemu, G. (2015). Market performance and determinants of marketed surplus of teff in Bacho Woreda of South West Shewa Zone, Oromia National Regional State, MSc Thesis, Haramaya University, Haramaya, Ethiopia.

Alemu, M. D., B. Tegegne, et al. (2018). "Technical efficiency in Teff (Eragrostis Teff) production: the case of smallholder farmers in Jamma district, South Wollo Zone, Ethiopia." J Agric Econ Rural Dev4(2): 513-519.

Alemu, Z. G. (2005). Causes of instability in cereal production in Ethiopia.

Alemu, Z. G., L. K. Oosthuizen, et al. (2002). "Agricultural development policies of Ethiopia since 1957." South African Journal of Economic History 17(1-2): 1-24.

Alene, A. D., V. Manyong, et al. (2008). "Smallholder market participation under transaction costs: Maize supply and fertilizer demand in Kenya." Food policy 33(4): 318-328.

Alexandratos, N. and J. Bruinsma (2012). World agriculture towards 2030/2050: the 2012 revision, ESA Working paper FAO, Rome.

Allaro, H. B. (2012). "The impact of trade liberalization on Ethiopia's trade balance." American Journal of Economics 2(5): 75-81.

Allen, I. E. and C. A. Seaman (2007). "Likert scales and data analyses." Quality progress 40(7): 64-65.

Allison, E.D., & Horemans, B. (2006). Putting the principles of the Sustainable Livelihoods Approach into fisheries development policy and practice. Marine Policy, 30, 757-766.

Amentae, T. K. (2016). Evaluation of supply chains and post-harvest losses of selected food commodities in Ethiopia.

Amentae, T. K. (2018). Supply chain management approach to reduce food losses.

Amentae, T. K., E. G. Tura, et al. (2016). "Exploring value chain and post-harvest losses of Teff in Bacho and Dawo districts of central Ethiopia."

Amha, W. (2002). "The Structure and Functioning of the Post-PADETS Grain Marketing System in Ethiopia."Ethiopian Development Research Institute International Food Policy Research: 55.

Amsalu, A. (2012). Eradicating extreme poverty and hunger in Ethiopia: A review of development strategies, achievements, and challenges in relation With MDG1, NCCR North-South.

Anand, S. and G. Sisay (2011). "Engaging Smallholders in Value Chains: Creating new opportunities for beekeepers in Ethiopia." Oxfam Policy and Practice: Agriculture, Food and Land 11(4): 74-88.

Anandajayasekeram, P. and B. Gebremedhin (2009). Integrating innovation systems perspective and value chain analysis in agricultural research for development: Implications and challenges, ILRI (aka ILCA and ILRAD).

Andersson, C., M. Bezabih, et al. (2017). "The Ethiopian Commodity Exchange and spatial price dispersion." Food Policy 66: 1-11.

Andersen, R. and T. Winge (2013). Realising Farmers' rights to crop genetic resources: Success stories and best practices, Routledge.

Andersen, R. and T. Winge (2005). "The access and benefit-sharing agreement on teff genetic resources." signature: 159.

Antonaci, L., M. Demeke, et al. (2015). "The Challenges of Implementing Price and Production Risk Management in Sub-Saharan Africa." Scientific Paper 9b, ULYSSES project, EU 7th Framework Programme.

Antonaci, L., M. Demeke, et al. (2015). "The Challenges of Implementing Price and Production Risk Management in Sub-Saharan Africa."

Aredo, D., (1990). The evolution of rural development policies. *Ethiopia: Options for Rural Development*, pp.49-57.

Areid, A., (1994). “Shifting Cultivation Expansion and Intensity of Production. The open Economy case” Development studies and Human Rights Working paper WP 1994; 3 Bergen; Chr. Michelin Institute.

Argenti, O. and C. Marocchino (2005). "Urban food supply and distribution in developing countries and countries in transition."

Asfaw, T. (1992). "An Overview of Ethiopia's Planning Experience." The Ethiopian Economy: Structure, Problems and Policy Issues.

Asfaw, W., D. Tolossa, et al. (2010). "Causes and impacts of seasonal migration on rural livelihoods: Case studies from Amhara Region in Ethiopia." Norsk Geografisk Tidsskrift–Norwegian Journal of Geography 64(1): 58-70.

Asrat, P., K. Belay, et al. (2004). "Determinants of farmers' willingness to pay for soil conservation practices in the southeastern highlands of Ethiopia." Land Degradation & Development 15(4): 423-438.

Asres, E. Makoto, N. Kumi, Y. Akira, I. and Arega D. (2014). “The effect of agricultural extension service on the technical efficiency of Teff (Eragrostis Tef) producers in Ethiopia.” American Journal of Applied Sciences 11 (2): 223-239, 2014.

Assefa, B. (2015). "Analysis of price incentives for Teff in Ethiopia for the time period 2005–2012."

Assefa, K., S. Chanyalew, et al. (2013). Achievements and Prospects of Tef Improvement-Proceedings of the Second International Workshop, November 7-9, 2011, Debre Zeit, Ethiopia, Ethiopian Institute of Agricultural Research, Addis Ababa, Ethiopia; Institute of Plant Sciences, University of Bern, Switzerland.

Association, E. E. (2004). "Transformation of Ethiopian Agriculture: Potentials, Constraints and Suggested Intervention Measures." Report on the Ethiopian Economy 4: 05.

Association, E. E. (2005). Report on the Ethiopian Economy, Ethiopian Economic Association.

ATA (Agricultural Transformation Agency). (2011). Strengthening the Tef Value Chain in Ethiopia. Training manual.

Atinkut, H. B., A. K. Bedri, et al. (2017). "Farmers’ investment on sustainable agricultural practices: evidence from Amhara Region, Ethiopia." American Journal of Life Sciences 5(2): 38-45.

Attride-Stirling, J. (2001). "Thematic networks: an analytic tool for qualitative research." Qualitative research 1(3): 385-405.

Authority, E. P. (2012). National Report of Ethiopia. The United Nations Conference on Sustainable Development (Rio 20+).

Ayalew, A., K. Kena, et al. (2011). "Application of NP Fertilizers for better production of Teff (Eragrostis tef (Zucc.) Trotter) on different types of soils in southern Ethiopia." Journal of Natural Sciences Research 1(1): 6-15.

Ayaz, S. and Z. Hussain (2011). "Impact of institutional credit on production efficiency of the farming sector: A case study of District Faisalabad." Pakistan Economic and Social Review: 149-162.

Azeb, B., Habtewold and Tadele, M. (2019). “Challenges and Opportunities for Smallholder Farmers Participation in Teff Market in Ambo District, West Shoa Zone of Oromia, Ethiopia.” International Journal of Business and Social Science Vol. 10. No. 8.

Azeb, B., Tadele, M., Challa, D. Asha, L. (2017). “Determinants of smallholder farmers in *Teff* market supply in Ambo district, West Shoa zone of Oromia, Ethiopia.” International Journal of Advanced Research in Management and Social Sciences, Vol. 6, No. 2.

Azulai, A. and J. A. Rankin (2012). "Triangulation in Canadian doctoral dissertations on aging." International Journal of Multiple Research Approaches 6(2): 125-140.

Babatunde, R. O. and M. Qaim (2009). "The role of off-farm income diversification in rural Nigeria: Driving forces and household access." Quarterly journal of international agriculture 48(4): 305-320.

Badar, H. (2015). "Value chain performance improvement for sustainable mango industry development in Pakistan."

Bardhan, P., and C. Udry. (1999). Development Microeconomics. Oxford: Oxford University Press.

Bart Minten, Seneshaw Tamru, Ermias Engida and Tadesse Kuma. (2013). Ethiopia’s Value Chains on the Move: the case of *Teff*. Ethiopia Strategy Support Programme, ESSP working paper 52.

Bekabil, F., Befekadu, B., Rupert, S., Tareke, B. (2011). Strengthening the *Teff* Value Chain in Ethiopia, Agricultural Transformation Agency. Addis Ababa, Ethiopia.

Balcha, T. D. (2011). Sources of Economic Growth in Ethiopia: A Time Series Empirical Analysis, 1981-2009.

Bandula, A., C. Jayaweera, et al. (2016). "Role of underutilized crop value chains in rural food and income security in Sri Lanka." Procedia food science 6: 267-270.

Bart, M., Seneshaw, T., Ermias, E., and Tadesse K. (2015). Feeding Africa's Cities: The Case of the Supply Chain of Teff to Addis Ababa. The University of Chicago, Economic Development and Cultural Change.

Bart, M., Seneshaw, T., Ermias, E., and Tadesse K. (2013). Ethiopia's value chain on the move: The Case of *Teff*. Ethiopia Strategy Support Program II. ESSP working paper 52.

Barrett, C. B. (2008). "Smallholder market participation: Concepts and evidence from eastern and southern Africa." Food policy 33(4): 299-317.

Baye, K. (2014). Teff: nutrient composition and health benefits, Intl Food Policy Res Inst.

Bechaye, T. (2011). Rural Household Food Security Situation Analysis: The Case of Boricha Woreda Sidama Zone, Msc Thesis. Addis Ababa University, Addis Ababa, Ethiopia 109p.

Bekele, E., P. Anandajayasekeram, et al. (2006). "Review of agricultural extension impacts in Ethiopia." Unpublished manuscript. Addis Ababa, Ethiopia.

Bekele, G. (2002). The role of the Ethiopian Grain Trade Enterprise in price policy. Agriculture Technology Diffusion and Price Policy: Proceedings of a Policy Forum in Addis Ababa, Ethiopian Development Research Institute and International Food Policy ….

Belay, K., F. Beyene, et al. (2005). "Coping with drought among pastoral and agro-pastoral communities in eastern Ethiopia." Journal of Rural Development/Mongchon-Gyeongju 28(1071-2019-1825): 185-210.

Belayneh, N. G., B. Tegegne, et al. (2019). "Determinants of Smallholder teff Producer Farmers Market Participation in Merhabete District, Amhara Region, Ethiopia." International Journal of Agricultural Economics 4(4): 135.

Belete, A. (1989). Efficiency of small-scale farmers and their role in Ethiopian agricultural development: A case study of the highland areas of Shoa administrative region, Ethiopia, Ph. D. Thesis, University of New England, Armidale.

Belissa, M. (2018). "Agricultural Extension Liberalization through Private Sector Involvement: The Necessity for Modernizing Ethiopia agriculture."

Bellemare, M. F., C. B. Barrett, et al. (2010). "The welfare impacts of commodity price fluctuations: Evidence from rural Ethiopia."

Benin, S., M. Smale, et al. (2004). "The economic determinants of cereal crop diversity on farms in the Ethiopian highlands." Agricultural Economics 31(2-3): 197-208.

Bereket, H., Tjeerd-Jan, S., & Ellis, H. (2011). *Teff* (Eragrostis tef) production constraints on Vertisols in Ethiopia: farmers' perceptions and evaluation of low soil zinc as yield-limiting factor, Soil Science and Plant Nutrition, 57:4, 587-596, DOI: 10.1080/00380768.2011.593482

Berhane, G., Z. Paulos, et al. (2011). "Foodgrain consumption and calorie intake patterns in Ethiopia." IFPRI Ethiopia Strategy Support Program II (ESSP II) Working Paper 23.

Berhe, T. (2009). "Recent Development in Teff, Ethiopia's Most Important Cereal and Gift to the World." http://www. slideshare. net 2009: 2010.

Berihun, K. (2014). Assessment of Factors Affecting Agricultural Production: Evidence from Smallholder Farmers of Southern Tigrai, Northern Ethiopia, Mekelle University.

Bernard, T. and A. S. Taffesse (2012). "Returns to scope? Smallholders' commercialisation through multipurpose cooperatives in Ethiopia." Journal of African Economies 21(3): 440-464.

Bernard, T., A. S. Taffesse, et al. (2008). "Impact of cooperatives on smallholders' commercialization behavior: evidence from Ethiopia." Agricultural Economics 39(2): 147-161.

Best and Kahn, R. (2005). Basic statistics for business and economics. McGraw Hill, Tokyo

Bethlehem, J. (1999). "Cross-sectional research." Research methodology in the social, behavioural and life sciences 110: 142.

Beyera, D. (2004). "Impact of Community Managed Irrigation on Farm Efficiency and Household income; the case of Weliso and Wenchi Districts of Oromia." Unpublished M. Sc Thesis, Haramaya University.

Bezemer, D. and D. Headey (2008). "Agriculture, development, and urban bias." World Development 36(8): 1342-1364.

Biénabe, E., C. Coronel, et al. (2004). "Linking smallholder farmers to markets: Lessons learned from literature review and analytical review of selected projects."

Birara, D. (2017). "Challenges of Social Reintegration for the 2013 Saudi Arabian Returnees in Ethiopia." International Journal of Humanities and Social Science Research 3: 31-37.

Birara, E., (2017). *Teff* Production and Marketing in Ethiopia. *Radix International Journal of Research in Social Science.* Volume 6, Issue 4.

Boger, S. (2001). "Quality and contractual choice: a transaction cost approach to the Polish hog market." European review of agricultural economics 28(3): 241-262.

Boka, G. T. (2017). "Climate change challenges, smallholders' commercialization, and progress out of poverty in Ethiopia." Working Paper Series (253).

Bolwig, S., S. Ponte, et al. (2010). "Integrating poverty and environmental concerns into value-chain analysis: a conceptual framework." Development policy review 28(2): 173-194.

Bonger, T., E. Gabre-Madhin, et al. (2002). "Agriculture technology diffusion and price policy."

Bonger, T., G. Ayele, et al. (2004). "Agricultural extension, adoption and diffusion in Ethiopia."

Brietzke, P. (1976). "Land reform in revolutionary Ethiopia." The Journal of Modern African Studies 14(4): 637-660.

Bruinsma, J. (2017). World agriculture: towards 2015/2030: an FAO study, Routledge.

Bryman, A. (2016). Social research methods, Oxford university press.

Bryman, A. (2008). Social Research Methods. Third edition. New York: Oxford University Press Inc.

Bryman, A. (2004). Social Research Methods. Second edition. New York: Oxford University Press Inc.

Budd, R. W., R. K. Thorp, et al. (1967). "Content analysis of communications."

Burchi, F., M. Scarlato, et al. (2016). "Addressing food insecurity in sub-Saharan Africa: The role of cash transfers."

Burney, J. A. and R. L. Naylor (2012). "Smallholder irrigation as a poverty alleviation tool in sub-Saharan Africa." World development 40(1): 110-123.

Byerlee, D. R., D. J. Spielman, et al. (2007). Policies to promote cereal intensification in Ethiopia: A review of evidence and experience.

Cagatay, N. (1998). Gender and poverty, UNDP, Social Development and Poverty Elimination Division.

Campbell, D. T. and D. W. Fiske (1959). "Convergent and discriminant validation by the multitrait-multimethod matrix." Psychological bulletin 56(2): 81.

Candice Jaimungal. (2019). Self-Reliance, Agriculture and Ujamaa: Policies of Development in Postcolonial Tanzania The New School. https://www.researchgate.net/publication/333455784.

Cannarozzi, G., S. Plaza-Wüthrich, et al. (2014). "Genome and transcriptome sequencing identifies breeding targets in the orphan crop tef (Eragrostis tef)." BMC genomics 15(1): 581.

Caracelli, V. J. and J. C. Greene (1993). "Data analysis strategies for mixed-method evaluation designs." Educational evaluation and policy analysis 15(2): 195-207.

Caroline Ashley and Diana Carney. (1999). Sustainable livelihoods: Lessons from early experience. Department for International Development (DFID).

Carswell, G. (2000). "Livelihood diversification in southern Ethiopia."

Carswell G., de Haan, A., Data Dea, Konde, A., Seba, H., Shankland, A, and Sinclair. (2002). Sustainable livelihoods in Ethiopia. IDS research report, Brighton: IDS

Creswell, J. (2012). Educational research: Planning, conducting, and evaluating quantitative and qualitative research (4thed.). Upper Saddle River, NJ: Pearson Education.

Cavanagh, S. (1997). "Content analysis: concepts, methods and applications." Nurse researcher 4(3): 5-16.

César, E. and A. Ekbom (2013). "Ethiopia environmental and climate change policy brief." Sida's Helpdesk for Environment and Climate Change.

Chaka, A., T. Kenea, et al. (2016). "Analysis of the supply chain and logistics practices of warqe food products in Ethiopia." International journal on food system dynamics 7(3): 213-228.

Chanyalew, D., B. Adenew, et al. (2010). "Ethiopia's Agriculture Sector Policy and Investment Framework (PIF): Ten Year Road Map (2010-2020)." Ministry of Agriculture and Rural Development: Addis Ababa, Ethiopia.

Chauvin, N. D., F. Mulangu, et al. (2012). "Food production and consumption trends in sub-Saharan Africa: Prospects for the transformation of the agricultural sector." UNDP Regional Bureau for Africa: New York, NY, USA.

Chawarika, A. (2016). "Food Security and the Developing World-Emerging Issues."

Cheng, A., S. Mayes, et al. (2017). "Diversifying crops for food and nutrition security–a case of teff." Biological Reviews 92(1): 188-198.

Cheng, M. L. and Y. Han (2014). "A modified Cobb–Douglas production function model and its application." IMA Journal of Management Mathematics 25(3): 353-365.

Chepng'eno, W., P. Koech, et al. (2012). "Socioeconomic factors affecting the adoption of improved agricultural technologies among women in Marakwet County Kenya." Journal of Emerging Trends in Economics and Management Sciences 3(4): 312-317.

Cheru, F. (1990). "Options for Rural Development in Ethiopia: The International Context." S. Pausewang, Fantu Cheru, S. Brune, and Eshetu Chole eds., Ethiopia: Rural Development Options, London: Zed Books 6978.

Chipeta, M., B. Emana, et al. (2015). Ethiopia's Agriculture Sector Policy and Investment Framework (2010–2020) External Mid-term Review, October. Secretariat of the Government of Ethiopia/Development Partners ….

Chokera, F., J. Ngwenya, et al. (2014). "The role of agricultural marketing on empowering rural farmers in Masvingo Province, Zimbabwe." European Journal of Business and Management 6(3): 153-163.

Chole, E. (1990). "Agriculture and surplus extraction: the Ethiopian experience." Ethiopia: Rural development options: 89-99.

Cochran, W. G. (2007). Sampling techniques, John Wiley & Sons.

Cochrane, L. and Y. W. Bekele (2018). "Average crop yield (2001–2017) in Ethiopia: Trends at national, regional and zonal levels." Data in brief 16: 1025.

Cohen, J. M. (1987). Integrated rural development: the Ethiopian experience and the debate, Nordic Africa Institute.

Cohen, J. M. and D. Weintraub (1975). "Land and peasants in imperial Ethiopia. The social background to a revolution."

Coleman, B. E. (1999). "The impact of group lending in Northeast Thailand." Journal of development economics 60(1): 105-141.

Collins, K. M., A. J. Onwuegbuzie, et al. (2006). "A model incorporating the rationale and purpose for conducting mixed methods research in special education and beyond." Learning disabilities: a contemporary journal 4(1): 67-100.

Collyns, D. (2013). "Quinoa brings riches to the Andes." The Guardian. January 14.

Conforti, P. (2011). Looking ahead in world food and agriculture: perspectives to 2050, Food and Agriculture Organization of the United Nations (FAO).

Conradie, B., J. Piesse, et al. (2009). "District-level total factor productivity in agriculture: Western Cape Province, South Africa, 1952–2002." Agricultural Economics 40(3): 265-280.

Council, N. R. (1996). Lost crops of Africa: volume I: grains, National Academies Press.

Covarrubias, K., L. Nsiima, et al. (2012). "Livestock and livelihoods in rural Tanzania: A descriptive analysis of the 2009 National Panel Survey."

Crawford, E., V. Kelly, et al. (2003). "Input use and market development in Sub-Saharan Africa: an overview." Food Policy 28(4): 277-292.

Creswell, J. W. (1999). Mixed-method Research: Introduction and application. Handbook of Educational Policy. Academic Press. pp. 455-472.

Creswell, J. W.(1994). Research design: Qualitative and quantitative approaches. Thousand Oaks, CA: Sage

Creswell, J. W., & Plano Clark, V. L. (2011). Designing and conducting mixed methods research. Thousand Oaks, CA: Sage.

Cristóbal Kay. (2009). "Development strategies and rural development: exploring synergies, eradicating poverty." The Journal of Peasant Studies, 36:1, 103-137, DOI: 10.1080/03066150902820339.

Crittenden, V. L. and W. F. Crittenden (2014). Market Orientation in Commodity Marketing: The Necessary Link Between Marketing and Production. Commodity Marketing, Springer: 421-430.

Crymes, Annette R., (2015). The International Footprint of Teff: Resurgence of an Ancient Ethiopian Grain. Arts & Sciences Electronic Theses and Dissertations. 394. http://openscholarship.wustl.edu/art_sci_etds/394.

CSA (2017/18). "Agricultural sample survey. Report on area and production of major crops (private peasant holding, *Meher* season." Statistical bulletin 586.

CSA (2015). "The Federal Democratic Republic of Ethiopia Central Statistical Agency Agricultural Sample Survey: Area and Production of Major Crops, Addis Ababa, Ethiopia.".

CSA, E. (2013). "Population projection of Ethiopia for all regions at wereda level from 2014–2017." Central Statistical Agency of Ethiopia.

CSA, M. (2011). "Agricultural sample survey 2010–11." Study documentation. Central Statistical Agency and Ministry of Finance and Economic Development, Addis Ababa.

CSA (Central Statistical Agency). (2011a). Agricultural Sample Survey: Area and Production of Crops, Meher Season. Addis Ababa, Ethiopia: Central Statistical Agency.

Cunningham, W., L. McGinnis, et al. (2008). Youth at risk in Latin America and the Caribbean: Understanding the causes, realizing the potential, The World Bank.

Curry, L. A., I. M. Nembhard, et al. (2009). "Qualitative and mixed methods provide unique contributions to outcomes research." Circulation 119(10): 1442-1452.

Curtis, K. R., J. S. Entsminger, et al. (2008). Market potential for Nevada teff products, Technical Report: UCED 2008/09-02. University Center for Economic Development/University of Nevada, Reno, NV.

Dalango, D., W. Mulugeta, et al. (2018). "Determinants of Smallholder Teff Farmers' Market Participation; A Case Study In Gena-Bossa District, Dawro Zone, Ethiopia."

D'Andrea, A. C. (2008). "T'ef (Eragrostis tef) in ancient agricultural systems of highland Ethiopia." Economic Botany 62(4): 547-566.

De Haan, L. J. (2012). "The livelihood approach: a critical exploration." Erdkunde: 345-357.

Degife, A. W., F. Zabel, et al. (2019). "Land Use Scenarios and Their Effect on Potential Crop Production: The Case of Gambella Region, Ethiopia." Agriculture 9(5): 105.

Dejene, A. (2000). "Institutions and economic development: A survey of aspects of the new institutional economics." Ethiopian Journal of Economics 6(683-2016-46785): 51.

Dejene, A. (1989). "The training and visiting agricultural extension in rainfed agriculture: Lessons from Ethiopia." World Development 17(10): 1647-1659.

Demeke, L. and J. Haji (2014). "Econometric analysis of factors affecting market participation of smallholder farming in Central Ethiopia."

Demeke, M. and F. Di Marcantonio (2019). "Analysis of incentives and disincentives for wheat in Ethiopia." Gates Open Res 3.

Demeke, M. and F. Di Marcantonio (2013). Analysis of incentives and disincentives for teff in Ethiopia. Technical notes series, MAFAP, FAO, Rome.

Denzin, N. K., Lincoln, Y. S. (1994). Introduction: Entering the field of qualitative research. In Denzin, N. K., Lincoln, Y. S. (Eds.), Handbook of qualitative research (pp. 1-17). Thousand Oaks, CA: Sage.

Department for International Development (DFID). (1999). Sustainable Livelihood Guideline Sheets, United Kingdom.

Dequidt, Vianney (2018). "Product quality in developing countries agrifood supply chains: a survey of theory" Universite Clermont Auverge, France. https://ferdi.fr/dl/df-r5s6cxeybQjy546NQfyLoL7t/papier-de-recherche-product-quality-in-developing-countries-agrifood-supply.pdf

Dercon, S. and R. V. Hill (2009). Growth from agriculture in Ethiopia: Identifying key constraints. IFPRI's ESSP-II policy conference' Accelerating agricultural development, economic growth and poverty reduction in Ethiopia', Hilton Hotel, Addis Ababa.

Deressa, T. T., R. M. Hassan, et al. (2011). "Perception of and adaptation to climate change by farmers in the Nile basin of Ethiopia." The Journal of Agricultural Science 149(1): 23-31.

Dessalegn, G., T. S. Jayne, et al. (1998). Market structure, conduct, and performance: Constraints of performance of Ethiopian grain markets, Michigan State University, Department of Agricultural, Food, and Resource Economics. Grain Market Research Project Working Paper 8. Addis Ababa, Ethiopia.

Diao, X., P. Hazell, et al. (2010). "The role of agriculture in African development." World development 38(10): 1375-1383.

Díaz-Bonilla, E. (2015). Lost in translation: the fractured conversation about trade and food security, Intl Food Policy Res Inst.

Dickson Adom, Akwasi Yeboah and Attah Kusi Ankrah .(2016). Constructivism philosophical paradigm: Implication for research, teaching and learning. Global Journal of Arts Humanities and Social Sciences, Vol 4, No.10, pp.1-9

Dijkstra, A., J. Polman, et al. (2008). "Survey on the nutritional and health aspects of teff (Eragrostis Tef)." Memorias, red-alfa lagrotech, comunidad europea, cartagena.

Dillon, B. and C. Dambro (2017). "How competitive are crop markets in Sub-Saharan Africa?" American Journal of Agricultural Economics 99(5): 1344-1361.

Dixon, J. A., D. P. Gibbon, et al. (2001). Farming systems and poverty: improving farmers' livelihoods in a changing world, Food & Agriculture Org.

Dorosh, P. and S. Rashid (2013). Food and agriculture in Ethiopia: Progress and policy challenges, University of Pennsylvania Press.

Dorward, A., J. Kydd, et al. (2004). "A policy agenda for pro-poor agricultural growth." World development 32(1): 73-89.

Durevall, D. and B. Sjö (2012). The dynamics of inflation in Ethiopia and Kenya, African Development Bank Group.

Efa, G., (2015). Analysis of *Teff* Value Chain in Becho and Dawo Districts of South West Shewa, Ethiopia. Jimma University, Ethiopia.

Efa, G., Degye, G., Tinsae, D., and Tadesse, K. (2017). “Determinants of market participation and intensity of marketed surplus of Teff producers in Bacho and Dawo districts of Oromia State, Ethiopia.” Journal of Agricultural Economics and Development Vol. 5(2), pp. 020-032.

Ellis, F. (1992). Agricultural policies in developing countries, Cambridge University Press.

Ellis, F. (1992). Peasant Economics. Cambridge, Cambridge University Press.

Elo, S. and H. Kyngäs (2008). "The qualitative content analysis process." Journal of advanced nursing 62(1): 107-115.

Endale, K. (2011). Factors constraining the production of traditional exportable agricultural products in Ethiopia: Evidence from the longitudinal Ethiopian rural household survey, in proceedings of the eighth international conference on the Ethiopian economy, volume III, edited by G Alemu & W Gebeyehu. Addis Ababa: Master Printing Press PLC.

Endale, W., Z. B. Mengesha, et al. (2014). "Food Insecurity in Farta District, Northwest Ethiopia: a community-based cross–sectional study." BMC research notes 7(1): 130.

Enibe, D., S. Chidebelu, et al. (2008). "Policy issues in the structure, conduct and performance of Banana Market in Anambra State, Nigeria." Journal of Agricultural Extension 12(2).

Ermias, E., Minten, B., Seneshaw, T., and Tadesse, K. (2013). Ethiopia’s Value Chains on the Move: The Case of Tef Addis Ababa, Ethiopia.

Etana, D. and D. Tolossa (2017). "Unemployment and food insecurity in urban Ethiopia." African Development Review 29(1): 56-68.

Ethiopia Agricultural Transformation Agency (EATA). (2014). Annual Report on transforming agriculture in Ethiopia, Addis Ababa.

Ethiopia, U. (2012). "Promoting ICT based agricultural knowledge management to increase production and productivity of smallholder farmers in Ethiopia." Development brief 3: 2013.

Ethiopia’s, A. S. P. and I. F. PIF (2010). "Federal Democratic Republic of Ethiopia Ministry of Agriculture and Rural Development."

Ezra, M. (2003). "Environmental vulnerability, rural poverty, and migration in Ethiopia: a contextual analysis." Genus: 63-91.

Fafchamps, M., E. Gabre-Madhin, et al. (2005). "Increasing returns and market efficiency in agricultural trade." Journal of Development Economics 78(2): 406-442.

Fantu, N., Bethelihem, K., and Alemayehu, S. (2015). Smallholder Teff Productivity and Efficiency: Evidence from High-Potential Districts of Ethiopia. International Conference of Agricultural Economics, Milan.

FAO. (2015). Analysis of price incentives for Teff in Ethiopia Technical notes series, MAFAP, by Assefa B. Demeke M., Lanos B, Rome.

FAO (2015). Regional overview of food insecurity: African food security prospects brighter than ever, FAO Accra.

FAO (2009). "Country profile: food security indicators country: Ethiopia."

Federal Democratic Republic of Ethiopia National Plan Commission. (2017). The 2017 Voluntary National Reviews on SDGs of Ethiopia: Government Commitments, National Ownership and Performance Trends. Addis Ababa, Ethiopia.

Feoli, E., L. G. Vuerich, et al. (2002). "Evaluation of environmental degradation in northern Ethiopia using GIS to integrate vegetation, geomorphological, erosion and socio-economic factors." Agriculture, Ecosystems & Environment 91(1-3): 313-325.

Ferede, B., F. Mekbib, et al. (2018). "Evaluation of Tef (Eragrostis tef (Zucc.) Trotter) Somaclones for Drought Tolerance." Advances in Crop Science and Technology 6(4): 385.

Fikadu, Asmiro A., Wedu, Tsega D., Derseh, Endalew A. (2019). Review on Economics of *Teff* in Ethiopia. Open Acc Biostat Bioinform. 2(3). OABB. 000539.. DOI: 10.31031/OABB.2018.02.000539.

Finance, M. o. and E. Development (2006). Ethiopia: Building on Progress. A Plan for Accelerated and Sustained Development to End Poverty (PASDEP),(2005/06-2009/10), Ministry of Finance and Economic Development (MoFED) Addis Ababa.

Francesconi, G. N. and N. Heerink (2010). "Ethiopian agricultural cooperatives in an era of global commodity exchange: does organizational form matter?" Journal of African Economies 20(1): 153-177.

Franz, A., M. Worrell, et al. (2013). "Integrating mixed method data in psychological research: Combining Q methodology and questionnaires in a study investigating cultural and psychological influences on adolescent sexual behavior." Journal of Mixed Methods Research 7(4): 370-389.

Fufa, B., B. Behute, et al. (2011). "Strengthening the tef value chain in Ethiopia." Addis Ababa: Ethiopian Agricultural Transformation Agency.

Fulginiti, L. E. and R. K. Perrin (1993). "Prices and productivity in agriculture." The review of economics and statistics: 471-482.

Funk, C. C. and M. E. Brown (2009). "Declining global per capita agricultural production and warming oceans threaten food security." Food Security 1(3): 271-289.

Gabre-Madhin, E. and T. Mezgebou (2006). "Prices and volatility in the Ethiopian grain market." Ethiopia Strategy.

Gabre-Madhin, E. Z. (2001). "The role of intermediaries in enhancing market efficiency in the Ethiopian grain market." Agricultural Economics 25(2-3): 311-320.

Gabre-Madhin, E. Z. (2001). Market institutions, transaction costs, and social capital in the Ethiopian grain market, Intl Food Policy Res Inst.

Gani BS., and Adeoti AI. (2011). Analysis of Market Participation and Rural Poverty among Farmers in Northern Part of Taraba State, Nigeria, 2(1), 23–36.

Gashaw, B. A. and S. M. Kibret (2018). "The Role of Ethiopian Commodity Exchange (ECX) in Crop Value Chain Development in Ethiopia." International Journal of Business and Economics Research 7(6): 183.

Gazeta, F. N. (1995). "Proclamation No. 1/1995." A Proclamation to Pronounce the Coming into Effect of the Constitution of the Federal Democratic Republic of Ethiopia: 141.

Gebreeyesus, M. (2016). "Industrial policy and development in Ethiopia." Manufacturing Transformation: 27.

Gebrehiwot, B. A. and A. T. Mengistu (2014). "What shapes Ethiopia’s foreign economic policy? The case of Ethiopia’s accession to the WTO."

Gebrehiwot, N. T., H. Azadi, et al. (2018). "How Participation in Vegetables Market Affects Livelihoods: Empirical Evidence from Northern Ethiopia." Journal of international food & agribusiness marketing 30(2): 107-131.

Gebrehiwot, T. (2009). Determinants of food security in rural households of the Tigrai Region, Addis Abeba University.

Gebremariam, M. M., M. Zarnkow, et al. (2014). "Teff (Eragrostis tef) as a raw material for malting, brewing and manufacturing of gluten-free foods and beverages: a review." Journal of Food Science and Technology 51(11): 2881-2895.

Gebremedhin, B. (2010). Sustainable land management through market-oriented commodity development: Case studies from Ethiopia, ILRI (aka ILCA and ILRAD).

Gebremedhin, B. and D. Hoekstra (2007). Cereal marketing and household market participation in Ethiopia: the case of teff, Wheat and rice. AAAE Conference Proceedings.

Gebremedhin, B., D. Hoekstra, et al. (2006). "Improving the competitiveness of agricultural input markets in Ethiopia: experiences since 1991."

Gebreselassie, S. (2006). Intensification of smallholder agriculture in Ethiopia: options and scenarios. Future Agricultures Consortium Meeting at the Institute of Development Studies.

Gebreselassie, S. and K. Sharp (2007). "Commercialisation of smallholder agriculture in selected Tef-growing areas of Ethiopia." Ethiopian Journal of Economics 16(1): 55-86.

Gebrewold, Z. (2014). An Assessment of Marketing Strategies of Ethiopian Grain Trade Enterprise: The case of Beklo Bet Head office, St. Mary's University.

Gecho, Y., G. Ayele, et al. (2014). "Rural household livelihood strategies: Options and determinants in the case of Wolaita Zone, Southern Ethiopia." Social sciences 3(3): 92-104.

Geda, A. (2001). "Macroeconomic performance in post-Derg Ethiopia." Northeast African Studies: 159-204.

Geda, A. and N. Berhanu (1960). "The political economy of growth in Ethiopia." The Political Economy of Economic Growth in Africa 2000: 116-142.

Geda, A., A. Shimeles, et al. (2009). "Growth, poverty and inequality in Ethiopia: Which way for pro-poor growth?" Journal of International Development: The Journal of the Development Studies Association 21(7): 947-970.

Gelo, D., E. Muchapondwa, et al. (2019). "Welfare Effect and Elite Capture in Agricultural Cooperatives Intervention: Evidence from Ethiopian Villages."

Gelo, D., E. Muchapondwa, et al. (2017). "Return to Investment in Agricultural Cooperatives in Ethiopia."

Geremewe, Y. T., B. Tegegne, et al. (2019). "Determinants of Potato (Solanum Tuberosum L.) Producers Market Outlet Choices in the Case of Sekela District, West Gojjam Zone, Amhara National Regional State, Ethiopia." Journal of Agricultural Economics 5(1): 535-541.

Gessesse, A. (2009). Analysis of fruit and vegetable market chains in Alamata, Southern Zone of Tigrai: The case of onion, tomato and papaya, International Livestock Research Institute.

Getnet, K. (2008). "From market liberalization to market development: The need for market institutions in Ethiopia." Economic Systems 32(3): 239-252.

Getnet, K. (2007). "Spatial equilibrium of wheat markets in Ethiopia." African Development Review 19(2): 281-303.

Getu, B. (2014). "Assessment of Factors Affecting Farmers' Adoption level of Row Planting Technology and Yield Improvement on the Production of Eragrostis Teff [ZUCC.]: The Case of Minjar Shenkora Woreda, Amhara Region, Ethiopia." The Case of Minjar Shenkora Woreda, Amhara Region, Ethiopia. unpublished.

Getu, H., Alfons, W., and Bart, M. (2017). "Determinants of the Productivity of Teff in Ethiopia." The European Journal of Development Research 29, 866–892.

Getu, H., Alfons, W., and Bart, M. (2015). Rural Organizations, Agricultural Technologies and Production Efficiency of Teff in Ethiopia. International Conference on Agricultural Economics.

Ghatak, S. and K. Ingersent. (1984). Agriculture and economic development. Brighton: Wheatsheaf Books.

Gideon, E. O. (2016). "Platform for Agricultural Risk Management: Managing risks to improve farmers' livelihoods, Agricultural Risk Assessment Study."

Gilbert, C. L. (2010). "How to understand high food prices." Journal of agricultural economics 61(2): 398-425.

Gilbert FS. (2008). New crop fact sheet for Teff in lost crops of Africa Vol.1 Grains. National Academy Press. 1: 215-235.

Gilbert, T. (2006). Mixed methods and mixed methodologies: The practical, the technical and the political. Journal of Research in Nursing, 11, 205-217.

Giovanni E. (2001). Four main theories of development: Modernization, Dependency, World System, and Globalization EMUI Euro-Mediterranean University Institute, Universidad Complutense de Madrid ISSN 1578-6730.

Girma Alemu. (2015). Market performance and determinants of marketed surplus of Teff: The case of Bacho Woreda in South West Shewa zone, Oromia National Regional State. Haramaya University. Ethiopia.

Girma, A. and G. Endrias (2015). Market Performance and Determinants of Marketed Surplus of Tef in Bacho Woreda of South West Shewa Zone, Oromia National Regional State.

Girma, D., K. Assefa, et al. (2014). "The origins and progress of genomics research on Tef (Eragrostis tef)." Plant biotechnology journal 12(5): 534-540.

Gizaw, B., T. ZerihunTsegay, et al. (2018). "Traditional knowledge on teff (Eragrostis tef) farming practice and role of crop rotation to enrich plant growth promoting microbes for soil fertility in East Showa: Ethiopia." Agric Res Technol 16: 556001.

Giziew, A. (2019). "Analysis of Gender and Determinants of Market Supply of Onion in Dugda District, East Shoa, Ethiopia." Journal of Agriculture and Environmental Sciences 3(1).

Glahe, F. R. (1978). Adam Smith and the wealth of nations: 1776-1976 bicentennial essays, Colorado Associated University Press.

Gómez M. I. and Ricketts K. D. (2013). Food Value Chain Transformations in Developing Countries: Selected Hypotheses on Nutritional Implications. Food Policy 42 (2013): 139–50.

Green, J., K. Willis, et al. (2007). "Generating best evidence from qualitative research: the role of data analysis." Australian and New Zealand journal of public health 31(6): 545-550.

Greene, J. C. and V. J. Caracelli (1997). "Defining and describing the paradigm issue in mixed-method evaluation." New directions for evaluation 1997(74): 5-17.

Gudeta, Z. (2002). "How successful the agricultural development led industrialisation strategy (ADLI) will be by leaving existing landholding system intact." Economic Focus (Addis Ababa, Ethiopia) 4(4): 16-20.

Gurmessa, N. E. (2016). The role of a credit guarantee in alleviating credit constraints among coffee farmers' cooperatives in Ethiopia.

Habtegebrial, K. and B. Singh (2006). "Effects of timing of nitrogen and sulphur fertilizers on yield, nitrogen, and sulphur contents of Tef (Eragrostis tef (Zucc.) Trotter)." Nutrient cycling in agroecosystems 75(1-3): 213-222.

Habtewold, A. B., T. M. Challa, et al. (2017). "Determinants of smallholder farmers in teff market supply in Ambo district, West Shoa Zone of Oromia, Ethiopia." International Journal of advanced research in management and social sciences 6(2): 133-140.

Haile, H. T. (2008). "Impact of Irrigation Development on Poverty Reduction in Northern Ethiopia." Ph.D. dissertation (The Department of Food Business and Development National University of Ireland, Cork.).

Haile, M., A. Tesfaye, et al. (2004). Market access versus productivity: The case of Teff. Paper prepared for the Ethiopian Economic Association. Conference on Ethiopian Economy, Addis Ababa.

Haileselassie, B., T.-J. Stomph, et al. (2011). "Feed Marketing in Ethiopia Feed Marketing in Ethiopia, 2009." Soil science and plant nutrition 57(4): 587-596.

Haileselassie, B., T.-J. Stomph, et al. (2011). "Teff (Eragrostis tef) production constraints on Vertisols in Ethiopia: farmers' perceptions and evaluation of low soil zinc as yield-limiting factor." Soil Science and Plant Nutrition 57(4): 587-596.

Haileselassie, H., A. Araya, et al. (2016). "Exploring optimal farm resources management strategy for Quncho-teff (Eragrostis tef (Zucc.) Trotter) using AquaCrop model." Agricultural Water Management 178: 148-158.

Hailu, G., A. Weersink, et al. (2015). Rural organizations, agricultural technologies and production efficiency of teff in Ethiopia.

Hashemnezhad, H. (2015). "Qualitative content analysis research: A review article." Journal of ELT and applied linguistics (JELTAL) 3(1): 54-62.

Hassen, I. W., M. D. Regassa, et al. (2018). "Teff and its role in the agricultural and food economy." The economics of Tef, exploring Ethiopia’s Biggest Cash Crop. International Food Policy Research Institute (IFPRI), Washington DC: 11-37.

Hayami, Y., and Ruttan V.W. (1971). Agricultural Development: An International Perspective. Boltimore and London: The John Hopkin University press.

Hazell, P., C. Poulton, et al. (2010). "The future of small farms: trajectories and policy priorities." World development 38(10): 1349-1361.

Headey, D. D. (2013). "Developmental drivers of nutritional change: a cross-country analysis." World Development 42: 76-88.

Heelan, P.A., & Schulkin, J. (1998). Hermeneutical philosophy and pragmatism: a philosophy of science. Synthese, 115, 269-302.

Henning, E., Van Rensburg, W., & Smit, B. (2004). Finding your way in qualitative research. First edition. Pretoria: Van Schaik publisher.

Hiironen, J. and K. Riekkinen (2016). "Agricultural impacts and profitability of land consolidations." Land Use Policy 55: 309-317.

Hofferth, S. (2003). Persistence and change in food security of families with children, 1997-1999. Department of family studies, University of Maryland.

Holden, S., B. Shiferaw, et al. (2004). "Non-farm income, household welfare, and sustainable land management in a less-favoured area in the Ethiopian highlands." Food policy 29(4): 369-392.

Hsieh, H.-F. and S. E. Shannon (2005). "Three approaches to qualitative content analysis." Qualitative health research 15(9): 1277-1288.

Humphrey, A., P. Costigan, et al. (2003). Factors affecting the labour market participation of older workers, Corporate Document Services.

Hunt, D. (1991). “Farm System and Household Economy as Frameworks for Prioritizing and Appraising Technical Research: A Critical Appraisal of Current Approaches.” In D. H. M. Haswell, ed., Rural Households in Emerging Societies: Technology and Change in Sub-Saharan Africa. Oxford: Berg.

Husmann, C. (2015). "Transaction costs on the Ethiopian formal seed market and innovations for encouraging private sector investments." Quarterly Journal of International Agriculture 54(892-2016-65238): 59-76.

Hussein, A. (2010). Market efficiency of the Ethiopia commodity exchange: The case of export coffee trading, Addis Ababa University.

Hussein, W. and P. Janekarnkij (2013). "Determinants of rural household food security in Jigjiga district of Ethiopia." Kasetsart J. (Soc. Sci) 34: 171-180.

Hyejin L. (2018). Teff, a Rising Global Crop: “Current Status of Teff Production and Value Chain.” The Open Agriculture Journal, Volume 12.

Ingram, A. L. and J. J. Doyle (2003). "The origin and evolution of Eragrostis tef (Poaceae) and related polyploids: evidence from nuclear waxy and plastid rps16." American Journal of Botany 90(1): 116-122.

International Cooperative Alliance (ICA). (1995). Statement on the Cooperative Identity, in Review of International Cooperation, Vol. 88, No. 3.

Islam, M. S., T. H. Miah, et al. (2001). "Marketing system of marine fish in Bangladesh: an empirical study." Bangladesh Journal of Agricultural Economics 24(454-2016-36397): 127.

Jacques Marzin, Pascal Bonnet, Omar Bessaoud and Christine Ton-Nu. (2017). Small-Scale Family Farming in the Near East and North Africa Region. Food and Agriculture Organization of the United Nations (FAO), International Centre for Advanced Mediterranean Agronomic Studies, Cairo, Egypt.

Jagwe, J., Machethe, C., Ouma, E. (2010). Transaction costs and smallholder farmers' participation markets in the Great Lakes Region of Burundi, Rwanda and the Democratic Republic of Congo. Afr. J. Agric. Res. 6(1), pp. 1-16.

Jaudy, M. and M. Kukenovaz (2011). Financial development and survival of African agri-food exports, The World Bank.

Jayne, T. S., D. Mather, et al. (2010). "Principal challenges confronting smallholder agriculture in sub-Saharan Africa." World development 38(10): 1384-1398.

Jeffrey, M. W. (2009). "Introductory Econometrics: A modern approach." Canada: South.

Jerven, M. (2013). Poor numbers: how we are misled by African development statistics and what to do about it, Cornell University Press.

Jhingan M.L. (1997). Economics of Development and Planning. New Delhi. Vikas Publishing House Pvt. Ltd.

Joachim, V., Mekdim, D., Bart, M., and Alemayohu, S. (2016). Row planting *Teff* in Ethiopia: Impact on farm-level profitability and labor allocation. Ethiopia Strategy Support Program. ESSP working paper 92.

Joachim, V., Mekdim, D., Bart, M., and Alemayehu, S. (2014). Perceptions, impacts and rewards of row planting of *Teff*. LICOS Centre for Institutions and Economic Performance, LICOS Discussion Paper Series, Discussion Paper 350/2014, Belgium.

Joerin, J., K. Assefa, et al. (2018). "Resilience of the Tef Value Chain in Ethiopia–Final report."

Johnson, B. K., J. J. Perry, et al. (2012). "The status of econometrics in the economics major: A survey." The Journal of Economic Education 43(3): 315-324.

Johnston, B.F. and J.W. Mellor. (1961). 'The role of agriculture in economic development." American Economic Review, 51(4), 566–93.

Johnson, R. B., A. J. Onwuegbuzie, et al. (2007). "Toward a definition of mixed methods research." Journal of mixed methods research 1(2): 112-133.

Johnson, R. B., Onwuegbuzie, A. J. (2004). Mixed method research: A research paradigm whose time has come. Educational Researcher, 33(7), 14-26.

Jonker, J. and B. Pennink (2010). The essence of research methodology: A concise guide for master and PhD students in management science, Springer Science & Business Media.

Judith Schoonenboom. (2018). Designing Mixed Methods Research by Mixing and Merging Methodologies: A 13-Step Model. American Behavioral Scientist 2018, Vol. 62(7) 998 – 1015.

Kahsu, M. (2018). The links between policy, sustainable food security and well-being in Gelgele and Yetnora villages in Ethiopia, Newcastle University.

Kaleab, B. (2018). Nutrient composition and health benefits. The Economics of Teff: Exploring Ethiopia's Biggest Cash Crop. International food policy research institute Washington DC.

Kaplinsky, R. and M. Morris (2000). A handbook for value chain research, University of Sussex, Institute of Development Studies.

Kaso, T. and G. Guben (2015). "Review of barley value chain management in Ethiopia." Journal of Biology, Agriculture and Healthcare 5(10): 84-97.

Kazianga, H. and C. Udry (2006). "Consumption smoothing? Livestock, insurance and drought in rural Burkina Faso." Journal of Development economics 79(2): 413-446.

Kebebew, A., Sherif, A., Getachew, B., Gizaw, M., Hailu, T., & Mark, E. (2011). Quncho: the first popular tef variety in Ethiopia, International Journal of Agricultural Sustainability, 9:1, 25-34.

Kebebew, A., Solomon, C., and Zerihun, T. (eds.). (2013). Achievements and Prospects of Teff Improvement; Proceedings of the Second International Workshop, November 7-9, 2011, Debre Zeit, Ethiopia. Ethiopian Institute of Agricultural Research, Addis Ababa, Ethiopia; Institute of Plant Sciences, University of Bern, Switzerland. Printed at Stämpfli AG, 3001 Bern, Switzerland. ISBN: 978-3-033-03818-9.

Kebede, Y. (1993). "The Micro-Economics of Household Decision Making: The Case of Adoption of Technologies in Ethiopia." Unpublished Ph. D. Dissertation, Departments of Agricultural Economics and Anthropology, McGill University.

Keeley, J. and I. Scoones (2000). "Knowledge, power and politics: the environmental policy-making process in Ethiopia." The Journal of Modern African Studies 38(1): 89-120.

Keller, B. and D. C. Mbewe (1991). "Policy and planning for the empowerment of Zambia's women farmers." Canadian Journal of Development Studies/Revue canadienne d'études du développement 12(1): 75-88.

Kelley, K., B. Clark, et al. (2003). "Good practice in the conduct and reporting of survey research." International Journal for Quality in health care 15(3): 261-266.

Kidane, H., Z. G. Alemu, et al. (2005). "Causes of household food insecurity in koredegaga peasant association, Oromia Zone, Ethiopia." Agrekon 44(4): 543-560.

Kiiza, B., G. Pederson, et al. (2013). The role of market information in adoption of agricultural seed technology in rural Uganda. Technology, Sustainability, and Rural Development in Africa, IGI Global: 72-88.

Kitzinger, J. (1994). "The methodology of focus groups: the importance of interaction between research participants." Sociology of health & illness 16(1): 103-121.

Klugman, J. and J. Loening (2007). "Welfare impacts of food price inflation in Ethiopia."

Kocho, T., G. Abebe, et al. (2011). "Marketing value-chain of smallholder sheep and goats in crop-livestock mixed farming system of Alaba, Southern Ethiopia." Small Ruminant Research 96(2-3): 101-105.

Kothari, C. R. (2004). Research methodology: Methods and techniques, New Age International.

Kotu, B. H. and A. Admassie (2016). "Potential Impacts of Yield-Increasing Crop Technologies on Productivity and Poverty in Two Districts of Ethiopia." Technological and Institutional Innovations for Marginalized Smallholders in Agricultural Development: 397.

Krantz, L. (2001). The Sustainable Livelihood Approach to Poverty Reduction. An Introduction. Executive Summary. pp. 6-21. Swedish International Development Cooperation Agency. Division for Policy and Socio-Economic Analysis.

Kris Johnson Ferreira, Joel Goh and Ehsan Valavi. (2017). Intermediation in the Supply of Agricultural Products in Developing Economies. Working Paper 18-033

Kuma, T. (2002). "Trends in agricultural production, technology dissemination, and price movements of outputs and inputs. "Ethiopian Development Research Institute International Food Policy Research Institute: 35.

Kumar, A., H. Singh, et al. (2011). "Value chains of agricultural commodities and their role in food security and poverty Alleviation–A Synthesis." Agricultural Economics Research Review 24(1): 169-181.

Lefebo, N., J. Haji, et al. (2016). "Determinants of status and extent of market participation among bulla producers in Hadiya Zone, Southern Ethiopia." Journal of Biology, Agriculture and Healthcare 6(7): 84-92.

Legesse, E. E., A. K. Srivastava, et al. (2019). Household income implications of improved fertilizer accessibility and lower use inefficiency: Long-term scenarios for Ethiopia, ZEF Working Paper Series.

Lightbourne, M. (2007). "Organization and legal regimes governing seed markets and farmers' rights in Ethiopia." Journal of African Law 51(2): 285-315.

Lindenberg, M. (2002). Measuring Household Livelihood Security at the Family and Community Level in the Developing World. World Development. Great Britain. 30(2):301–318.

Lindkvist, K. (1981). Approaches to Textual Analysis. Teoksessa Rosengren K.(ed.) Advances in Content Analysis, Sage Publications.

Liu, Y., H. Pan, et al. (2013). "Computing self-supporting surfaces by regular triangulation." ACM Transactions on Graphics (TOG) 32(4): 1-10.

Loening, J. and L. Mikael Imru (2009). "Ethiopia: diversifying the rural economy. An assessment of the investment climate for small and informal enterprises."

Loening, J., B. Rijkers, et al. (2008). Nonfarm microenterprise performance and the investment climate: evidence from rural Ethiopia, The World Bank.

Lucrezia Tincani .(2015). Influence of Theory of Livelihood Conceptualization in Two Regions of Burkina Faso. African review of social science methodology. Volume 1, 2015, Issue 1-2. Centre for Development, Environment and Policy (CeDEP), School of Oriental and African Studies (SOAS), University of London.

Lune, H. and B. L. Berg (2016). Qualitative research methods for the social sciences, Pearson Higher Ed.

Lybbert, T. J., C. B. Barrett, et al. (2004). "Stochastic wealth dynamics and risk management among a poor population." The Economic Journal 114(498): 750-777.

Macauley, H. (2015). "Feeding Africa an action plan for African agricultural transformation." Dakar Senegal.

Mack, N. (2005). "Qualitative research methods: A data collector’s field guide."

Mack, N., Woodsong, A., Macqueen, K., Guest, G. and Namey, E., (2005). Qualitative Research Methods: A data Collector’s Field Guide. Family Health International. USA

Madey, D. L. (1982). "Some benefits of integrating qualitative and quantitative methods in program evaluation, with illustrations." Educational evaluation and policy analysis 4(2): 223-236.

Maharjan, K. L. and N. P. Joshi (2011). "Determinants of household food security in Nepal: A binary logistic regression analysis." Journal of Mountain Science 8(3): 403-413.

Malik, M., K. Hnatkova, et al. (2004). "Sample size, power calculations, and their implications for the cost of thorough studies of drug induced QT interval prolongation." Pacing and clinical electrophysiology 27(12): 1659-1669.

Mamo, T., W. Getahun, et al. (2017). "Analysis of wheat commercialization in Ethiopia: The case of SARD-SC wheat project innovation platform sites." African Journal of Agricultural Research 12(10): 841-849.

Manly, B. F. (2006). Randomization, bootstrap and Monte Carlo methods in biology, Chapman and Hall/CRC.

Mariapia Mendola. (2007). Farm Household Production Theories: A Review of "Institutional" and "Behavioral" Responses. Asian Development Review, vol. 24, no. 1, pp. 49-68.

Marshall, M., (1996). Sampling for qualitative research. Family Practice 1996: 13, pp. 522-525. Oxford University Press.

Martey, E., R. M. Al-Hassan, et al. (2012). "Commercialization of smallholder agriculture in Ghana: A Tobit regression analysis." African Journal of Agricultural Research 7(14): 2131-2141.

Matthew, N. and M. Todd (2009). "Choosing the Right Marketing Channels for Small-Scale Vegetable Producers." Department of Applied Economics and Management, Cornell University.

Maxwell, D. (2002). "Why do famines persist? A brief review of Ethiopia 1999–2000." IDS Bulletin 33(4): 48-54.

McCorriston, S., D. J. Hemming, et al. (2013). "What is the evidence of the impact of agricultural trade liberalisation on food security in developing countries." A systematic review. London: EPPI Centre, University of London.

McGuire, S. (2015). FAO, IFAD, and WFP. The state of food insecurity in the world 2015: meeting the 2015 international hunger targets: taking stock of uneven progress. Rome: FAO, 2015, Oxford University Press.

McKeown, R. E. and D. L. Weed (2004). "Ethical choices in survey research." International Journal of Public Health 49(1): 67.

McTavish, D. G. and E. B. Pirro (1990). "Contextual content analysis." Quality and quantity 24(3): 245-265.

Mehari Getaneh. (2002). Agricultural Development models reviewed. A paper presented to the 1st International Conference of Ethiopian Economic Association (EEA). Addis Ababa, Ethiopia

Mehmood, Y., B. Anjum, et al. (2011). "Benefit cost ratio analysis of organic and inorganic rice crop production; evidence from district Sheikhupura in Punjab Pakistan." Pakistan Journal of Medical Sciences 63(3): 174-177.

Melkamu, D. (2017). "Successes and Failures of International Financial Institutions (IFIs) in Exporting Neo-liberalism in Africa: The Case of Ethiopia." International Journal of Political Science and Development. Vol. 5(6), pp. 203-209.

Melke, D. (2013). "Promising democratic developmental state in Africa: Evidences from Ethiopia." International Journal of Educational Research and Development 2(7): 168-177.

Mekonnen, M., Martin, Z., & Thomas, B. (2012). Teff (Eragrostis tef) as a raw material for malting, brewing and manufacturing of gluten-free foods and beverages: a review. J Food Sci Technol (November 2014) 51(11):2881–2895 DOI 10.1007/s13197-012-0745-5.

Mertens, D. M. (2014). Research and evaluation in education and psychology: Integrating diversity with quantitative, qualitative, and mixed methods, Sage publications.

Mertens, D. M. (1998). Research methods in education and psychology: Integrating diversity with quantitative and qualitative approaches. Thousand Oaks, CA: Sage.

Mesfin, W., B. Fufa, et al. (2011). "Pattern, trend and determinants of crop diversification: empirical evidence from smallholders in eastern Ethiopia." Journal of Economics and Sustainable Development 2(8): 78-89.

Meulenberg, M. T. (1997). Evolution of agricultural marketing institutions: a channel approach. Agricultural marketing and consumer behavior in a changing world, Springer: 95-108.

Miller, P. J. and R. Cameron (2011). "Mixed method research designs: A case study of their adoption in a doctor of business administration program." International Journal of Multiple Research Approaches 5(3): 387-402.

Minten, B., D. Stifel, et al. (2012). "Structural transformation in Ethiopia: Evidence from cereal markets."

Minten, B., E. Engida, et al. (2016). How big are post-harvest losses in Ethiopia?: Evidence from teff, Intl Food Policy Res Inst.

Minten, B., S. Tamru, et al. (2013). "Ethiopia's value chains on the move: The case of teff." Ethiopia Strategy Support Program II Working Paper 52: 1-26.

Minten, B., S. Tamru, et al. (2013). "Using evidence in unraveling food supply chains in Ethiopia: the supply chain of teff from major production areas to Addis Ababa." ESSP Working Paper 54: 1-23.

Minten, B., S. Tamru, et al. (2016). "Feeding Africa's cities: The case of the supply chain of teff to Addis Ababa." Economic Development and Cultural Change 64(2): 265-297.

Minten, B., S. Tamru, Engida, E., Kuma T. (2016). "Transforming staple food value chains in Africa: The case of teff in Ethiopia." The Journal of Development Studies 52(5): 627-645.

Minten, B., S. Tamru, et al. (2018). "Dynamics in teff value chains." The economics of teff: Exploring Ethiopia's biggest cash crop: 327.

Mkumbwa, S. S. (2011). "Cereal food commodities in Eastern Africa: consumption-production gap trends and projections for 2020."

MoFED (2012). Ethiopia's progress towards eradicating poverty: An interim report on poverty analysis study (2010/11), Ministry of Finance and Economic Development (MoFED) Addis Ababa, Ethiopia.

MoFED, A. (2006). Plan for Accelerated and Sustained Development to End Poverty (PASDEP), Ministry of Finance and Economic Development Addis Ababa, Ethiopia.

MoFED (2003). Rural development policy and strategies, Ministry of Finance and Economic Development (MoFED), Addis Ababa, Ethiopia ….

Mohajan, H. (2013). "Ethiopia: A socio-economic study." Journal of Business Management and Administration Vol. 1(5), pp.59-74.

Mohammed, M. I., A. I. Mustafa, et al. (2009). "Evaluation of Wheat Breads Supplemented with Teff ('Eragrostis tef (ZUCC.') Trotter) Grain Flour." Australian Journal of Crop Science 3(4): 207.

Morgan, D. L. (2007). Paradigms lost and pragmatism regained: Methodological implications of combining qualitative and quantitative methods. Journal of Mixed Methods Research, 1(1), 48-76.

Morris, M., V. A. Kelly, et al. (2007). Fertilizer use in African agriculture: Lessons learned and good practice guidelines, The World Bank.

Mottaleb, K. A. and D. B. Rahut (2018). "Household production and consumption patterns of Teff in Ethiopia." Agribusiness 34(3): 668-684.

Munyua, H. and C. Stilwell (2010). "A mixed qualitative-quantitative-participatory methodology: A study of the agricultural knowledge and information system (AKIS) of small-scale farmers in Kirinyaga district, Kenya." Library management 31(1/2): 5-18.

Mussaa, E., G. A. Obare, et al. (2011). "Resource use efficiency of smallholder crop production in the central highlands of Ethiopia."

Mussema, R. (2006). Analysis of red pepper marketing: the case of Alaba and Siltie in SNNPR of Ethiopia, Haramaya University.

Mussema, R., B. Kassa, et al. (2015). "Determinants of crop diversification in Ethiopia: Evidence from Oromia region." Ethiopian Journal of Agricultural Sciences 25(2): 65-76.

Mutayoba, V. and D. Ngaruko (2015). "Market performance and farmers' choice of marketing channels of high value crops in Tanzania." International Journal of Economics, Commerce and Management United Kingdom 3(8).

Mwita, P. N., R. O. Otieno, et al. (2011). "Prediction of the likelihood of households food security in the Lake Victoria Region of Kenya." Pakistan Journal of Statistics and Operation Research 7(2): 331-346.

Najafi, B. (2003). An overview of current land utilization systems and their contribution to agricultural productivity. Report of the APO Seminar on impact of land utilization systems on agricultural productivity. Productivity Organization, Islamic Republic of Iran Asian.

Nata, T. and K. Bheemalingeswara (2010). "Prospects and constraints of household irrigation practices, Hayelom Watershed, Tigrai, Northern Ethiopia." Momona Ethiopian Journal of Science 2(2): 86-109.

Ndinda Catherine, Tidings P. Ndhlovu, Pamela Juma, Gershim Asiki and Catherine Kyobutungi (2018). The evolution of non-communicable diseases policies in post-apartheid South Africa. BMC Public Health Article number: 956

Ndinda Catherine & Tidings P. Ndhlovu (2016). Attitudes towards foreigners in informal settlements targeted for upgrading in South Africa: A gendered perspective, Agenda

Nega Mirete. (2010). The Interface between Access to Genetic Resources, Benefit Sharing and Intellectual Property Right Laws in Ethiopia: Analysis of their Synergies. Addis Ababa University, School of graduate studies, School of law.

Negassa, A., R. J. Myers, et al. (2003). Grain marketing policy changes and spatial efficiency of maize and wheat markets in Ethiopia.

Nehru, V. and A. Dhareshwar (1994). New estimates of total factor productivity growth for developing and industrial countries, The World Bank.

Nicolas Depetris Chauvin, Francis Mulangu and Guido Porto. (2012). Food Production and Consumption Trends in Sub-Saharan Africa: Prospects for the Transformation of the Agricultural Sector. UNDP working paper 2012-011, UNDP regional bureau for Africa.

Obamiro, E., W. Doppler, et al. (2003). Farming Systems and Policy Options for Food Security in Southwestern Nigeria, Citeseer.

OECD/Food and A. O. o. t. U. Nations (2015). OECD-FAO agricultural outlook 2015, OECD Publishing Paris.

Ofcansky, T. P. and L. Berry (1991). "Ethiopia: A country study. Washington: GPO for the Library of Congress." available online at: URL: http://countrystudies. us/ethiopia/95. htm.

Oicha, T., W. Cornelis, et al. (2010). Short-term effects of conservation tillage on soil (Vertisol) and crop (teff, Eragrostis tef) attributes in the orthern Ethiopian highlands. Proceedings of the 19th World Congress of Soil Science, Soil Solutions for a Changing World.

O'Leary, Z. (2010). The Essential Guide to Doing Your Research Project. 3rd edition. London: SAGA Publications Inc.

Omiti, J. M., K. A. Parton, et al. (2000). "Some Policy Implications of the resurfacing of rural factor markets following agrarian de-collectivization in Ethiopia." Human Ecology 28(4): 585-603.

Onwuegbuzie, A.J., & Johnson, R.B. (2006). The validity issues in mixed research. Research in the schools, 13, 48-63

Organization, W. H. and R. f. I. T. Control (2008). WHO report on the global tobacco epidemic, 2008: the MPOWER package, World Health Organization.

Paddy, F. (2003). "Gender differentials in land ownership and their impact on household food security: a case study of Masaka district." Master of Science Thesis. Uganda.

Pasteur, K. (2001). *Tools for Sustainable Livelihoods: Policy Analysis*. Institute of Development Studies

Pausewang, S., F. Cheru, et al. (1990). "Ethiopia-rural development options."

Petros, M. T., K. Nachimuthu, et al. (2018). "Agricultural Extension: Challenges of Extension service for rural poor and youth in Amhara Region, North Western Ethiopia. The Case of North Gondar Zone." International Journal of Scientific Research and Management 6(02).

Petros, M. T., K. Nachimuthu, et al. (2018). "Agricultural Extension: Challenges of Extension service for rural poor and youth in Amhara Region, North Western Ethiopia. The Case of North Gondar Zone." International Journal of Scientific Research and Management 6(02).

Poole, N. (2017). Smallholder Agriculture and Market Participation, Rugby, UK: Practical Action Publishing, http://dx.doi.org/10.3362/9781780449401

Prateek Goorha. (2017). Modernization Theory. Oxford Research Encyclopedia of International Studies.

Provost, C. and E. Jobson (2014). "Move over quinoa, Ethiopia's teff poised to be next big super grain." The Guardian Newspaper.

Provost, C. and E. Jobson (2014). "Move over quinoa, Ethiopia's teff poised to be next big super grain." The Guardian Newspaper.

Prowse, M. (2008). "Locating and extending livelihoods research." Brooks World Poverty Institute Working Paper (37).

Rahmato, D. (2008). Ethiopia: Agriculture policy review. Digest of Ethiopia's National Policies, Strategies and Programs. Addis Ababa: Forum for Social Studies.

Rajić, A., I. Young, et al. (2013). "Improving the utilization of research knowledge in agri-food public health: a mixed-method review of knowledge translation and transfer." Foodborne pathogens and disease 10(5): 397-412.

Rashid, S. (2010). Staple food prices in Ethiopia: prepared for the COMESA policy seminar.

Rashid, S. (2011). Inter-commodity price transmission and food price policies: An analysis of Ethiopian cereal markets, International Food Policy Research Institute (IFPRI).

Rashid, S. and A. Negassa (2011). "Policies and performance of Ethiopian cereal markets." Ethiopia strategy support program 2.

Rashid, S. and P. Dorosh (2009). "The interplay of public policy and grain market behavior in Ethiopia." Center for African Studies, Oxford University. http://users. ox. ac. uk/~ econstd/Brief_SRashid_v2. pdf.

Reardon, T., C. Delgado, et al. (1992). "Determinants and effects of income diversification amongst farm households in Burkina Faso." The Journal of Development Studies 28(2): 264-296.

Rehima, M., K. Belay, et al. (2013). "Factors affecting farmers' crops diversification: Evidence from SNNPR, Ethiopia." International Journal of Agricultural Sciences 3(6): 558-565.

Ricket, J. (1991). Economic Development in Ethiopia: Agriculture, the market and the Sate, OECD, Paris.

Ridvan Turhan. (2018). The Effect of Dependency Theory on Discussions of 'Underdevelopment' in Turkey. De Gruyter. http://www.jstor.com/stable/j.ctvbkk12k.22.

Rigg, J. (2006). "Land, farming, livelihoods, and poverty: rethinking the links in the rural South." World development 34(1): 180-202.

Robinson, S., D. Willenbockel, et al. (2010). "Implications of food production and price shocks for household welfare in Ethiopia: a general equilibrium analysis."

Roseberg, R. J., S. Norberg, et al. (2005). "Yield and quality of teff forage as a function of varying rates of applied irrigation and nitrogen." Klamath Experiment Station Annual Report.

Ruttan V.W. (1977). Induced innovation and agricultural development. Food policy 2(3): 196-202.

Sah, U., S. Kumar, et al. (2007). "Need perception of tribal farmers with regard to recommended potato production practices in Meghalaya." Potato journal 34(3-4).

Salami, A., A. B. Kamara, et al. (2010). Smallholder agriculture in East Africa: Trends, constraints and opportunities, African Development Bank Tunis.

Sandelowski, M. (2003). Tables or tableaux? The challenges of writing and reading mixed methods studies. In A. Tashakkori & C. Teddlie (Eds.), Handbook of mixed methods in social & behavioral research (pp. 321-350). Thousand Oaks, CA: Sage.

SantosPaulino, A. and A. P. Thirlwall (2004). "The impact of trade liberalisation on exports, imports and the balance of payments of developing countries." The Economic Journal 114(493): F50-F72.

Sassi, M. (2018). Food Security Information Systems and Sources of Food Security Data. Understanding Food Insecurity, Springer: 51-59.

Schultz, T.W. (1964). Transforming Traditional Agriculture. Yale University Press. New Haven.

Scoones, I. (2009). Livelihoods perspectives and rural development. The Journal of Peasant Studies, 36, 171-196.

Scott N Romaniuk. (2017). Dependency Theory. University of Alberta.

Scully, G. W. (2003). "Optimal taxation, economic growth and income inequality." Public choice 115(3-4): 299-312.

Se, A. S. T., P. Dorosh, et al. (2010). "Crop production in Ethiopia: Regional patterns and trends." Food and agriculture in Ethiopia: Progress and policy challenges 74: 53.

Seid Yimer. (2011). "Determinants of food consumption expenditure in Ethiopia." Int. J. Eco. Res., 2011 2(5), 151-165.

Sen, A. (1981). "Ingredients of famine analysis: availability and entitlements." The quarterly journal of economics 96(3): 433-464.

Seneshaw Tamru. (2013). Spatial Integration of Cereal Markets in Ethiopia. ESSP (Ethiopia Strategy Support Programme II) working paper 56.

Seyfu, K. (1997). "Teff. Eragrostis tef (Zucc.) Trotter. Promoting the Conservation and Use of Underutilized and Neglected Crops. Institute of Plant Genetic and Crop Plant Research, Gaterstleben/International Plant Genetic Resources Institute, Rome, 35." International Plant Genetic Resources Institute, Rome.

Shah, V. and M. Makwana (2013). "Marketed and marketable surplus of major food grains in Rajasthan." Agro-Economic Research Centre for the states of Gujarat and Rajasthan, Sardar Patel University, Sardar Patel, India.

Shahidur Rashid and Asfaw Negassa. (2013). Policies and performance of Ethiopian cereal markets. University of Pennsylvania Press for IFPRI, Editors: Paul Dorosh and Shahidur Rashid.

Shahidur Rashid and Asfaw Negassa. (2011). Policies and performance of Ethiopian cereal markets: Development Strategy and Governance Division, International Food Policy Research Institute – Ethiopia Strategy Support Program II, Ethiopia. Ethiopia Strategy Support Program II (ESSP II) ESSP II Working Paper No. 21.

Shahidur, R., Meron, A., and Gezahegn, A. (2007). Distortions to Agricultural Incentives in Ethiopia. Agricultural Distortions Working Paper 43.

Shiferaw, A., M. Söderbom, et al. (2015). "Road infrastructure and enterprise dynamics in Ethiopia." The Journal of Development Studies 51(11): 1541-1558.

Shita, A., N. Kumar, et al. (2019). "Economic Benefit of Agricultural Technology on Teff and Maize Crops in Ethiopia: The Blinder-Oaxaca Decomposition." Journal of Poverty: 1-16.

Simoons, Frederick, J. (1965). “Some Questions on the Economic Prehistory of Ethiopia.” The Journal of African History, 6. 1, 1-13. Retrieved fromhttp://www.jstor.org/stable/179643.

Siskos, Y., N. F. Matsatsinis, et al. (2001). "Multicriteria analysis in agricultural marketing: The case of French olive oil market." European Journal of Operational Research 130(2): 315-331.

Spaenij-Dekking, L., Y. Kooy-Winkelaar, et al. (2005). "The Ethiopian cereal tef in celiac disease." New England Journal of Medicine 353(16): 1748-1749.

Spielman, D. J. (2008). "Encouraging economic growth in Ethiopia: Perspectives on agricultural input markets, agricultural extension and advisory services, and agricultural education and training." Briefing note. Washington, DC: International Food Policy Research Institute.

Spielman, D. J., D. Byerlee, et al. (2010). "Policies to promote cereal intensification in Ethiopia: A review of evidence and experience." Food Policy 35(3): 185-194.

Spielman, D. J., D. Kelemwork, et al. (2012). "Seed, fertilizer, and agricultural extension in Ethiopia." Food and agriculture in Ethiopia: Progress and policy challenges: 84-122.

Staal, S., C. Delgado, et al. (1997). "Smallholder dairying under transactions costs in East Africa." World development 25(5): 779-794.

Stavi, I. and R. Lal (2015). "Achieving zero net land degradation: challenges and opportunities." Journal of Arid Environments 112: 44-51.

Stefan Dercon and Douglas Golli. (2014). Agriculture in African Development: Theories and Strategies. Annu. Rev. Resour. Econ. 2014. 6:471–92.

Stephen Morse, Nora McNamara and Moses Acholo. (2009). Sustainable Livelihood Approach: A critical analysis of theory and practice. Geographical Paper No. 18. The University of Reading.

Stern, D. I., M. S. Common, et al. (1996). "Economic growth and environmental degradation: the environmental Kuznets curve and sustainable development." World development 24(7): 1151-1160.

Stevens, R., and Jabara, C. (1988). Agricultural Development Principles: Economic Theory and Empirical Evidence. Baltemore and London: The John Hopkins University Press.

Stifel, D. and B. Minten (2017). "Market access, well-being, and nutrition: evidence from Ethiopia." World Development 90: 229-241.

Stump, D. (2013). "The role of agricultural and environmental history in East African developmental discourse." Humans and the Environment: New Archaeological Perspectives for the Twenty-First Century: 171.

Suh, J. (2002). "Estimation of Non-market Forest Benefits Using Choice Modelling."

Swift, J. (1989). "Why are rural people vulnerable to famine?" IDS bulletin 20(2): 8-15.

Taddese, G. (2001). "Land degradation: a challenge to Ethiopia." Environmental management 27(6): 815-824.

Tadesse, G. and A. G. Guttormsen (2011). "The behavior of commodity prices in Ethiopia." Agricultural Economics 42(1): 87-97.

Tadesse Kenea Amentae. (2016). Evaluation of Supply Chains and Postharvest Losses of Selected Food Commodities in Ethiopia. Licentiate Thesis Swedish University of Agricultural Sciences Uppsala. Department of Energy and Technology. ISBN 978-91-576-9388-4.

Tadesse, L., K. Suryabhagavan, et al. (2017). "Land use and land cover changes and Soil erosion in Yezat Watershed, North Western Ethiopia." International Soil and Water Conservation Research 5(2): 85-94.

Takele, A. (2010). Analysis of rice profitability and marketing chain: The case of Fogera Woreda, South Gondar Zone, Amhara national regional state, Ethiopia, Haramaya University.

Tamru, S. (2013). "Spatial integration of cereal markets in Ethiopia." Ethiopia Strategy Support Program-Ethiopian Development Research Institute.

Tarawali, S., M. Herrero, et al. (2011). "Pathways for sustainable development of mixed crop livestock systems: Taking a livestock and pro-poor approach." Livestock science 139(1-2): 11-21.

Tashakkori, A. & Teddlie, C. (Eds.). (2003). Handbook of mixed methods in social & behavioral research (pp. 321-350). Thousand Oaks, CA: Sage.

Te Velde, D. W., J. Rushton, et al. (2006). "Entrepreneurship in value chains of non-timber forest products." Forest Policy and Economics 8(7): 725-741.

Tefera, T. (2014). "Determinants of smallholder pulse producers market orientation in Southern Ethiopia." Asian Journal of Business Management 6(2): 97-103.

Teferi, A. (1992). Food Grain Marketing Reform in Ethiopia.

Tegegn, A. (2013). "Value chain analysis of vegetables: The case of Habro and Kombolcha Woredas in Oromia Region, Ethiopia." An MSc Thesis Presented to School of Graduate Studies of Haromaya University.

Tegegne, M. (2012). An assessment on the role of women in agriculture in Southern Nation Nationality People's Region: The case of Halaba Special Woreda, Ethiopia, Indira Gandhi National Open University.

Teklu, Y., Tefera H., (2005). Genetic improvement in grain yield potential and associated agronomic traits of tef (Eragrostis tef). *Euphytica*, 141, 247–254.

Temesgen, F., B. Emana, et al. (2017). "Application of multivariate probit on determinants of sesame farmers market outlet choices in Gimbi District, Ethiopia." African Journal of Agricultural Research 12(38): 2830-2835.

Tesfamariam, K., T. Berhanu, et al. (2015). "Determinants of the choice of marketing channel among small-scale honey producers in Tigrai region, Ethiopia." Journal of Business Management and Social Sciences Research 4(4): 295-305.

Tesfaye, A., M. Tesfaye, et al. (2016). Production, Marketing, Processing and Technology Adoption of Noug (Guizotia abyssinica) in Central Ethiopia, Ethiopian Institute of Agricultural Research (EIAR).

Tesfaye, W., T. Abdissa, et al. (2015). "Economic analysis of teff yield response to different sowing methods: Experience, Illuababora Zone, Ethiopia." Journal of Economics and Sustainable Development, 6 (1).

Teshome, A. (2006). Agriculture, growth and poverty reduction in Ethiopia: policy processes around the new PRSP (PASDEP). a paper for the Future Agricultures Consortium Workshop, Institute of Development Studies, University of Sussex, UK, Citeseer.

Teshome, A. (2006). Agriculture, growth and poverty reduction in Ethiopia: policy processes around the new PRSP (PASDEP). a paper for the Future Agricultures Consortium Workshop, Institute of Development Studies, University of Sussex, UK, Citeseer.

Tewodros Reta Bereda. (2011). The significance of neoliberalism in the political economy of sub Saharan Africa: The case of Ethiopia. MSc thesis. Department of political science and international relations. Addis Ababa University.

Tsehai Alemayehu. (2009). “The Ethiopian Developmental State: Requirements and Perquisite.” Journal of Business & Economics Research, 7(8), 11-18.

Thomas, R. B. and T. L. Leatherman (1990). "Household coping strategies and contradictions in response to seasonal food shortage." European Journal of Clinical Nutrition 44: 103-111.

Tilahun, D. (2011). The Effectiveness of Marketing Communication Channels: The Case of Ethiopia Commodity Exchange, Addis Ababa University.

Tollens, E. (2006). Market information systems in sub-Sahara Africa: challenges and opportunities.

Ton, G., K. de Grip, et al. (2013). Effectiveness of innovation grants to smallholder agricultural producers: an explorative systematic review, EPPI-Centre, Social Science Research Unit, Institute of Education ….

Tongco, M. D. C. (2007). "Purposive sampling as a tool for informant selection." Ethnobotany Research and applications 5: 147-158.

Triomphe, B. and R. Rajalahti (2013). From concept to emerging practice: what does an innovation system perspective bring to agricultural and rural development? Renewing innovation systems in agriculture and food, Springer: 57-76.

Tsegamariam, D., (2017). Factors Affecting *Teff* Production by Female Headed Households in Abeshege Woreda of Gurage Zone, Southern Nations Nationalities and Peoples Region, Ethiopia. Journal of Culture, Society and Development. Vol.28, 2017

Tshiunza, M., J. Lemchi, et al. (2001). "Determinants of market production of cooking banana in Nigeria." African Crop Science Journal 9(3): 537-547.

Tura, E. G., D. Goshub, et al. (2016). "Determinants of market participation and intensity of marketed surplus of teff producers in Bacho and Dawo districts of Oromia State, Ethiopia." Forthcoming: Agricultural Economics.

Udemezue JC, Osegbue EG. (2018). Theories and Models of Agricultural Development. Ann Rev Resear. 2018; 1(5): 555574.

United Nations. (2015). Transforming our world. The 2030 Agenda for Sustainable Development. A/RES/70/1.

UNDP (United Nations Development Program). (2013). Annual Report on Strategy for Industrial Development in Ethiopia. New York.

UNDP, A. (2012). Africa Human Development Report Towards a Food Secure Future, United Nations Development Programme (UNDP).

United Nations, D. o. E. a. S. A., Population Division (2017). "World Population Prospects: The 2017 Revision, Key Findings and Advance Tables." Working Paper No. ESA/P/WP/248.

Urgessa, M. (2011). Market chain analysis of teff and wheat production in Halaba Special Woreda, southern Ethiopia, Haramaya University.

Ushehwedu, K., Ingrid, H.,Frutuoso, S., Maria, D. (2017). Dialogues in Development: Dependency. Young Scholars Initiative. Institute for New Economic Thinking. Volume 1. ISSN: 2472-6966.

Van der Mheen-Sluijer, J. (2010). Ethiopian commodity exchange and contract farming arrangements, Working Paper, Wageningen UR.

Van der Veen, A. and T. Gebrehiwot (2011). "Effect of policy interventions on food security in Tigrai, Northern Ethiopia." Ecology and Society 16(1).

Vandercasteelen, J., S. T. Beyene, et al. (2018). "Cities and agricultural transformation in Africa: Evidence from Ethiopia." World Development 105: 383-399.

Valdés-Rodríguez, Ofelia Andrea, Pérez-Vázquez, Arturo. (2011). Sustainable Livelihoods: An analysis of the methodology. Tropical and Subtropical Agro ecosystems, vol. 14, núm. 1, enero-abril, 2011, pp. 91-99.

Von Braun, J. and T. Olofinbiyi (2007). "Famine and food insecurity in Ethiopia."

Wahyuni, D. (2012). "The research design maze: Understanding paradigms, cases, methods and methodologies." Journal of applied management accounting research 10(1): 69-80.

Walonick, D. (1993). "Everything you want to know about questionnaires." StatPac Research Library.

Warner, J., T. Stehulak, et al. (2019). "Woreda-level crop production rankings in Ethiopia: A pooled data approach." Gates Open Res 3.

Webb and Von Braun. (1994). *Famine and Food Security in Ethiopia: Lessons for Africa*. Chichester: John Wiley and Sons.

Welteji, D. (2018). “A critical review of rural development policy of Ethiopia: Access, utilization and coverage”, *Agriculture and Food Security*, Vol. 7/1, pp. 1-6, http://dx.doi.org/10.1186/s40066-018-0208-y.

White, H. (2002). "Combining quantitative and qualitative approaches in poverty analysis." World development 30(3): 511-522.

White, H. and J. Leavy (2001). "Economic reform and economic performance: evidence from 20 developing countries." The European Journal of Development Research 13(2): 120-143.

Wiebe, K. D., M. J. Soule, et al. (2001). "Agricultural productivity for sustainable food security in Sub-Saharan Africa." FAO Economic and Social Development Paper: 55-74.

Wiggins, S. (2000). “Interpreting changes from the 1970s to the 1990s in African agriculture through village studies.” World Development 28 (4): 631–662.

Wiggins, S., J. Kirsten, et al. (2010). "The future of small farms." World development 38(10): 1341-1348.

Wilkinson, T., and Bhandarkar, P., (1992). Methodology and Techniques of Social Research. Himalaya Publishing House. Mumbai.

Wisdom, J. P., M. A. Cavaleri, et al. (2012). "Methodological reporting in qualitative, quantitative, and mixed methods health services research articles." Health services research 47(2): 721-745.

WoARD (2010 E.C). "Performance report of agriculture and rural development for Halaba special Wereda, SNPPR."

WoARD (2018). "Agriculture and rural development performance report for the year 2010 E.C for Tahtai Maichew Wereda, Wukro Marai, Ethiopia “.

WoARD (2018). "Annual performance report of Agriculture and Rural Development of Shenkora na Minjar Wereda of Amhara regional state, Arerti, Ethiopia “.

WoARD (2018). "Performance report of agriculture and rural development for Halaba special Wereda, SNPPR."

WoARD (2018). "Performance report of Office of Agriculture and Rural Development for Lomie Wereda of Oromia regional state, Modjo, Ethiopia."

WoFED (2010). "Statistical bulletine of the Wereda, Halaba special Wereda, SNNPR."

WoFED (2017). "Statistical bulletine of Tahtai Maichew Wereda of Tigrai regional state, Wukro Marai, Ethiopia."

WoFED (2017). "Summary of performance report of sector offices of Shenkora na Minjar Wereda of Amhara regional state, Arerti, Ethiopia ".

WoFED (2018). "Statistic bulletine of the Lomie Wereda in Oromia regional state, Modjo, Ethopia."

WoFED (2018). "Statistical bulletine of the Wereda, Halaba special Wereda, SNNPR."

Woldie, G. A. and K. Siddig (2009). "The impact of banning export of cereals in response to soaring food prices: Evidences from Ethiopia using the new GTAP African database."

Woldu, T. and F. Tadesse (2015). Women's Participation in Agricultural Cooperatives in Ethiopia.

Wolelaw, S. (2005). "Factors determining supply of rice: A study in Fogera district of Ethiopia." An MSc Thesis Presented to the School of Graduate Studies of Alemaya University.

Wongtschowski, M., J. Belt, et al. (2013). "The business of agricultural business services." Working with smallholders in Africa.

Worku, M. A., A. Ejigu, et al. (2016). "The Contribution of Ethiopia's Commodity Exchange for Promoting Exports of Agricultural Products." Journal of Economics and Sustainable Development 7(9): 81-90.

World Bank. (2017). Enabling the Business of Agriculture 2017. Washington, DC, World Bank. Retrieved 28 March 2017, from http://eba.worldbank.org/~/ media/WBG/AgriBusiness/ Documents/Reports/2017/EBA2017-Report17. pdf.

World Bank. (2007). Explaining Sources of Food Price Inflation in Ethiopia: A Just in Time Policy Note.

Yasir, M., A. J. Naeem, et al. (2011). "Factors affecting post-harvest losses of citrus; a case study of District Sargodha." American-Eurasian Journal of Agricultural & Environmental Sciences 10(5): 934-937.

Yihdego, A. G., A. A. Gebru, et al. (2015). "The impact of small-scale irrigation on income of rural farm households: Evidence from Ahferom Woreda in Tigrai, Ethiopia." International Journal of Business and Economics Research 4(4): 217-228.

Yihun, Y. M., A. M. Haile, et al. (2013). "Crop water productivity of irrigated teff in a water stressed region." Water resources management 27(8): 3115-3125.

Yimer, S. (2011). "Determinants of food consumption expenditure in Ethiopia." International Journal of Economic Research 2(5): 151-165.

Yismaw, T. G. (2019). "Effect of Inflation on Economic Growth of Ethiopia." Journal of Investment and Management 8(2): 48-52.

Yuan, Z. (2011). "Analysis of agricultural input-output based on Cobb-Douglas production function in Hebei Province, North China." African Journal of Microbiology Research 5(32): 5916-5922.

Yvonne Feilzer, M. (2010). "Doing mixed methods research pragmatically: Implications for the rediscovery of pragmatism as a research paradigm." Journal of mixed methods research 4(1): 6-16.

Zambakari, Christopher. (2018). Modernization Theory and the Metaphor of the Development Ladder. Harvard Africa Policy Journal, Available at SSRN: https://ssrn.com/abstract=3128705.

Zar, J. H. (1999). Biostatistical analysis, Pearson Education India.

Zechmeister, E. B. and E. J. Posavac (2003). Data analysis and interpretation in the behavioral sciences, Wadsworth Pub Co.

Zechmeister, J. S., E. B. Zechmeister, et al. (2001). Essentials of research methods in psychology, McGraw-Hill Higher Education.

Zeller, M., A. Diagne, et al. (1998). "Market access by smallholder farmers in Malawi: Implications for technology adoption, agricultural productivity and crop income." Agricultural Economics 19(1-2): 219-229.

Zerihun, A. (2008). "Industrialization Policy and Industrial Development Strategy in Ethiopia." Digest of Ethiopia’s National Policies, Strategies and Programs: 239-281.

Zewdu, A. (2010). Ethiopian Commodity Exchange (ECX)-Linking farmers to the market.

Zivenge, E. and C. Karavina (2012). "Analysis of factors influencing market channel access by communal horticulture farmers in Chinamora District, Zimbabwe." Journal of Development and Agricultural Economics 4(6): 147-150.

APPENDIX 1: LIST OF TABLES AND FIGURES

Table 1: Attribute for FGD participants (n = 84)

Variables for the FDG participants	Category	Respondents	Percentage from total	Average
Sex	Female	42	50.0 %	
	Male	42	50.0 %	
Age (years)	18 up to 35	23	27.38 %	52.16 years
	35-65	60	71.43 %	
	65 and Above	1	1.19 %	
Marital status	Married	65	77.38 %	
	Single	3	3.57 %	
	Divorced	2	2.38 %	
	Separated	2	2.38 %	
	Widowed	12	14.29 %	
Family size	1-2 persons	5	5.95 %	Average of 5.57 with a standard deviation of 2.04
	3-4 persons	22	26.19 %	
	5-6 persons	26	30.95 %	
	7-8 persons	26	30.95 %	
	9-10 persons	5	5.95 %	
Education	Not attending schools	47	55.95 %	
	Elementary school primary cycle (Grade 1 to grade 4)	14	16.67 %	
	Elementary school secondary cycle (Grade 5 to grade 8)	17	20.24 %	
	High school (Grade 9 to grade 12)	6	7.14 %	
Owned land	Up to 0.5 ha owned land	23	27.38 %	Average of 0.69 ha with a standard deviation of 0.49
	From 0.5 ha up to 1 ha of owned land	36	42.86 %	
	From 1 ha up to 1.5 ha of owned land	20	23.81 %	
	From 1.5 ha up to 2 ha of owned land	4	4.76 %	
	2 ha and above of owned of land	1	1.19 %	
	No	36	42.86 %	

Membership in multipurpose coop	Yes	48	57.14 %
Membership in marketing coop	No	61	72.62 %
	Yes	23	27.38 %
Membership in saving and credit cooperatives	No	53	63.10 %
	Yes	31	36.90 %
Membership in women association	No	60	71.43 %
	Yes	24	28.57 %
Membership in farmers association	No	28	33.33 %
	Yes	56	66.67 %
Membership in youth association	No	75	89.29 %
	Yes	9	10.71 %
Membership in political party	No	49	58.33 %
	Yes	35	41.67 %
Membership in religious associations	No	29	34.52 %
	Yes	55	65.48 %
Membership in *Edir*	No	31	36.90 %
	Yes	53	63.10 %
Membership in *Equib*	No	61	72.62 %
	Yes	23	27.38 %

Source: Survey result, 2018

Table 2: Socio-demographic characteristics of survey respondents (n= 248)

Variables	Category	Number of respondents	Percentage from total	Average
Sex	Female respondents	34	13.71 %	
	Male respondents	214	86.29 %	
Age (years)	18 up to 35 years of age	58	23.39 %	45.88 with a SD of 12.50
	36-65 years of age	174	70.16 %	
	Above 65 years of age	16	6.45 %	
Marital status	Married (Custom / traditional / church marriage)	177	71.37 %	
	Married (Civil marriage)	31	12.50 %	
	Widow /Widower	22	8.87 %	
	Divorced or Separated	9	3.63 %	
	Single / Never Married	8	3.23 %	
	Living together (not married)	1	0.40%	
Family size	1 and 2 family size	22	8.87 %	5.12 with a standard deviation of 1.91
	3 and 4 family size	76	30.65 %	
	5 and 6 family size	90	36.29 %	
	7 and 8 family size	47	18.95 %	
	9 and 10 family size	13	5.24 %	
Educational status	Not attending schools	135	54.44 %	
	Elementary school (Grade 1 to grade 8)	91	36.69 %	
	High school (Grade 9 to grade 12)	18	7.26 %	
	Attend college or university	4	1.61 %	
Total *Teff* cultivated land in ha	Up to 0.5 ha	49	19.76 %	0.77 ha with a standard deviation of 0.42
	From 0.5 up to 1 ha	106	42.74 %	
	From 1 ha up to 1.5 ha	61	24.60 %	
	From 1.5 ha up to 2 ha	22	8.87 %	
	2 ha and above	10	4.03 %	
Teff production in kg in 2010 E.C (2017/18)	No *Teff* production at all	2	0.81 %	1104 kg of *Teff* per household with a SD of 757
	Less than 1000 kg	117	47.18 %	
	From 1000 kg up to 2000 kg	95	38.30 %	
	From 2000 kg up to 3000 kg	21	8.47 %	
	3000 kg and above	13	5.24 %	

Source: Survey result, 2018

Table 3: Socio-demographic characteristics of survey respondents by district (n= 248)

Variables	Categorical variables	Name of the districts							
		Halaba		Lomie		Shenkora na Minjar		Tahtai Maichew	
		Count	%	Count	%	Count	%	Count	%
Sex of the respondent	Female	7	11.3%	5	8.1%	6	9.7%	16	25.8%
	Male	55	88.7%	57	91.9%	56	90.3%	46	74.2%
Age of the respondent	From 18 up to 35	28	45.2%	6	9.7%	15	24.2%	9	14.5%
	From 35 up to 65	33	53.2%	48	77.4%	46	74.2%	47	75.8%
	65 and above	1	1.6%	8	12.9%	1	1.6%	6	9.7%
Religion of the respondents	Orthodox Tewahido	0	0.0%	60	96.8%	60	96.8%	62	100.0%
	Catholic	0	0.0%	0	0.0%	2	3.2%	0	0.0%
	Protestant	0	0.0%	2	3.2%	0	0.0%	0	0.0%
	Muslim	62	100.0%	0	0.0%	0	0.0%	0	0.0%
Marital status of the respondents	Civil marriage	0	0.0%	3	4.8%	7	11.3%	21	33.9%
	Cultural or religious marriage	53	85.5%	51	82.3%	43	69.4%	30	48.4%
	Living together but not married	0	0.0%	0	0.0%	1	1.6%	0	0.0%
	Widowed	2	3.2%	6	9.7%	6	9.7%	8	12.9%
	Divorced/ separated	5	8.1%	0	0.0%	1	1.6%	3	4.8%
	Single (never married)	2	3.2%	2	3.2%	4	6.5%	0	0.0%
Family size	Up to 3 persons	2	3.2%	5	8.1%	10	16.1%	5	8.1%
	From 3 up to 6 persons	23	37.1%	35	56.5%	35	56.5%	27	43.5%
	From 6 up to 9 persons	30	48.4%	21	33.9%	15	24.2%	28	45.2%
	9 and above persons	7	11.3%	1	1.6%	2	3.2%	2	3.2%
Highest level of education completed by the head of the household	Not attending schools	36	58.1%	38	61.3%	42	67.7%	19	30.6%
	Elementary school (grade 1 to grade 8)	18	29.0%	19	30.6%	17	27.4%	37	59.7%
	Secondary school (grade 9 to grade 12)	5	8.1%	5	8.1%	3	4.8%	5	8.1%
	Attended college or university	3	4.8%	0	0.0%	0	0.0%	1	1.6%

Source: Survey result, 2018

Table 4: Details of *Teff* production by Kebele (tabia) level (n= 248)

District and Region	Kebele (tabia) of the study area	N, Mean and SD	Total *Teff* production in kg per household	Total available land in ha for cultivation	*Teff* cultivated land in ha per household	Average quantity of oxen ownership per household
Lomie district of Oromia regional state	Deke Bora	N	31	31	31	31
		Mean	1,943.55	1.94	1.08	3.10
		SD	742.49	1.02	0.40	1.08
	Tulu Re'ee	N	31	31	31	31
		Mean	1,779.03	2.02	1.10	3.13
		SD	846.74	0.92	0.46	1.77
Shenkora na Minjar district of Amhara regional state	Bolo Silassie	N	31	31	31	31
		Mean	1,132.26	1.29	0.61	1.87
		SD	432.35	0.79	0.25	0.85
	Agirat	N	31	31	31	31
		Mean	1,301.61	1.56	0.98	1.87
		SD	506.70	0.73	0.38	0.92
Halaba zone of SNNPR	Guba	N	31	31	31	31
		Mean	879.03	1.38	0.71	1.39
		SD	627.66	0.80	0.39	1.15
	Andegna Hansha	N	31	31	31	31
		Mean	943.55	1.49	0.77	1.97
		SD	480.06	0.81	0.29	1.02
Tahtai Maichew district of Tigrai regional state	Kewanit	N	31	31	31	31
		Mean	402.42	0.97	0.47	1.42
		SD	228.43	0.56	0.32	0.67
	May Brazio	N	31	31	31	31
		Mean	451.61	0.64	0.40	1.00
		SD	258.36	0.32	0.21	0.82
Total		**N**	**248**	**248**	**248**	**248**
		Mean	**1,104.13**	**1.41**	**0.77**	**1.97**
		SD	**757.39**	**0.87**	**0.42**	**1.29**

Source: Survey result, 2018

Table 5: Category of *Teff* production by sex (n =248)

Category of *Teff* production per household	Sex of the respondent				Total	%
	Female	%	Male	%		
No *Teff* production at all	0	0.00	2	0.93	2	0.81
Less than 1000 kg of *Teff* production	22	64.71	95	44.39	117	47.18
From 1000 kg up to 2000 kg of *Teff* production	10	29.41	85	39.72	95	38.31
From 2000 kg up to 3000 kg of *Teff* production	2	5.88	19	8.88	21	8.47
3000 kg and above of *Teff* production	0	0.00	13	6.07	13	5.24
Total respondents	**34**	**100**	**214**	100	**248**	100.00

Source: Survey result, 2018

Table 6: Family size, active labour force and dependency at household level by district

District of the respondent	N	*Teff* production in kg per household		Family size of the respondents		Size of active labour force at household level		Size of dependents at household level	
		Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
Halaba	62	911.29	555.11	6.10	1.95	3.15	1.59	2.95	1.17
Lomie	62	1,861.29	794.11	4.81	1.64	2.26	1.20	2.55	0.94
Shenkora na Minjar	62	1,216.94	474.85	4.31	1.80	1.79	1.36	2.52	1.04
Tahtai Maichew	62	427.02	243.11	5.27	1.83	1.68	1.10	3.60	1.51
Total	**248**	**1,104.13**	**757.39**	**5.12**	**1.91**	**2.22**	**1.44**	**2.90**	**1.25**

Source: Survey result, 2018

Table 7: Details of *Teff* cultivated area in relation to *Teff* production (n= 248)

***Teff* cultivated land in ha per household**	**Number of respondents, total *Teff* cultivated land in ha and percentage from total**			**Average total land holding and *Teff* production per household**	
	N	**Total land in ha**	**% from total**	**Total available land for cultivation**	***Teff* production in kg per household**
0	2	0.00	0.00	1.00	0.00
0.063	2	0.13	0.07	0.19	100.00
0.125	3	0.38	0.20	0.33	100.00
0.25	31	7.75	4.10	0.68	283.87
0.313	1	0.31	0.17	0.50	500.00
0.375	9	3.38	1.78	1.24	500.00
0.438	2	0.88	0.46	1.25	625.00
0.5	68	34.00	17.97	1.08	743.75
0.625	1	0.63	0.33	1.50	500.00
0.75	32	24.00	12.69	1.28	1160.94
0.875	4	3.50	1.85	1.88	1300.00
1	50	50.00	26.43	1.69	1442.00
1.25	11	13.75	7.27	2.36	1804.55
1.5	22	33.00	17.44	2.22	2063.64
1.75	10	17.50	9.25	2.88	2750.00
Total	**248**	**189.19**	**0.00**	**1.41**	**1104.13**

Source: Survey result, 2018

Table 8: Livestock ownership of the respondents (n= 248)

Type of livestock	Not owners	Owners	Average quantity of livestock ownership		Average unit price	
			Mean	SD	Mean	SD
Ox	30	218	1.98	1.274	12,039.52	6026.578
Cows	94	154	1.00	1.076	4,915.32	4505.769
Heifers	161	87	.52	.810	2,058.47	3241.246
Calves	159	89	.47	.708	996.98	1659.155
Chicken	53	195	7.42	16.962	121.94	103.807
Sheep	138	110	2.02	3.130	545.16	664.237
Goats	148	100	1.94	3.227	517.54	676.608
Camel	228	20	.08	.273	1,427.42	4906.698
Donkey	52	196	1.34	1.061	1,940.12	1146.608
Honeybee	246	2	0.11	1.562	14.11	158.441
Horse	0	0	0	0	0	0

Source: Survey result, 2018

Table 9: Investment in utilities and *Teff* production (n=248)

Category of investment in utilities	Number of respondents		Mean and SD	*Teff* production in kg per household	*Teff* cultivated land per household	Quantity of oxen ownership per household
	Count	%				
No investment	13	5.24	Mean	1,311.54	0.88	1.77
			SD	822.13	0.46	1.30
Less than Birr 1000.00	148	59.68	Mean	976.18	0.69	1.72
			SD	692.04	0.40	1.11
From Birr 1000.00 up to Birr 2000.00	42	16.94	Mean	1,179.76	0.80	2.10
			SD	725.16	0.40	1.16
From Birr 2000.00 up to Birr 3000.00	15	6.05	Mean	1,006.67	0.75	1.87
			SD	586.11	0.42	1.06
Birr 3000.00 and above	30	12.09	Mean	1,588.33	1.05	3.13
			SD	954.27	0.46	1.74
Total	248	100	Mean	1,104.13	0.77	1.97
			SD	757.39	0.42	1.29

Source: Survey result, 2018

Table 10: Summary of different variables by district (n=248)

Household level variables	Name of districts							
	Halaba		Lomie		Shenkora na Minjar		Tahtai Maichew	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Age	40.42	10.99	48.35	12.66	45.06	12.48	49.66	12.01
Family size	6.1	1.95	4.81	1.64	4.31	1.8	5.27	1.83
Active labour force	3.15	1.59	2.26	1.2	1.79	1.36	1.68	1.1
Dependents	2.95	1.17	2.55	0.94	2.52	1.04	3.6	1.51
Education	3.05	4.43	2.35	3.35	1.55	2.87	4.19	3.62
Oxen ownership	1.68	1.11	3.11	1.45	1.87	0.88	1.21	0.77
Available land in ha	1.433	0.8	1.984	0.962	1.421	0.768	0.804	0.478
Teff cultivated land in ha	0.732	0.355	1.087	0.437	0.795	0.367	0.438	0.269
Cost of inputs	2201.35	991.36	5342.79	2098.27	2754.46	1496.02	1775.01	1165.39
Total cost of labour	807.66	913.24	2419.06	2003.3	1344.35	1614.39	2694.71	1141.53
Training days	3.21	2.07	5.24	7.05	5.58	3.57	9.45	6.22
Loan amount	277.42	1036.45	333.87	1193.28	4061.29	5776.42	2573.55	4962.74
Loan allocated to *Teff* production	77.42	441.09	126.61	668.11	1274.19	3086.99	90.32	310.19
Years in coop membership	5.76	6.38	12.55	9.08	12.08	8.45	10.92	7.81
Total livestock value	44136.13	27791.25	75646.53	32542.92	54205.65	27796.2	28048.55	22825.33
Total farm asset value	780.73	385.42	1137.03	572.42	1209.6	397.96	1333.77	787.5
Investment in utilities	1141.13	948.92	1160.53	984.59	1379.52	970.71	571.61	424.45
Teff production in kg	911.29	555.11	1861.29	794.11	1216.94	474.85	427.02	243.11

Source: Survey result, 2018

Table 11: Average consumption, supply, price and revenue of *Teff* crops (n = 248)

Name of the district	N	Mean and SD	Average cereal consumption in kg per year per household	Average *Teff* consumption in kg per year per household	Average *Teff* supply in kg to the market per year	Average price of *Teff* crops per kg	Average revenue generated from sale of *Teff* crops per year
Halaba	62	Mean	1,011.29	129.52	781.45	18.83	14,981.60
		SD	557.57	102.02	486.98	3.05	9,724.78
Lomie	62	Mean	940.45	449.84	1,410.48	20.54	30,176.74
		SD	325.15	207.70	707.75	4.27	15,852.19
Shenkora na Minjar	62	Mean	834.19	321.77	895.16	20.95	18,816.13
		SD	376.17	144.18	385.68	1.67	8,274.92
Tahtai Maichew	62	Mean	864.39	287.90	137.98	20.42	3,164.46
		SD	316.19	175.16	103.38	7.47	2,336.11
Total	**248**	**Mean**	**912.58**	**297.26**	**806.27**	**20.19**	**16,784.73**
		SD	**409.01**	**197.52**	**653.86**	**4.68**	**14,039.58**

Source: Survey result, 2018

Table 12: Average *Teff* consumption, supply to the market, price and revenue by literacy

Can read and write	N	Mean and SD	Total cereal crops consumption in kg per annum per household	Average *Teff* consumption in kg per year per household	Average *Teff* supply to the market in kg per year per household	Average price of *Teff* crops per kg	Average revenue generated from sale of *Teff* crops per year per household
No	135	Mean	938.04	298.00	950.89	20.35	19,726.95
		SD	434.40	198.62	662.58	3.72	14,235.20
Yes	113	Mean	882.16	296.37	633.50	19.99	13,269.70
		SD	376.09	197.08	601.89	5.63	13,013.53
Total	**248**	**Mean**	**912.58**	**297.26**	**806.27**	**20.19**	**16,784.73**
		SD	**409.01**	**197.52**	**653.86**	**4.68**	**14,039.58**

Source: Survey result, 2018

Table 13: Source of market information for farmers (n= 248)

Source of market information	Total respondents	Percent of the respondents	Rank
Traders (retailers and wholesalers)	74	29.84 %	1st
Mobile	48	19.35 %	2nd
Radio	38	15.32 %	3rd
Cooperatives	33	13.31 %	4th
Extension agents	16	6.45 %	5th
Television	4	1.61 %	
Experts in district office	2	0.81 %	
Model farmers	1	0.40 %	
Brokers	1	0.40 %	
Assemblers	1	0.40 %	
Others such as NGOs, family, etc	10	4.03 %	
No source of information	20	8.06 %	
Total	248	100.00 %	

Source: Survey result, 2018

Table 14: Cost of transportation, supply of *Teff* crops, price and revenue (n= 248)

Category of transportation costs	N	Mean and SD	Average *Teff* consumption in kg per year per household	Average *Teff* supply to the market in kg per year per household	Average price of *Teff* crops per kg	Average revenue generated from sale of *Teff* crops per year per household
No cost of transportation	128	Mean	258	686	19.45	14,263.66
		SD	155	586	6.04	12,482.65
Up to Birr 100.00	47	Mean	281	390	21.45	8,013.28
		SD	213	405	2.63	8,156.72
From Birr 100 up to Birr 200.00	37	Mean	329	935	20.42	19,367.59
		SD	228	452	1.89	10,540.41
Birr 200 and above	36	Mean	424	1644	20.92	34,545.56
		SD	228	568	2.14	12,878.28
Total	**248**	**Mean**	**297**	**806**	**20.19**	**16,784.73**
		SD	**198**	**654**	**4.68**	**14,039.58**

Source: Survey result, 2018

Table 15: Total annual revenue of households (n= 248)

Lists of revenue source	Number of respondents who have revenue from such sources		Average yearly revenue per household		SD	Minimum average revenue	Maximum average revenue
	Count	Percent	Amount	% from total			
Sale of crops	241	97.18	23,029.92	55.90	20,436.37	0.00	101,500.00
Sales of live animal	149	60.08	5,275.81	12.81	7,645.32	0.00	50,000.00
Sale of vegetables	91	36.69	4,271.77	10.37	9,739.83	0.00	86,000.00
Remittances	19	7.66	2,544.24	6.18	10,161.33	0.00	72,000.00
Daily wage	32	12.90	1,923.73	4.67	5,930.04	0.00	36,000.00
Salaries	17	6.85	1,634.37	3.97	7,207.26	0.00	60,000.00
Income from *Chat* selling	26	10.48	651.61	1.58	2,542.40	0.00	25,000.00
Beekeeping and honey production	13	5.24	586.69	1.42	4,479.34	0.00	55,200.00
Sales of animal products	54	21.77	401.69	0.98	1,639.41	0.00	20,000.00
Rental income and interest	4	1.61	241.94	0.59	2,495.18	0.00	36,000.00
Selling of local beverage	8	3.23	193.55	0.47	1,374.60	0.00	14,000.00
Grants	2	0.81	145.16	0.35	1,613.17	0.00	18,000.00
Selling of firewood and charcoal	12	4.84	135.45	0.33	1,318.45	0.00	20,000.00
Sales of fruits	6	2.42	92.06	0.22	790.27	0.00	10,000.00
Pensions	3	1.21	70.16	0.17	715.87	0.00	9,000.00
Total yearly revenue			**41,198.16**	**100.00**	**24,587.04**	**4000.00**	**101,500.00**

Source: Survey result, 2018

Table 16: Total annual revenue of households by source and district (n= 248)

Source of revenue	Annual revenue per district				Annual revenue for all districts	Percentage contribution to total revenue
	Halaba	Lomie	Shenkora na Minjar	Tahtai Maichew		
Sale of crops	20,546.77	41,619.29	26,580.65	3,372.96	92,119.67	55.90
Sale of live animals	4,955.65	6,344.39	6,327.42	3,475.81	21,103.26	12.81
Sale of vegetables	3,895.16	4,935.48	7,133.87	1,122.58	17,087.10	10.37
Remittance	4,612.84	0.00	387.10	5,177.03	10,176.97	6.18
Wage	1,604.90	96.77	0.00	5,993.23	7,694.90	4.67
Salary	2,047.74	541.94	764.52	3,183.29	6,537.48	3.97
Sale of *chat*	2,606.45	0.00	0.00	0.00	2,606.45	1.58
Sale of honey and wax	0.00	0.00	0.00	2,346.77	2,346.77	1.42
Sale of animal by products	254.84	381.29	169.35	801.29	1,606.77	0.98
Rental income	0.00	0.00	0.00	967.74	967.74	0.59
Sale of local beverage	0.00	0.00	193.55	580.65	774.19	0.47
Grants	0.00	0.00	0.00	580.65	580.65	0.35
Sale of wood and charcoal	0.00	80.52	0.00	461.29	541.81	0.33
Sale of fruits	8.06	258.06	102.10	0.00	368.23	0.22
Pension	0.00	145.16	106.45	29.03	280.65	0.17
Other revenue	0.00	0.00	0.00	0.00	0.00	0.00
Total revenue per year per district	**40,532.42**	**54,402.90**	**41,765.00**	**28,092.32**	**164,792.64**	**100.00**
Share of the revenue	**24.60**	**33.01**	**25.34**	**17.05**	**100.00**	

Source: Survey result, 2018

Table 17: Total annual average expenditure per households (n= 248)

Types of expenditure	Number of respondents		Average annual expenditure in Birr		SD	Minimum average expenditure	Maximum average expenditure
	Count	%	Amount	%			
Food consumption	248	100.00	13045.02	57.13	671. 03	200.00	4,000.00
Clothing	248	100.00	3,353.61	14.69	2,068.51	0.00	10,000.00
Cost of labour	157	63.31	2,005.69	8.78	3,209.48	0.00	25,000.00
Utilities	230	92.74	1507.27	6.60	129.69	0.00	600.00
Transport	224	90.32	627.98	2.75	710.81	0.00	5,000.00
Entertainment	140	56.45	595.93	2.61	889.11	0.00	4,000.00
Animal feeding	85	34.27	550.12	2.41	1,249.49	0.00	10,000.00
Education	100	40.32	269.19	1.18	613.35	0.00	6,000.00
Health	113	45.56	272.18	1.19	696.48	0.00	6,000.00
Payment to debts	19	7.66	259.63	1.14	1,120.90	0.00	10,000.00
Religious expense	129	52.02	236.89	1.04	610.61	0.00	6,000.00
House rent	4	1.61	59.03	0.26	41.82	0.00	500.00
Other expenses	1	0.40	36.29	0.16	57.15	0.00	900.00
Transfer to others	5	2.02	16.80	0.07	168.08	0.00	2,400.00
Total expense per household			**22,835.63**	**100**		**4,700.00**	**77,000.00**

Source: Survey result, 2018

Table 18: Total annual average expenditure of households by district (n= 248)

Types of expenditure per year	Name of district				Total expenditure for all districts	Share per type of expenditure
	Halaba	Lomie	Shenkora na Minjar	Tahtai Maichew		
Food expenditure	10,112.90	16,193.61	12,609.68	13,263.87	52,180.06	57.13 %
Clothing	2,974.19	4,477.42	3,243.55	2,719.27	13,414.43	14.69 %
Cost of labour	1,155.81	4,528.42	1,612.90	725.65	8,022.78	8.78 %
Utilities	1,728.39	1,275.48	1,935.48	1,089.74	6,029.09	6.60 %
Transport	592.74	953.06	516.94	449.19	2,511.93	2.75 %
Entertainment	511.29	843.87	725.48	303.06	2,383.70	2.61 %
Cost for animal feed	72.58	978.23	578.55	571.13	2,200.49	2.41 %
Health expenses	105.40	390.32	385.82	207.16	1,088.70	1.19 %
Cost of education	11.29	151.61	171.29	742.58	1,076.77	1.18 %
Debt payment	0.00	20.16	0.00	1,018.35	1,038.51	1.14 %
Religious expense	18.39	565.40	135.53	228.23	947.55	1.04 %
Rent expense	0.00	96.77	0.00	139.35	236.12	0.26 %
Other expense	0.00	0.00	0.00	145.16	145.16	0.16 %
Transfer to others	0.00	65.58	0.00	1.61	67.19	0.07 %
Total expense	**17,282.98**	**30,539.95**	**21,915.23**	**21,604.37**	**91,342.53**	**100 %**
Share per district	**18.92 %**	**33.43 %**	**23.99 %**	**23.65 %**	**100 %**	

Source: Survey result, 2018

Table 19: Details of cost of *Teff* production by cost components in 2010 E.C (n= 248)

Details of cost of *Teff* production	Minimum	Maximum	Mean	Std. Deviation	Total cost of *Teff* production for all respondents
Cost of fertilizer	0	7,140	2,023.43	1,432.56	501,811.50
Land fee /rent	0	20,000	1,901.32	4,298.43	471,527.00
Cost of labour	0	8,000	1,150.00	1,414.62	285,200.00
Cost of pesticide	0	9,600	400.39	831.21	99,295.50
Cost of seed	0	3,000	330.46	468.40	81,953.00
Hiring of oxen	0	3,000	58.87	316.10	14,600.00
Transportation cost	0	700	42.14	106.65	10,450.00
Cost of manure	0	600	23.39	106.55	5,800.00
Cost of energy	0	1,500	21.85	120.15	5,420.00
Cost of machinery renting	0	2,400	21.77	207.57	5,400.00
Cost of loading and unloading	0	180	1.81	14.69	450.00
Cost of storage	0	200	0.81	12.70	200.00
Cost of cleaning	0	0	0.00	0.00	0.00
Cost of bagging	0	0	0.00	0.00	0.00
Cost of renting	0	0	0.00	0.00	0.00
Other costs	0	0	0.00	0.00	0.00
Total cost of *Teff* production	**0**	**21,600**	**3,866.76**	**3,511.53**	**958,955.50**

Source: Survey result, 2018

Table 20: Details of cost of *Teff* production per household by district (n = 248)

Cost of *Teff* production in 2010 EC	Name of district				Total cost of *Teff* production for all districts
	Halaba	Lomie	Shenkora na Minjar	Tahtai Maichew	
Cost of fertilizer for *Teff* production	1468.77	3346.82	2094.73	1183.41	8093.73
Land fee for *Teff* production	161.29	4765.32	2656.85	21.81	7605.27
Labour cost for *Teff* production	711.61	2287.74	977.42	623.23	4600.00
Cost of pesticide for *Teff* production	256.98	1003.42	194.68	146.47	1601.54
Cost of seed for *Teff* production	483.82	507.46	140.23	190.31	1321.82
Hiring of oxen for *Teff* production	80.65	0.00	24.19	130.65	235.48
Transportation cost for *Teff* production	39.35	39.52	27.42	62.26	168.55
Cost of manure for *Teff* production	0.00	0.00	0.00	93.55	93.55
Cost of energy for *Teff* production	0.00	0.00	25.81	61.61	87.42
Cost of machinery renting for *Teff* production	16.13	0.00	70.97	0.00	87.10
Cost of loading and unloading for *Teff* production	0.00	0.00	2.90	4.35	7.26
Cost of storage for *Teff* production	0.00	0.00	0.00	3.23	3.23
Cost of cleaning for *Teff* production	0.00	0.00	0.00	0.00	0.00
Cost of bagging for *Teff* production	0.00	0.00	0.00	0.00	0.00
Cost of renting for *Teff* production	0.00	0.00	0.00	0.00	0.00
Other costs for *Teff* production	0.00	0.00	0.00	0.00	0.00
Total cost of *Teff* production per household by district	**3,265.90**	**6,177.65**	**3,502.60**	**2,520.87**	**15,467.02**
Share per district	**21.12%**	**39.94%**	**22.65%**	**16.29%**	**100%**

Source: Survey result, 2018

Table 21: Summary of Pearson Correlation for *Teff* production

Independent variables	Correlations	*Teff* production in kilograms per household
Sex of the respondent	Pearson Correlation	.170**
	Sig. (2-tailed)	.007
Age of the respondent	Pearson Correlation	.064
	Sig. (2-tailed)	.319
Family size of the respondents	Pearson Correlation	.077
	Sig. (2-tailed)	.225
The size of active labour force at household level	Pearson Correlation	.179**
	Sig. (2-tailed)	.005
Highest level of education that the head of the household has successfully completed	Pearson Correlation	-.195**
	Sig. (2-tailed)	.002
Quantity of oxen ownership per household	Pearson Correlation	.650**
	Sig. (2-tailed)	.000
Total available land for cultivation ha	Pearson Correlation	.530**
	Sig. (2-tailed)	.000
Teff cultivated land per household ha	Pearson Correlation	.834**
	Sig. (2-tailed)	.000
Perception of the respondent towards land fertility	Pearson Correlation	.561**
	Sig. (2-tailed)	.000
Adequacy of rain fall during 2010 EC	Pearson Correlation	.157*
	Sig. (2-tailed)	.013
Total cost for inputs	Pearson Correlation	.784**
	Sig. (2-tailed)	.000
Total labour cost	Pearson Correlation	.198**
	Sig. (2-tailed)	.002
Frequency of contact with extension workers	Pearson Correlation	.219**
	Sig. (2-tailed)	.001
Total training days attended	Pearson Correlation	-.051
	Sig. (2-tailed)	.423
Amount of loan allocated to *Teff*	Pearson Correlation	.062
	Sig. (2-tailed)	.329
Experience of membership in cooperatives in years	Pearson Correlation	.217**

	Sig. (2-tailed)	.001
Monetary value of livestock	Pearson Correlation	.663**
	Sig. (2-tailed)	.000
Monetary value of farm assets	Pearson Correlation	.224**
	Sig. (2-tailed)	.000
Total investment for utilities	Pearson Correlation	.249**
	Sig. (2-tailed)	.000
**. Correlation is significant at the 0.01 level (2-tailed).		
*. Correlation is significant at the 0.05 level (2-tailed).		

Source: Survey result, 2018

Table 22: Multicollinearity Variance Inflation Factor (VIF), linktest and Ramcey RETEST for *Teff* production

```
. estat vif
```

Variable	VIF	1/VIF
HALA	3.79	0.263524
LOM	3.48	0.287225
SM	3.38	0.296068
OWNEDLAND	2.05	0.486689
GENDER	2.00	0.499386
AGE	1.94	0.515768
MARITAL	1.92	0.521440
RENTEDLAND	1.67	0.597110
COOP	1.54	0.648720
FARMASSET	1.53	0.654363
UTILITY	1.48	0.677340
LABCOST	1.46	0.683402
LABOUR	1.44	0.696185
SCHOOL	1.43	0.698638
TRAIN	1.43	0.699604
SHARELAND	1.34	0.744759
RAI	1.34	0.747555
OX	1.26	0.793156
EXT	1.20	0.835396
TEFFLOAN	1.17	0.852912
INHERITEDL~D	1.12	0.891611
Mean VIF	1.81	

```
. linktest

      Source |       SS           df       MS      Number of obs   =       248
-------------+----------------------------------   F(2, 245)       =    247.89
       Model |  22282.1059         2  11141.0529   Prob > F        =    0.0000
    Residual |  11010.9808       245  44.9427789   R-squared       =    0.6693
-------------+----------------------------------   Adj R-squared   =    0.6666
       Total |  33293.0867       247  134.789825   Root MSE        =    6.7039

------------------------------------------------------------------------------
sqrt_Teff_~n |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        _hat |   .8864413   .2323093     3.82   0.000      .428863     1.34402
      _hatsq |   .0017883   .0035894     0.50   0.619    -.0052817    .0088583
       _cons |   1.641476   3.604576     0.46   0.649    -5.458436    8.741388
------------------------------------------------------------------------------

. estat ovtest

Ramsey RESET test using powers of the fitted values of sqrt_Teff_production
       Ho:  model has no omitted variables
                 F(3, 223) =      0.74
                  Prob > F =      0.5274
```

Source: Survey result, 2018

Table 23: Summary of Pearson correlation for the amount of *Teff* supplied to the market

Variables	Correlation	*Teff* supplied to the market in kg
Age	Pearson Correlation	.036
	Sig. (2-tailed)	.576
	N	248
Family size	Pearson Correlation	.110
	Sig. (2-tailed)	.083
	N	248
Education	Pearson Correlation	-.214**
	Sig. (2-tailed)	.001
	N	248
Market information	Pearson Correlation	.021
	Sig. (2-tailed)	.742
	N	248
Distance to the nearest major market	Pearson Correlation	-.003
	Sig. (2-tailed)	.965
	N	248
Total cost of transport	Pearson Correlation	.609**
	Sig. (2-tailed)	.000
	N	248
Price	Pearson Correlation	.168**
	Sig. (2-tailed)	.008
	N	248
Timing of sales	Pearson Correlation	.456**
	Sig. (2-tailed)	.000
	N	248
Membership in marketing cooperative	Pearson Correlation	-.129*
	Sig. (2-tailed)	.042
	N	248
Storage capacity	Pearson Correlation	.405**
	Sig. (2-tailed)	.000
	N	248
Teff production in kg	Pearson Correlation	.971**
	Sig. (2-tailed)	.000

	N	248
Role of the government	Pearson Correlation	.029
	Sig. (2-tailed)	.648
	N	248
**. Correlation is significant at the 0.01 level (2-tailed).		
*. Correlation is significant at the 0.05 level (2-tailed).		

Source: Survey result, 2018

Table 24: Results of multicollinearity Variance Inflation Factor (VIF) for *Teff* supply

Coefficients[a]		
Independent variables	**Collinearity Statistics**	
	Tolerance	**VIF**
Shenkora na Minjer (SM)	.438	2.281
Lomie (LOM)	.397	2.522
Halaba (Hala)	.398	2.513
Male (Gender)	.630	1.588
Age (Age)	.793	1.261
Family size (FAMI)	.758	1.319
Number of dependents (DEPEND)	.777	1.287
Not attending school (NOSCHO)	.769	1.300
Elementary school (ELEM)	.856	1.168
High School (HS)	.919	1.088
Teff consumption (TCONSU)	.358	2.796
Membership in marketing cooperatives (MARCOOP)	.602	1.660
Distance to Market (DIST)	.613	1.631
Travel time (TRATIME)	.762	1.312
Total cost of transport (TRANS)	.371	2.695
Average price of Teff crops per kg (PRICE)	.794	1.260
Market information (MINFO)	.869	1.151
Storage capacity (STOR)	.680	1.470
Selling time (SALETIME)	.619	1.616
Role of the government (GOV)	.917	1.090
Teff production (TPROD)	.202	4.944
a. Dependent Variable: sqrt of the amount of *Teff* supplied to the market (transformed)		

Source: Survey result, 2018

Table 25. Changes in Ethiopia's National Development Approaches - 1950 to present

Political ruling	**Monarchy**	***Derg* government**	**EPRDF**
Period	**1950-74**	**1974-91**	**1991 to present**
National development strategies	Industrial development through import substitution and industrialization	Centrally planned, industry-led development	Home-grown, agricultural-led, export-oriented development policies
Selected policies	● Land was mainly owned by the state and the church ● Establishment of large commercial farms producing coffee, as means of earning foreign currency ● Prioritized the development of non-agricultural industries	● Nationalization of land and other productive assets ● Collectivization of farms and promotion of villagization programs ● Mixed economic policies (1988-89). ● Distortion of markets through price controls and overvaluation of the Ethiopian birr	● Land remains state owned ● Changed national development priority to agricultural development ● Adoption of export-oriented open economy
Key rural development issues	● Food shortages ● Neglect of cereal production despite accounting for 80 % of the cultivated area	● Severe droughts and famine in 1983-84 and food insufficiency ● Civil conflicts	● Persistent food shortages ● Rise in rural population ● Environmental degradation and climate change-related shocks

Source: Welteji (2018) and Alemu *et al* (2002)

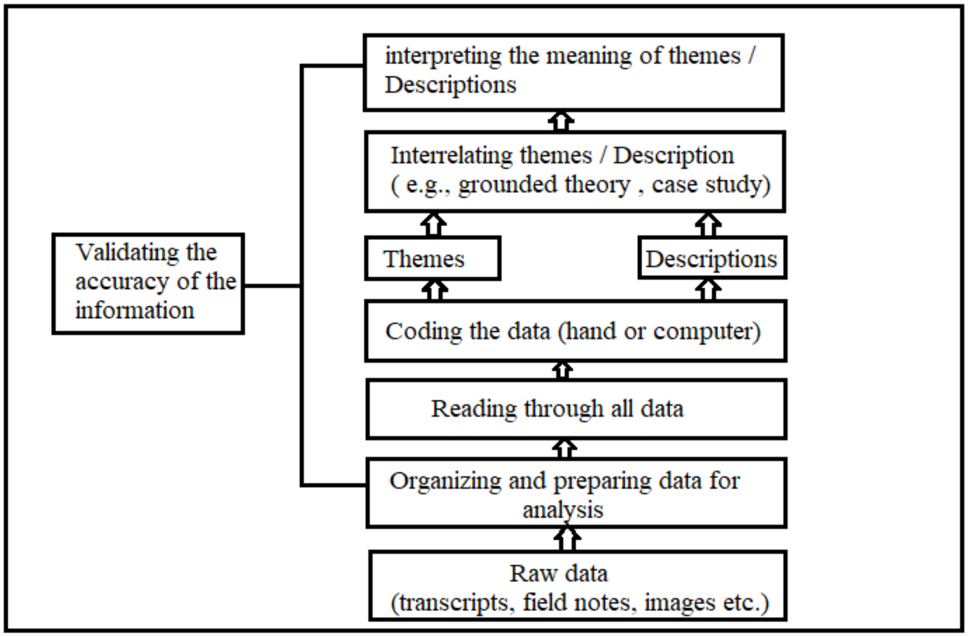
Table 26: Component of analysis

Objective	Questions analysed
Describe the socio-demographic characteristics of *Teff* producers and features of *Teff* production in rural Ethiopia	• How did *Teff* come to be grown in this community? • How long has it been grown in this community? • When and how *Teff* is produced? • Which is the most common type of *Teff* crop grown in your area and why? (Manga *Teff*, White *Teff*, Red *Teff*, Mixed *Teff)* • Who are involved in *Teff* production in your locality and why? • What is the role of women in ploughing (land preparation), planting, weeding, harvesting, threshing and processing *Teff* before it is used by the household or sold? • What is the role of men in ploughing (land preparation), planting, weeding, harvesting, threshing and processing *Teff* before it is used by the household or sold?
Examine the explanatory variables that affect *Teff* productivity differentials across a group of farmers in the study areas.	• How do you evaluate the suitability of the land for *Teff* production? • How do you evaluate the suitability of the weather for *Teff* production? • What is your opinion with regard to the availability and adequacy of the following services for *Teff* producers in your area: Access to land, Access to labour force, Availability of farm inputs (such as manure, fertilizer, seed, pesticide, etc), Extension services, Credit services and Training services? • To what extent are the existing agricultural policies supportive for *Teff* production? • What are the major problems of *Teff* production in your area? • What possible solution do you suggest addressing the *Teff* production problems?
Identify the explanatory variables that affect *Teff* distribution differentials across a group of farmers in the study areas.	• Which are the most common markets for selling *Teff*? • What are the major *Teff* marketing channels for farmers in your region? • Who are the main buyers of *Teff* produced in this area? • How do farmers transport their *Teff* crops to market? • What seems the availability of market infrastructure (such as transport facilities, storage facilitates, scales, etc) in your area? • Who are the main actors of *Teff* value chain at your locality and would you please identify their respective roles?

	• What is the source of market information for farmers and how they get it? • In your opinion, do you think that the existing business policies and laws on *Teff* marketing and distribution are supportive for improving the livelihoods of farmers? • How is price determined in the market for *Teff* crops? • What is the role of the government in *Teff* marketing? • What type of constraints do you foresee in *Teff* distribution? • What type of support do *Teff* producers need to enhance their participation in *Teff* marketing?
Assess the effect of local and global *Teff* production and distribution to the livelihood of smallholder farmers.	• What is the primary purpose of *Teff* production in your area? • What are the different uses of *Teff* in this community? • What is the importance of *Teff* to the cultural and social life of the people in this area? • How has the economic importance of *Teff* changed over the last 5 years? • Is all the *Teff* grown by households sold or used within the household? Give details. (Consumption, marketing, both consumption and marketing) • What are your recommendations in relation to creating sustainable livelihood through the promotion of *Teff* production and distribution? • Are there *Teff* exporters in your region or *Woreda*? • Do you think that farmers can benefit from selling *Teff* crops to international market? If yes, would you please describe the benefits? • What do you think the positive effect of *Teff* export? • What do you think the negative effect of *Teff* export? • What can be done to encourage farmers to be participating in exporting *Teff*?

Source: Own compilation, 2018

Figure 1: Framework for qualitative data analysis



Source: Creswell, 2009

APPENDIX 2: CONSENT FORMS

A. Consent form for FGD participants

Who we are

Hello, I am ________________________ working for Mr. Nahusenay Teamer Gebrehiwot, a student of the University of South Africa (UNISA).

What we are doing

We are conducting a survey in partial fulfilment for the award of Doctor of Literature and Philosophy in Development Studies with research title "*Teff* Production and Distribution: Implications for Rural Livelihoods in Ethiopia". The proposed study aims to collect data on the factors affecting *Teff* production and distribution among smallholder farmers in four regions (Oromia, Amhara, SNNPR and Tigrai) of Ethiopia. In so doing, the baseline data collected should in future be useful in improving the livelihood of *Teff* producers. We are conducting a study to be able describe the socioeconomic characteristics of *Teff* producers, identify factors affecting *Teff* production, explore how smallholder farming households participate in *Teff* marketing and identify factors affecting their performance and investigate how global demand is affecting production and distribution of *Teff*.

Your participation

We are asking for your permission to conduct one focus group discussion (FGD) with you about your knowledge and opinions about *Teff* production and distribution. A focus group is "a discussion with a group of participants. These allow researchers to examine people's different perspectives as they operate within a social network and they permit the exploration of how the articulation of accounts is influenced by group norms". The people participating in the focus group are those who live in this research area, who are above 18 years old and are able to explain their experiences in *Teff* production and distribution. You have been approached to participate because you're over 18 years and you can be able to discuss the issues about *Teff* production and distribution. If you agree, we will ask you to 'participate in the focus group' for approximately one hour.

Please understand that your participation is voluntary and you are not being forced to take part in this study. The choice of whether to participate or not, is yours alone. If you choose not to take part, you will not be affected in any way. If you agree to participate, you may stop participating in the research at anytime and tell me that you don't want to continue. If you do this, there will be no penalties and you will not be prejudiced in any way.

Confidentiality

All identifying information will be kept in a locked storage space and will not be available to others. It will be kept confidential to the extent possible by law. The records from your participation may be reviewed by people responsible for making sure that research is done properly, including members of the ethics committee of UNISA and supervisor of the student. (All of these people are required to keep your identity confidential.) Otherwise, records that identify you will be available only to people working on the study, unless you give permission for other people to see the records. We are asking you to give us permission to tape-record the discussion so that we can accurately record what is said.

Your answers will be stored electronically in a secure environment and used for research or academic purposes now or at a later date in ways that will not reveal who you are. All future use of the stored data will be subject to further Research Ethics Committee review and approval. We will not record your name anywhere and no one will be able to connect you to the answers you give in the discussion. Your answers will be linked to a fictitious code number or a pseudonym (another name) and we will refer to you in this way in the data, any publication, report or other research output like policy briefs.

Please note that in a focus group there are limits to confidentiality. You need to be aware that although confidentiality will be encouraged in group discussions it cannot be guaranteed. You need to understand that 1) Although the researcher will adhere to confidentiality and ensure anonymity of the data and reports, he cannot guarantee that other participants will regard the information as confidential, but will be urged to do so, and 2) participants are thus advised not to disclose sensitive personal information in FGDs.

Risks/discomforts

At the present time, we do not see any risk or harm from your participation. The risks associated with participation in this study are no greater than those encountered in daily life. These include providing your demographic data and others such as age, education, access to land, *Teff* production, extension services, marketing of *Teff* crops, infrastructure and transport facilities among others.

Benefits

There are no immediate benefits to you from participating in this study. However, this study will be extremely helpful to us in that we hope will promote understanding on *Teff* production and distribution and its implications for rural livelihoods in Ethiopia. If you would like to receive feedback on our study, we will record your phone number on a separate sheet of paper and can send you the results of the study when it is completed sometime after 31st of December 2018.

Who to contact if you have been harmed or have any concerns

This research has been approved by the UNISA Research Ethics Committee (REC). If you have any complaints about ethical aspects of the research or feel that you have been harmed in any way by participating in this study, please call the UNISA learning centre in Ethiopia (0114-352089 or 0114-352093). You may also contact the PhD student if you have any concern or queries on telephone number: +251 (0)914722266, or email: nahusenay.teamer@mu.edu.et or 61195294@mylifeunisa.ac.za. If you have concerns or questions about the research, you may call or contact the supervisor of the PhD student at the following address:

Full name: Dr. Catherine Ndinda

Phone: +27 12-302-2505

Email: cndinda@hsrc.ac.za

CONSENT

I hereby agree to participate in PhD studies with the research title "*Teff* Production and Distribution: Implications for Rural Livelihoods in Ethiopia". I understand that I am participating freely and without being forced in any way to do so. I also understand that I can stop participating at any point should I not want to continue and that this decision will not in any way affect me negatively. I understand that this is a research project whose purpose is not necessarily to benefit me personally in the immediate or short term. I understand that my participation will remain confidential.

……………………………..	**……………………………..**
Signature of participant	**Signature of researcher**
Date:…………………..	**Date: …………………………..**
Witness:…………………..	**Witness………………………….**
Date……………………..	**Date………………………………..**

CONSENT FOR TAPE RECORDING

I hereby agree to the tape-recording of my participation in the study.

……………………………..

Signature of participant **Date**:…………………..

I understand that the information that I provide will be stored electronically and will be used for research purposes now or at a later stage.

……………………………..

Signature of participant **Date**:…………………..

B. Consent form for key informant

Who we are

Hello, I am **________________________** working for Mr. Nahusenay Teamer Gebrehiwot, a student of the University of South Africa (UNISA).

What we are doing

We are conducting a survey in partial fulfilment for the award of Doctor of Literature and Philosophy in Development Studies with the research title "*Teff* Production and Distribution: Implications for Rural Livelihoods in Ethiopia". The proposed study aims to collect data on the factors affecting *Teff* production and distribution among smallholder farmers in four regions (Oromia, Amhara, SNNPR and Tigrai) of Ethiopia. In so doing, the baseline data collected should in future be useful in improving the livelihood of *Teff* producers. We are conducting a study to be able to describe the socioeconomic characteristics of *Teff* producers, identify factors affecting *Teff* production, explore how smallholder farming households participate in *Teff* marketing and identify factors affecting their performance and investigate how global demand is affecting production and distribution of *Teff*.

Your participation

We are asking you whether you will allow us to conduct one interview with you about your knowledge and opinions on *Teff* production and distribution. If you agree, we will ask you to 'participate in one interview' for approximately one hour.

Please understand that **your participation is voluntary** and you are not being forced to take part in this study. The choice of whether to participate or not, is yours alone. If you choose not to take part, you will not be affected in any way whatsoever. If you agree to participate, you may stop participating in the research at anytime and tell me that you don't want to continue. If you do this, there will be no penalties and you will not be prejudiced in any way.

Confidentiality

All identifying information will be kept in a locked storage space and will not be available to others and will be kept confidential to the extent possible by law. The records from your participation may be reviewed by people responsible for making sure that research is done properly, including members of the ethics committee at UNISA and my supervisor. (All of these people are required to keep your identity confidential.) Otherwise, records that identify you will be available only to people working on the study, unless you give permission for other people to see the records.

We are asking you to give us permission to tape-record the interview so that we can accurately record what is said in our discussion

Your answers will be stored electronically in a secure environment and used for research or academic purposes now or at a later date in ways that will not reveal who you are. All future use of the stored data will be subject to further Research Ethics Committee review and approval.

We will not record your name anywhere and no one will be able to connect you to the answers you givein this interview. Your answers will be linked to a fictitious code number or a pseudonym (another name) and we will refer to you in this way in the data, any publication, report or other research output like policy briefs.

Risks/Discomfort

At the present time, we do not see any risk of harm from your participation. The risks associated with participation in this study are no greater than those encountered in daily life. These include providing your demographic data and others such as age, education, access to land, *Teff* production, extension services, marketing of *Teff* crops, infrastructure and transport facilities among others.

Benefits

There are no immediate benefits to you from participating in this study. However, this study will be extremely helpful to us in that we hope will promote understanding on *Teff* production and distribution and its implications for rural livelihoods in Ethiopia.

If you would like to receive feedback on our study, we will record your phone number on a separate sheet of paper and can send you the results of the study when it is completed sometime after 31st of December 2018.

Who to contact if you have been harmed or have any concerns

This research has been approved by the UNISA Research Ethics Committee (REC). If you have any complaints about ethical aspects of the research or feel that you have been harmed in any way by participating in this study, please call the UNISA learning centre in Ethiopia (0114-352089 or 0114-352093). You may also contact the PhD student if you have any concern or queries on telephone number: +251 (0)914-722266, or email: nahusenay.teamer@mu.edu.etor 61195294@mylifeunisa.ac.za

If you have concerns or questions about the research, you may call or contact the supervisor of the PhD student at the following address:

Full name: Dr Catherine Ndinda

Phone: +27 12-302-2505

Email: cndinda@hsrc.ac.za

CONSENT

I hereby agree to participate in PhD studies with the research title "*Teff* Production and Distribution: Implications for Rural Livelihoods in Ethiopia". I understand that I am participating freely and without being forced in any way to do so. I also understand that I can stop participating at any point should I not want to continue and that this decision will not in any way affect me negatively. I understand that this is a research project whose purpose is not necessarily to benefit me personally in the immediate or short term. I understand that my participation will remain confidential.

……………………………..

Signature of participant **Date**:………………..

CONSENT FOR TAPE RECORDING

I hereby agree to the tape-recording of my participation in the study.

……………………………..	**……………………………………**
Signature of participant	**Signature of researcher**
Date:………………….	**Date:………………….**
Witness:…………………..	**Witness…………………………**
Date………………………	**Date……………………………….**

I understand that the information that I provide will be stored electronically and will be used for research purposes now or at a later stage.

……………………………..

Signature of participant **Date**:…………………..

C. Consent form for survey respondents

Who we are

Hello, I am ________________________ working for Mr. Nahusenay Teamer Gebrehiwot, a student of the University of South Africa (UNISA).

What we are doing

We are conducting a survey in partial fulfilment for the award of Doctor of Literature and Philosophy in Development Studies with research title "*Teff* Production and Distribution: Implications for Rural Livelihoods in Ethiopia". The proposed study aims to collect data on the factors affecting *Teff* production and distribution among smallholder farmers in four regions (Oromia, Amhara, SNNPR and Tigrai) of Ethiopia. In so doing, the baseline data collected should in future be useful in improving the livelihood of *Teff* producers.

We are conducting a study to be able describe the socioeconomic characteristics of *Teff* producers, identify factors affecting *Teff* production, explore how smallholder farming households participate in *Teff* marketing and identify factors affecting their performance and investigate how global demand is affecting production and distribution of *Teff*.

Your participation

We are asking you whether you will allow us to complete a questionnaire that asks about *Teff* production and distribution. If you agree, we will ask you to complete this questionnaire for approximately two hours.

Please understand that **your participation is voluntary,** and you are not being forced to take part in this study. The choice of whether to participate or not, is yours alone. If you choose not to take part, you will not be affected in any way whatsoever. If you agree to participate, you may stop participating in the research at any time and tell me that you don't want to continue. If you do this, there will be no penalties and you will not be prejudiced in any way.

Confidentiality

All identifying information will be kept in a locked storage space and will not be available to others and will be kept confidential to the extent possible by law. The records from your participation may be reviewed by people responsible for making sure that research is done properly, including members of the ethics committee at the UNISA and supervisor. (All of these people are required to keep your identity confidential.) Otherwise, records that identify you will be available only to people working on the study, unless you give permission for other people to see the records.

Your answers will be stored electronically in a secure environment and used for research or academic purposes now or at a later date in ways that will not reveal who you are. All future use of the stored data will be subject to further Research Ethics Committee review and approval.

We will not record your name anywhere and no one will be able to connect you to the answers you give in the questionnaire. Your answers will be linked to a fictitious code number, or a pseudonym (another name) and we will refer to you in this way in the data, any publication, report or other research output like policy briefs.

Risks/discomforts

At the present time, we do not see any risk of harm from your participation. The risks associated with participation in this study are no greater than those encountered in daily life. These include providing your demographic data and others such as age, education, access to land, *Teff* production, extension services, marketing of *Teff* crops, infrastructure, and transport facilities among others.

Benefits

There are no immediate benefits to you from participating in this study. However, this study will be extremely helpful to us in that we hope will promote understanding on *Teff* production and distribution and its implications for rural livelihoods in Ethiopia.

If you would like to receive feedback on our study, we will record your phone number on a separate sheet of paper and can send you the results of the study when it is completed sometime after31st of December 2018.

Who to contact if you have been harmed or have any concerns

This research has been approved by the UNISA Research Ethics Committee (REC). If you have any complaints about ethical aspects of the research or feel that you have been harmed in any way by participating in this study, please call the UNISA learning centre in Ethiopia (0114-352089 or 0114-352093). You may also contact the PhD student if you have any concern or queries on telephone number: +251 (0)914722266, or email: nahusenay.teamer@mu.edu.et or 61195294@mylifeunisa.ac.za

If you have concerns or questions about the research, you may call or contact the supervisor of the PhD student at the following address:

Full name: Dr Catherine Ndinda

Phone: +27 12-302-2505

Email: cndinda@hsrc.ac.za

CONSENT

I hereby agree to participate in PhD studies with the research title "*Teff* Production and Distribution: Implications for Rural Livelihoods in Ethiopia". I understand that I am participating freely and without being forced in any way to do so. I also understand that I can stop participating at any point should I not want to continue and that this decision will not in any way affect me negatively. I understand that this is a research project whose purpose is not necessarily to benefit me personally in the immediate or short term. I understand that my participation will remain confidential.

……………………………..	**……………………………………**
Signature of participant	**Signature of researcher**
Date:…………………..	**Date:…………………..**
Witness:…………………..	**Witness………………………….**
Date……………………..	**Date………………………………..**

I understand that the information that I provide will be stored electronically and will be used for research purposes now or at a later stage.

……………………………..

Signature of participant **Date**:…………………..

APPENDIX 3: INFORMATION SHEET FOR FGD AND KEY INFORMANT INTERVIEW

Part One: Describe the socio-demographic characteristics of *Teff* producers and features of *Teff* production in rural Ethiopia

1. What is the history of *Teff* production in this region?
   a. How did *Teff* come to be grown in this community?
   b. How long has it been grown in this community?
2. Who are involved in *Teff* production in your locality?
3. What factors influence to produce *Teff* crops as compared to other crops?
4. When and how *Teff* is produced?
5. Which is the most common type of *Teff* crop grown in your area and why? (Manga *Teff*, White *Teff*, Red *Teff*, Mixed *Teff)*
6. Gender roles
   a. What is the role of men in ploughing (land preparation), planting, weeding, harvesting, threshing and processing *Teff* before it is used by the household or sold?
   b. What is the role of women in ploughing (land preparation), planting, weeding, harvesting, threshing and processing *Teff* before it is used by the household or sold?

Part Two: Examine the explanatory variables that affect *Teff* productivity differentials across a group of farmers in the study areas.

1. How do you evaluate the suitability of the land for *Teff* production?
2. How do you evaluate the suitability of the weather for *Teff* production?
3. What seems the methods of farming for *Teff* production in your area? (rain-fed, irrigation, both rain-fed and irrigation)
4. What is your opinion in relation to the availability and adequacy of the following services for *Teff* production in your area?
   a. Access to land
   b. Access to labour force
   c. Availability of farm inputs (manure, fertilizer, *Teff* seed, pesticide, etc)
   d. Extension services

e. Credit services
f. Training services

5. To what extent you are satisfied with the support from the government in the areas of extension work, provision of agricultural input, access to market information, access to credit, trade policy, infrastructure, etc? Give details.
6. What are the major problems of *Teff* productions in your area?
7. What possible solution do you suggest to address the *Teff* production problems?

Part Three: Identify the explanatory variables that affect *Teff* distribution differentials across a group of farmers in the study areas.

1. Which are the most common markets for selling *Teff* and why? (at farm level, *Kebele* market, Woreda market, Zone market, Regional market or Addis Ababa)
2. Who are the main buyers of *Teff* produced in this area?
3. Which market channel is mostly used by farmers in selling their *Teff* crops and why?
4. Who are the main actors in *Teff* marketing in your area and what are their roles?
   a. What is the role of brokers in *Teff* marketing?
   b. What is the role of cooperatives in *Teff* marketing?
5. How do farmers transport their *Teff* crops to market?
6. What seems the availability of market infrastructure (such as transport facilities, storage facilitates, scales, etc) in your area?
7. What is the source of market information for farmers and how they get it?
8. How is price determined in the market for *Teff* crops?
   a. Do you think that *Teff* producers are getting fair price for their produce in markets? If not why?
   b. What is the role of the government in *Teff* marketing?
9. To what extent are cooperatives in this area involved in marketing *Teff* crops? Give details.
10. What are the major problems in *Teff* marketing?
11. What are the possible solutions to solve *Teff* marketing related problems?

Part Four: Assess the effect of local and global *Teff* production and distribution to the livelihood of smallholder farmers.

1. What are the different uses of *Teff* in this community? Give details.
2. What is the importance of *Teff* to the cultural and social life of the people in your area?
3. Changes in the importance of *Teff:*
   a. How has the cultural importance of *Teff* changed over the last 5 years?
   b. How has the economic importance changed over the last 5 years?
4. Purpose of growing *Teff:*
   a. What is the primary purpose of *Teff* production in your area?
   b. Is all the *Teff* grown by households sold or used within the household? Give details. (consumption, marketing, both consumption and marketing)
5. What are your recommendations in relation to creating sustainable livelihood through the promotion of *Teff* production and distribution?
6. To what extent are *Teff* producers aware of the global demand for the crop?
7. How do *Teff* producers get information about the demand for *Teff* crops in global market?
8. Are there *Teff* exporters in this area? If yes, who are they? Give details.
9. Selling *Teff* in global markets:
   a. Do you think that farmers get benefits from selling *Teff* crops to international market? Give details.
   b. What are the negative and positive effects of this community (and others) in exporting *Teff*?
10. What can be done to encourage farmers to be participating in exporting *Teff*?
11. What are the solutions to the challenges faced in *Teff* production and distribution?

Thank you in advance for your time and initiative in providing information!!!

APPENDIX 4: HOUSEHOLD QUESTIONNAIRE

1. General Information

Questionnaire number | | | |

1.1. Information on the enumerator and supervisor

1.1.1. Enumerator's name: ________________________________
1.1.2. Enumeration date (in E.C): ________/_________/________
1.1.3. Time interview started: ______________________________
1.1.4. Time interview completed: _________________________
1.1.5. Supervisor's name: ________________________________
1.1.6 Supervisor signature: ______________________________

NB: HOUSEHOLD MEMBERSHIP CRITERIA

A household is a group of persons related or not, living under the same roof, **under the responsibility of a head whose authority is acknowledged by all the members**. The ordinary household is composed of a head of household, his spouse(s), his unmarried children, and **possibly** his relatives or other persons **to whom he is unrelated**.

1.2. Information on the respondent

1.2.1. Sex of the respondent:
1= Female
2= Male

1.2.2. Marital status of the respondent:
1= Married (Civil marriage)
2= Married (Custom/traditional /church marriage)
3= Living together (not married)
4= Widow/Widower
5= Divorced or Separated
6= Single/Never Married

1.2.3. Religion of the respondent:
1= Orthodox Tewahido
2= Catholic
3= Protestant
4= Muslim
5= Other (specify)_____________

1.2.4. Regional state of the respondent:
1= Tigrai regional state
2= Amhara regional state
3= Oromia regional state
4= SNNP regional state

1.2.4. Zone: _________________
1.2.5. District (Woreda): _________
1.2.6. *Kebele* (*Tabia*):___________

1.2.7. What are the THREE MAJOR occupations (means of livelihood) for living based on their income and contribution to the livelihood to the household?

1= Farming with rainfed
2= Basically farming with rain fedbut supplemented with irrigation
3= Farming with irrigation
4= Animal husbandry
5= Employed (public or private)
6 = Skilled labour (masonery, plasterer, etc)
7= Unskilled labour
8= Petty trading
9= Local beverage
10= Weaving or blacksmithing
11= Selling of firewood and charcoal
12= No occupation
99= Others (specify)________________

1st_____________ 2nd ____________ 3rd ___________

2. Demographic characteristics of the household								
S.N	**2.1. Name of members of the household** **N.B. <u>Write down first name of each member of the household, start the list with the head of the household and then from oldest to youngest.</u>**	**2.2. What is the sex of [NAME] ?** 1=Female 2=Male	**2.3. What is the age of [NAME] (in number of years)?**	**2.4. Can [NAME] read and write?** 1 = Cannot read and write 2= Read only 3= Read and write	**2.5. Have [NAME] ever attended or is attending school?** 0= No 1= Yes 99= I don't know	**2.6. What is the <u>HIGHEST</u> level of education that [NAME] has successfully completed?** 00 = No Schooling 01 = Grade 1 complete 02 = Grade 2 complete 03 = Grade 3 complete 04 = Grade 4 complete 05 = Grade 5 complete 06 = Grade 6 complete 07 = Grade 7 complete 08 = Grade 8 complete 09 = Grade 9 complete 10 = Grade 10 complete 11 = Grade 11 complete 12 = Grade 12 complete 13 = 12+ 1 complete 14 = 12+ 2 or (10+3) /Diploma 15 = 12+3 (Advanced diploma) 16 = BA/BSc degree complete 17 = Postgraduate complete 18= I don't know 99 = Other (Specify)	**2.7. Relationship to the head of the household** 1 = Head/acting head of the household 2 = Wife or husband or partner 3 = Son/daughter/stepchild /adopted child 4 = Father/mother/step mother/step father 5 = Brother/sister/step brother/step sister 6 = Grandchild/great grandchild 7 = Grandparent/great grandparent 8 = Mother-or father-in-law 9 = Son-or daughter-in-law 10 =Brother-or sister-in-law 11 = Other relative (specify) 12 = No-relation (specify)	**2.8. Member's <u>main activity</u> (Choose one from the options for each member of the household)** 1= Farm work 2= Housewife (Child care) 3= Off farm work 4= Professional (employed) 5= Student 6= Too old/ too young to work 7= Disabled (Handicapped) 99= Others (specify)____
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								

Source of income	2.9. What is the average monthly/ annual income for this household by source of income in 2010 E.C (2017/18)? N.B. ***<u>Please consider the income of all household members and any income which may be received by the household as a whole.</u>***	Category of expenditure	2.10. In total, how much did the household on average spend on the following categories in a given month/ year in 2010 E.C. (2017/18)? N.B. ***<u>Please consider the expenses of all household members and any expense which may be paid by the household as a whole.</u>***
1. Salaries per month		1. Food consumption per month	
2. Daily wage (for skilled and unskilled) per month		2. Clothing per year	
3. Income from sale of crops per year		3. Transport per year	
4. Income from sale of vegetables per year		4. Education (school fees) per year	
5. Income from sales of fruits per year		5. Health related costs per year	
6. Income from sales of live animal such as oxen,cows, goat, sheep, hen, etc per year		6. Cost of hiring of labourers per year	
7. Income from sales of animal products such as milk, egg, meat, skin, etc per year		7. Costs for household utilities (such as water, electricity and telephone) per month	
8. Income from selling of local beverage per year		8. Costs for animal feeding per year	
9. Income from selling of firewood and charcoal per year		9. Costs for entertainment and alcohol consumption per year	
10. Pensions per month		10. Religious or cultural expenses per year	
11. Grants per month		11. Transfers to other households per year	
12. Remittances (money received from people living elsewhere) per month		12. Debts per year	
13. Rental income and interest per month		13. Renting house per month, if any	
14. Beekeeping and honey production income per year		99. Other expenses (specify)____________	
15. Income from *Chat* selling per year			
99. Other income (specify)______________			

3. Livestock ownership

Types of livestock	3.1. Does your household currently own any livestock from the list? 0= No 1= Yes	3.2. If your answer to question 3.1. is YES, what is the quantity of livestock owned by your household?	3.3. If someone wants to buy a similar livestock, how much would s/he have to pay for one livestock [in Birr]?
1. Oxen			
2. Cows			
3. Heifers			
4. Calves			
5. Chicken			
6. Sheep			
7. Goats			
8. Horses			
9. Camels			
10. Donkey			
99. Others ________			

4. Asset ownership

Types of agricultural equipment	4.1. Does your household currently own any working (functional) agricultural equipment from the list of items? 0= No 1= Yes	4.2. If your answer to question 4.1. is YES , what is the quantity of agricultural equipment owned by your household?	4.3. If someone wants to buy similar agricultural equipment, how much would s/he have to pay for one item [in Birr]?
1. Tractor			
2. Generator			
3. Treadle pump			
4. Plowing set (*Maresha*)			
5. Hoe (*Mekoferia*)			
6. Sickle (*Machid*)			
7. Axe (*Metrebia, Gojemo*)			
8. Hammer (*Medosha*)			
9. Saw (*Megaz*)			
99. Others (specify) ______________			

5. Oxen ownership

5.1. Do your household have oxen for cultivation of your agricultural fields? 0= No 1= Yes	**5.2. If your answer to question 5.1. is YES, do you think that they are enough for cultivation of your agricultural fields?** 0= No 1= Yes	**5.3. If your answer to question number 5.2. is NO (you face shortage of oxen for farming) in 2010 E.C (2017/18), how did you overcome it?** **(Multiple response is possible)** 1= Hiring 2= Borrowing 3= Exchange arrangement 99= Other(specify)____________	**5.4. If you are hiring oxen, what was the renting price per day in 2010E.C (2017/18) harvesting period?**	**5.5. If oxen were hired, how do you evaluate the cost of renting?** **(Choose one from the options)** 1= Cheap 2= Fair 3= Expensive	**5.6. If oxen were hired, what was the total cultivated area in *Tsimad*?**

6. Land ownership

Ownership type	**6.1. What is the size of land in *Tsimad?*** (NB: One *tsimad*= 0.25 ha)	**6.2. Perception of the respondent towards land fertility** 1= Low land fertility 2= Average land fertility 3= High land fertility	**6.3. How do you cultivate your land in <u>MOST CASES</u>?** **(Multiple response is possible)** 1= Hand 2= Animal drawn 3= Tractor 99= Others	**6.4. What are the major problems in accessing the land? (Multiple response is possible)** 1= Small size of land 2= Poor soil fertility 3= High cost of renting 4= No timely redistribution of land 99= Others (specify)
1. Owned				
2. Rented				
3. Share cropped				
4. Inherited				
5. Obtained for free				

7. Access to Infrastructure

Type of infrastructure	7.1. Do you have access to such services? 0= No 1= Yes	7.2. If your answer to question 7.1. is YES, what is the total initial cost (investment) in Birr to get the services?	7.3. What is your monthly average expenditure in Birr per service?	7.4. How do you feel the reliability of the service? 1= Very poor 2= Poor 3= Neither poor nor good 4= Good 5= Very good
1. Potable water				
2. Electricity				
3. Fixed telephone line				
4. Mobile				
5. Internet				

8. Availability of labour force

8.1. Do you have adequate labour force for farming in 2010E.C (2017/18) harvesting period? 0= No 1= Yes	8.2. If your answer to question 8.1. is NO (you face shortage of labour) in 2010E.C (2017/18) harvesting period for agricultural activities, how do you often overcome it? (Multiple response is possible) 1= I hired daily labourers from market 2= I used female labourers of my family 3= I used children labour of my family 4= I used traditional labour pooling system (such as Wefera, Debo, Jigi, etc) 99= Others (specify)	8.3. If you were hiring labourers, what was the average wage (price) per day per person in 2010E.C (2017/18)?	8.4. If labourers were hired, how do you evaluate the cost of hiring? 1= Cheap 2= Fair 3= Expensive 99= I don't know	8.5. Are there users of modern mechanization (use of tractor and combine harvester) in your area? 1= No 2= Yes 99= I don't know	8.6. What are the limiting factors for using modern mechanization (use of tractor, combine harvester, etc) in your area? (Multiple response is possible) 1= High costs of renting machines 2= Small plot size (fragmented) 3= Inconvenient nature of the land 4= The machines are not available in our area 99= Others (specify)

9. *Teff* production

9.1. Are you producing *Teff* crops in general? 0= No 1= Yes	**9.2. If your answer to question number 9.1. is YES, for how many years you have been producing it?**	**9.3. If your answer to question number 9.1. is YES, what type of production system are you using? (Choose one from the options)** 1= Farming with rainfed 2= Basically farming with rain fed but supplemented with irrigation 3= Farming with irrigation	**9.4 If your answer to question number 9.1. is YES, are you producing *Teff* for household consumption or for selling (commercial) purpose or both?** **(Choose one from the options)** 1= Household consumption only 2= Selling (commercial) only 3= Both for household consumption and selling (commercial)	**9.5. If you are producing *Teff* for selling (commercial) purpose, for how long you have been involved in such business?** **(Choose one from the options)** 1= Less than 2 years 2= From 2 up to 4 years 3= From 4 up to 6 years 4= From 6 up to 8 years 5= From 8 up to 10 years 6= Above 10 years	**9.6. Is this production of *Teff* sufficient for your household for a year?** **(Choose one from the options)** 1= Not Sufficient 2= Sufficient 3= Surpluses 99= I don't know	**9.7 Have you suffered from shortage of *Teff* crops for eating?** 0= No 1= Yes	**9.8. If your answer to question 9.7. is YES (you suffer from shortage of *Teff* crops for eating), for how many months did you face problems of fulfilling the *Teff* needs of the household?** **(Choose one from the options)** 1= Less than 2 months 2= From 2 up to 4 months 3= From 4 up to 6 months 4= From 6 up to 8 months 5= From 8 up to 10 months 6= Above 10 months

9.9. What percentage of your total land was allocated for *Teff* production in 2010 E.C (2017/18) year? (Choose one from the options) 1= Up to 20 percent 2= From 20 up to 40 percent 3= From 40 up to 60 percent 4= From 60 up to 80 percent 5= 80 percent and above	**9.10. How often did you cultivate *Teff* crops from your land in 2010 E.C (2017/18) year? (Choose one from the options)** 1= Once in a year 2= Twice in a year 3= Three times a year	**9.11. Did you get enough rain in 2010 E.C (2017/18) year?** 0= No 1= Yes	**Parcels of land used for *Teff* production in 2010 E.C (2017/18) harvest period**	**9.12. What is the size of the area (land) in *Tsimad?***	**9.13. What is the ownership of the land? (Choose one from the options)** 1= Owned 2= Rented 3= Share cropped 4= Inherited 5= Obtained for free	**9.14. If owned, is there certificate of ownership for this parcel of land?** 0= No 1= Yes	**9.15. If rented, what is the renting price in Birr per *Tismad* per harvest period?**	**9.16. What are the types of *Teff* crops cultivated in the parcel of land?** 1= Manga *Teff* 2= White *Teff* 3= Red *Teff* 4= Mixed *Teff*	**9.17. What is the total *Teff* production in quintals by plot of land in2010 E.C (2017/18) harvest period from such plot of land?**
			1= Plot 1						
			2= Plot 2						
			3= Plot 3						

10. Labour requirement for *Teff* production

10.1. What was your <u>major source of labour</u> in 2010 E.C (2017/18) for *Teff* production? (Choose one from the options) 1= Family labour 2= Hired labour 3= Labour exchange	**10.2. In your opinion, do you think that you had adequate family labour to do your *Teff* production activities?** 0= No 1= Yes	**10.3. If your answer to question number 10.2 is NO, what could be the reason of the inadequacies of family labour? (Multiple response is possible)** 1= Large farm size 2= Old age and illness 3= Women headed 4= Children at school 99= Others (specify)	**10.4. Have you had extra (excess) family labour force in2010 E.C (2017/18) year?** 0= No 1= Yes	**10.5. If your answer to question number 10.4 is YES, what do you do with your extra family labour? (Multiple response is possible)** 1= Work on others' land for cash 2= Work on nonfarm activities 3= Involve in petty trade 99= Others (Specify)	**10.6. Did you find readily available labour force in the market when you are in need of labour for *Teff* production from the market?** 0= No 1= Yes	**10.7. Was there shortage of labour in the market for *Teff* production activities in 2010 E.C (2017/18) production year?** 0= No 1= Yes

10.8. If your answer to question number 10.7 is YES, how did you overcome it? **(Multiple response is possible)** 1= I used traditional labour pooling system (such as Wefera, Debo, Jigi, etc) 2= I hired daily labourers from other places 3= I used female labourers of the family 4= I used children labour of the family 99= Others (specify)	**10.9. What is the average working hours allocated by you for agricultural activities in a given day?**	**10.10. What percentage of your total agricultural working time was allocated for *Teff* production in 2010 E.C (2017/18) year? *(Choose one from the options)*** 1= Up to 20 percent 2= From 20 up to 40 percent 3= From 40 up to 60 percent 4= From 60 up to 80 percent 5= 80 percent and above	**10.11. What are the average number of days you and your family observe as a holiday in a given month?**	**10.12. If you face a serious shortage of labour during farming activities, are you working on the respected holidays?** 0= No 1= Yes	**10.13. Have you used traditional labour pooling systems (*wefera, debo, etc*) in 2010 E.C (2017/18) for *Teff* production period?** 0= No 1= Yes	**10.14. If your answer to question number 10.13 is YES, for which agricultural activities do you share MORE labour? *(Choose one from the options)*** 1=Ploughing (land preparation) 2= Planting 3= Weeding 4= Harvesting 5= Threshing
	_____hours		______days			

List of major activities in *Teff* production	10.15. In your opinion, if one average person was assigned to cultivate one *Tsimad* /0.25 ha/ to produce *Teff*, how many days will it take him to do the different *Teff* production activities? **<u>NB</u>: Assume 8:00 working hours per day per person**	**10.16. Summary of labour force used for *Teff* production in 2010 E.C (2017/18) year**							
		Use of family labour			**Use of hired labour**			**Use of traditional labour pooling**	
		10.16.1. What is the number of family labourers used for such farming activity?	**10.16.2. What is the total number of working days used by family labour for such farming activity?**	**10.16.3. What is the average labour cost in Birr per day per person (if paid) for family labourer?**	**10.16.4. What is the number of hired labourers used for such farming activity?**	**10.16.5. What is the total number of working days used by hired labourers for such farming activity?**	**10.16.6. What is the average labour cost in Birr per day per person for a hired labourer?**	**10.16.7. What is the number of labourers from traditional labour pooling system used for such farming activity?**	**10.16.8. What are the total numbers of working days by the use of traditional labour pooling system?**
1. Ploughing (land preparation)									
2. Planting									
3. Weeding									
4. Harvesting									
5. Threshing									

11. Utilization of inputs for *Teff* production in 2010 E.C (2017/18) year

11.1. Are you a user of agricultural (chemical) inputs (fertilizer, pesticides, etc) for *Teff* production? 0= No 1= Yes	**11.2. If your answer to question 11.1. is YES, for how long you have been using agricultural (chemical) inputs for *Teff* production?**	**11.3. Would you please identify the TOP THREE individuals or institutions that motivated you to use chemical inputs for *Teff* production?** 1= Family members 2= Model farmers 3=Development agents from the government 4= Cooperatives 5= Universities 6= Research institutes 7= NGOs 99= Others (specify)	**11.4. What motivated you to apply chemical fertilizer for *Teff* production? (Multiple answers are possible)** 1= To increase the productivity of land 2= To increase biomass 3= Fear of denial of credit opportunities 4= Fear of exclusion from safety net 99= Others, (specify)	**11.5. Do you have access to the chemical inputs upon demand?** 0= No 1= Yes	**11.6. Is there any supplier of chemical inputs in your area?** 0= No 1= Yes	**11.7. If your answer to question 11.6 is YES, how far is it from your residence in kilometer to get the suppliers for such chemical inputs?**	**11.8. How much hours did you travel to get access to such chemical inputs?**
		1st_____ 2nd _____ 3rd _____					

11.9. Is there any improved *Teff* seed producer in your area? 0= No 1= Yes	**11.10. If your answer to question 11.9 is YES, who is the nearest seed producer to you? (Choose one from the options)** 1= Model farmers 2= Seed cooperatives 3= Farmers training centre 4= Seed enterprises 5= Research institutions 99= Others	**11.11. If your answer to question 11.9 is YES, how far is it from your residence in kilometers to get access to improved *Teff* seed?**	**11.12. If your answer to question 11.9 is YES, how much hours did you travel to get access to such improved seeds?**	**11.13. How often do you use chemical inputs and improved seeds for *Teff* production?** 1= Never (no) 2= Rarely 3= Yes, sometimes 4= Yes, mostly 5= Yes, always	**11.14. Did you use other soil fertility improving methods to maintain or enhance the productivity of your *Teff* fields?** 0= No 1= Yes	**11.15. If your answer to question 11.14. is YES, which method(s) of soil fertility did you use in 2010 E.C (2017/18) harvest period? (Multiple answers are possible)** 1= Green manure 2= Farm yard manure 3= Crop rotation 4= Fallowing 99= Others (specify)

11.16. If you are not using chemical inputs and improved seeds, what are your problems for not using the chemical inputs and improved seeds? **(Multiple options are possible)** 1= It is costly (high selling price of inputs) 2= Scarcity or late arrival of fertilizer supply 3= No credit arrangement for purchasing inputs 4= Risky if there is shortage of rain 99= Other (Specify)

Categories: Source of chemical inputs and improved seed	**11.17. Would you please rank the source of your chemical inputs and seed suppliers for 2010 E.C (2017/18) *Teff* production period based on the frequency and volume of use?** **(Choose and circle one for each category)** 1= I don't use as a source of chemical inputs and seeds 2= I rarely use as a source of chemical inputs and seeds 3= I sometimes use as a source of chemical inputs and seeds 4= I mostly use as a source of chemical inputs and seeds 5= I always use as source of chemical inputs and seeds				
1= Myself (prepare manure and/or multiply improved *Teff* seed by myself)	1	2	3	4	5
2= Model farmers	1	2	3	4	5
3= Office of Agriculture and Rural Development	1	2	3	4	5
4= Farmers training centers	1	2	3	4	5
5= Cooperatives	1	2	3	4	5
6= Seed enterprises	1	2	3	4	5
7= Private sector (traders and wholesalers)	1	2	3	4	5
8= NGOs	1	2	3	4	5
9= Research institutions	1	2	3	4	5
10= Universities	1	2	3	4	5
99= Others (Specify)__________	1	2	3	4	5

11.18. If you are using chemical inputs and improved seed, what advantages did you get from using the inputs? **(Multiple answers are possible)** 1= More *Teff* yield (production) 2= Drought resistant crops 3= More biomass 4= Access to uniform and early mature seeds 99= Other (specify)	**Type of *Teff* crops**	**11.19. What was the size of your *Teff* production in quintals per *tsimad* before using chemical inputs and improved seed?**	**11.20. What was the size of your *Teff* production in quintals per *tsimad* after using chemical inputs and improved seed?**	**11.21. Does using chemical inputs and improved seed in *Teff* production bring change in your income and livelihood?** 1= Never (no) 2= Rarely 3= Yes, sometimes 4= Yes, mostly 5= Yes, always	**11.22. Comparing the period before and after using the chemical inputs and improved seeds for *Teff* production, what is the status of your household in terms of food security?** 1= Less food secure 2= No change at all 3= More food secure	**11.23. What seems the change in your agricultural income after commencement of using chemical inputs and improved seeds for *Teff* production?** 1= Declined 2= Remained the same 3= Increased
	1.*Manga Teff*					
	2.White *Teff*					
	3.Red*Teff*					
	4.Mixed *Teff*					

11.24. Would you please rank the constraints you faced on the availability and use of chemical inputs and improved seeds in 2010 E.C (2017/18) *Teff* production year? (Circle one for each problem)

<u>Remark</u>

1= No problem at all

5= High (severe) problem

List of potential problems	**No problem**				**Highest problem**
1= Lack of knowledge	1	2	3	4	5
2= Inadequate supply	1	2	3	4	5
3= Low quality (taste)	1	2	3	4	5
4= Lack of safety device	1	2	3	4	5
5= Poisoning when applying	1	2	3	4	5
6= Unknown origin of inputs	1	2	3	4	5
7= High price of inputs	1	2	3	4	5
8= Late delivery of inputs	1	2	3	4	5
9= Absence of credit for inputs	1	2	3	4	5
10. Inappropriate repayment schedule for input credit	1	2	3	4	5
99. Others (specify)	1	2	3	4	5

11.25. Have you experienced any negative side of using chemical inputs and improved seeds?	**11.26. If your answer to question 11.25. is YES, what are the main negative impacts of using chemical inputs and improved seeds? (Multiple answers are possible)**
0= No 1= Yes	1= Deplete nutrient from soil 2= Decreased production over time 3= Poisoning and affects the environment 4= Increased weeds 99= Others

11.27. Use of fertilizers, improved seed and insecticides for *Teff* production in 2010 E.C (2017/18) year

S.N	Type of inputs	11.27. 1. Did you use such inputs for *Teff* production in 2010E.C (2017/18)? 0= No 1= Yes	11.27.2. If you use inputs, what is the amount of inputs used in kg or liter?	11.27. 3. What is the price per kg or liter in Birr?	11.27.4. Was the amount of inputs used enough? 0= No 1= Yes	11.27.5. What is the main source of chemical inputs and improved seeds? (Choose one for each type of input) 1= Own source 2= Model farmers 3= Cooperatives 4= Private sector (traders) 5= Bureau of Agriculture and Rural Development 6= NGOs 7= Research institutions 8= Universities 9= Unknown source in the market 99= Others (specify)	11.27.6. What is your main source of finance for purchasing chemical inputs and improved seeds? (Choose one for each type of input) *1*= Crop sales 2= Livestock sales 3= Credit 4= Off-farm activities 5= Donation 99= Others (specify)
1	Manure						
2	Improved *Teff* seed						
3	DAP						
4	UREA						
5	Herbicide						
6	Fungicide						
7	Insecticide						
99	Others (specify)						

12. Use of farm tools for *Teff* production

S.N	Type of farm implements /equipment used for *Teff* production in 2010 E.C (2017/18) year	12.1. Are you using such farm equipment for *Teff* production in 2010 E.C (2017/18) year? 0= No 1= Yes	12.2. If your answer to question 12.1. is YES, what is the quantity used for farming in numbers?	12.3. How do you own it? (Choose one for each type of farm implements) 1= Purchased 2= Rented 3= Donated	12.4. If you purchase it, before how many years do you purchase it?	12.5. If you purchase it, what was the cost of purchase per piece in Birr?	12.6. If rented, what was the renting price per day or per hour?	12.7. If the item was donated, who gave you the items? 1= Family 2= Friends 3= Government 4= Donors 99= Others (specify)
1	Plowing set (*Maresha*)							
2	Hoe (*Mekoferia*)							
3	Sickle (*Machid*)							
4	Harrow							
5	Generator							
6	Treadle pump							
7	Tractor							
8	Combined harvester							
99	Others (specify)							

13. Use of irrigation facilities for *Teff* production in 2010 E.C (2017/18) year

13.1. Have you used irrigation schemes for *Teff* production activities in2010 E.C (2017/18) year? 0= No 1= Yes	13.2. If your answer to question 13.1. is YES, what was the source of water for your irrigation activities? (Multiple answers are possible) 1= Pond 2= Borehole 3= River/spring 4= Lake 99= Others (specify)___________	13.3. What was your method of your irrigation farming? (Multiple answers are possible) 1= Furrow 2= Sprinkler 3= Basin 99= Others (specify)_____	13.4. What is the cost of using irrigation pumps in Birr?		13.5. What are the major challenges in using irrigation schemes? (Multiple answers are possible) 1= Lack of adequate water 2= Lack of irrigation facilities in the market 3= Shortage of capital for purchasing irrigation facilities 4= Small size of the land 99= Others (specify)
			13.4.1. Owned pump (purchase value)	13.4.2. Rented pump (renting price per day)	

14. Availability of credit services to *Teff* production

14.1. Have you ever received any credit (loan)? 0= No 1= Yes	**14.2. Has any member of your household contracted any loan(s) [in cash and/or kind] or bought anything on credit in 2010 E.C (2017/18)?** 0= No 1= Yes	**14.3. Have you received loans for crop production activities in 2010 E.C (2017/18) production year?** 0= No 1= Yes	**14.4. Would you please describe the total amount of money you borrowed in 2010 E.C (2017/18) production year?**	**14.5. Who are the three major source of loan/credit in your locality based on the frequency of use and the amount of loan?** 1 = Government banks 2= Private banks 3 = Microfinance 4= Cooperatives 5= Women association 6= Safety net programme 7= Community organizations (*Equib* and *Edir*) 8 = NGOs 9 = Relative/ Neighbour/ Friend 10= Employer 11= Money lenders 12= Business firms(traders) 99= Other (Specify)	**14.6. What are the three main purposes and use of the loan (credit)?** 1= Purchase of farm tools 2= Rent for agricultural land 3= Purchase of chemical inputs 4= Purchase of improved seeds 5 = Business 6 = House upgrading 7 = Education/training 8 = Health 9 = Ceremonies such as weddings, funerals, graduation, birthdays, etc. 10 = Purchase of motor or vehicle 11= Clothing 12= Investment in property such as TV, radio, refrigerator, etc 13 = Purchase of consumable goods 99 = Other (Specify)
				1st______ 2nd ______ 3rd _____	1st______ 2nd ______ 3rd _____

14.7. Did you have the option to use your land or house / building as collateral/ guarantee for this loan? 0= No 1= Yes	14.8. What are the three major kinds of guarantees required by the lender/credit providers in your locality? 1 = None 2 = Land 3 = Cattle 4 = Furniture such as TV 5 = House/building 6 = Employment 7 = Relatives 8= Group collateral 9 = ID / passport 99 = Other (Specify)	14.9. What is the maturity period of the loan? 1= Less than one year 2= From 1 up to 2 years 3= From 2 up to 3 years 4= From 3 up to 4 years 5= From 4 up to 5 years 6= Above 5 years	14.10. What is the interest rate per year in percent? (Choose one from the options) 1= Below 3 % 2= From 3% up to 6 % 3= From 6% up to 9 % 4= From 9 % up to 12% 5= From 12% up to 15% 6= From 15% up to 18 % 7= From18 % up to 21 % 8= From 21% up to 24 % 9= From 24 up to 27% 10=From 27up to 30% 11= Above 30%	14.11. What is the loan repayment schedule for your loan? *(Choose one from the options)* 1= Every week 2= Every two weeks 3= Every month 4= Every two months 5= Every three months 6= Every six months 7= Once in a year 8= Every two years 9= End of the loan term	14.12. Do you think that the loan repayment schedule is convenient to you? 0= No 1= Yes
	1st_____ 2nd ______3rd _____				

14.13. What is the amount of the loan repayment (principal and interest) per period?	14.14. Have you paid back your entire loan? 0= No 1= Yes	14.15. If you do not pay your loan, what is the reason? (Multiple answers are possible) 1= I never get profit from the loan 2= I become bankrupt 3= I lost my crops due to natural hazard (s) 4= Our group members fail to pay the loan 99= Other (specify)	14.16. What is your source of money to repay the loan? (Multiple answers are possible) 1= Selling crops 2= Selling vegetables and fruits 3= Selling livestock and livestock products 4= Income from off farm activities or food for work 99= Other, (specify)	14.17. Did you allocate part of the borrowed money for *Teff* production activities? 0= No 1= Yes	14.18. If your answer to question 14.17 is YES, what is the amount of the loan allocated for *Teff* production activities?

14.19. If you don't borrow, what are the three main reasons for not taking the loan/credit based on severity of the problem? (Multiple answers are possible) 1= Interest rate on credit is too high 2= The credit is not available on time 3= There is no credit provider in our locality 4= I couldn't provide collateral to banks 5= I couldn't find group members for collateral 6= I do not have money for initial down payment 7= I don't have money for repayment 8= I don't want to take risks 99= Other (specify)	**14.20. Would you please rank the major problems you face in accessing credit from "1" to "5" considering the severity of the problem?** ***(Choose and circle one from the ranking for each option)*** 1 = No problem at all 5= Very high (severe) problem					
	Potential problems in accessing credit	No problem				Highest problem
	1. Lack of collateral	1	2	3	4	5
	2. High interest rate	1	2	3	4	5
	3. Problem of money lenders	1	2	3	4	5
	4. Short maturity period	1	2	3	4	5
	5. Small amount of loan	1	2	3	4	5
	6. Bureaucracy (lengthy process)	1	2	3	4	5
	7. No lending financial institution in convenient proximity to my residence	1	2	3	4	5
	8. I do not know how I could get access to credit from financial institutions	1	2	3	4	5
	9. I was denied by the credit provider	1	2	3	4	5
	10. High risk of taking loans	1	2	3	4	5
1st________ 2nd ________ 3rd __________	99. Other problem (specify)	1	2	3	4	5

15. Access to extension services and training

15.1. Do you have any contact with extension agents? 0= No 1= Yes	**15.2. Did you get an advice or any support from the extension agents in 2010 E.C (2017/18) harvest period?** **0= No** **1= Yes**	**15.3. If your answer to question 15.2. is YES, on average how many days did the development agents contacted (visited) you in 2010 E.C (2017/18) harvest period?** ***(Choose one from the options)*** 1= No visit at all 2= Once per year 3= Once per six months 4= Once per three months 5= Once per two months 6= Once per month 7= Twice per month 8= Once per week	**15.4. Do you think the number of contacts with the extension agents were enough?** 0= No 1= Yes	**15.5. What types of services did you get from extension agents in 2010 E.C (2017/18) harvest period? (Multiple response is possible)** 1= Access to farm inputs 2= Technical support 3= Training and consultation on farming methods 4= Provision of market information and market linkage 99= Other (specify)	**15.6. Have you been attending any agriculture related training program in 2010 E.C (2017/18) year?** 0= No 1= Yes	**15.7. Who are the three main training providers in your locality?** 1= Extension Agents 2= Village head 3= Model farmers 4= Farmers training centres 5= Woreda experts 6= Cooperative experts 7= Regional Bureau of Agriculture and Rural Development 8= Experts from NGOs 99= Others (specify)
						1st _____2nd ____3rd______

Type of training	15.8. Have you ever attended such training ? 0= No 1= Yes	15.9. If your answer to question 15.8 is YES, what is the duration of training in days? 1= One day 2= Two days 3= Three days 4= Four days 5= Five days 6= More than five days	**15.10. If your answer to question 15.8 is YES, how do you evaluate the significance of the training to *Teff* production and marketing?** ***(Choose and circle one from the options)*** 1= Very low 2= Low 3= Average 4= High 5= Very high					**15.11. Have you attended any field demonstration day in 2010 E.C (2017/18) year?** 0= No 1= Yes	**15.12. If your answer to question 15.11. is YES, how do you evaluate the significance of the field demonstration day to *Teff* production and marketing?** ***(Choose one from the options)*** 1= Very low 2= Low 3= Average 4= High 5= Very high	**15.13. What are the <u>three major problems</u> you usually face in contacting extension officers and access to training based on the severity of the problem?** 1= Inadequate technical support 2= Extension workers are not available when needed 3= Capacity limitations of trainers 4= Lack of educational materials 5= Inadequate trainers 6= Not demand driven support 7= Inappropriate timing 8= Lack of transparency in selecting farmers for training 99= Other (specify)
1. Modern farming methods			1	2	3	4	5			
2. Use and application of inputs (seed and fertilizer)			1	2	3	4	5			1st______ 2nd ______ 3rd _______
3. Adoption of new technologies			1	2	3	4	5			
4. Soil and water conservation			1	2	3	4	5			
5. Post-harvest management			1	2	3	4	5			
6. Animal husbandry			1	2	3	4	5			
7. Food processing			1	2	3	4	5			
8. Petty trade			1	2	3	4	5			
9. Marketing			1	2	3	4	5			
10. Financial management			1	2	3	4	5			
99. Others (specify)________			1	2	3	4	5			

16. Membership in primary cooperatives

16.1. Are you a member of primary cooperatives? 0= No 1= Yes	**16.2.If your answer to question 16.1 is YES, who motivated you to be a member of primary cooperatives?** **(Multiple response is possible)** 1= Farmers 2= Development agents 3= NGOs 4= Universities/ research institutions 99= Other (specify)	**16.3. If your answer to question 16.1 is YES, for how long you have been involved as a member of primary cooperatives?**	**16.4. If your answer to question 16.1 is YES, in which type of primary cooperatives is your membership? (Multiple response is possible)** 0= No 1= Yes	**16.5. If your answer to question 16.1 is YES, as a member of the primary cooperative, how often do use the services from your cooperative?** ***(Choose one from the options)*** 1= Never 2= Rarely 3= Sometimes 4= Often 5= Always	**16.6. Which are the <u>three most common methods</u> of communication best practiced in your area in relation to the promotion of cooperatives?** 1= Cooperative promoters 2= Visits of development agent(government) 3= Farmers meetings 4= Farmers associations 5= Community meetings 6= Farmer training centers 7= Radio 8= Television or video show 9= Newspaper and magazines 10= Fellow farmers 11= Neighbour farmers 99= Other (specify)
			1= Multipurpose primary cooperatives 2= Marketing primary cooperatives 3= Irrigation primary cooperatives 4= Savings and credit primary cooperatives 5= Consumer primary cooperatives 99= Other (specify)________		1st_____ 2nd _____ 3rd _____

Types of services from primary cooperatives	**16.7. If your answer to question 16.1 is YES, as a member of the primary cooperatives, which types of services are you getting from the primary cooperatives?** 0= No 1= Yes	**16.8.If your answer to question 16.7 is YES, how do you evaluate the efficiency and quality of the services of primary cooperatives?** ***(Choose and circle one from the options)*** 1= Very poor 2= Poor 3= Average 4= Good 5= Very good					**List of potential problems of primary cooperatives**	**16.9. How do you evaluate the severity and seriousness of the problems mentioned in the list?** ***(Choose and circle one from each potential problem)*** **1= It is not a problem at all** **5= Very serious problem**				
		Very poor				Very good		**No problem**				**Very serious problem**
1. Fast input delivery		1	2	3	4	5	1= Do not follow bylaws	1	2	3	4	5
2. Affordable input price		1	2	3	4	5	2= Poor service delivery	1	2	3	4	5
3. Fair farm gate output price (purchase of farm outputs)		1	2	3	4	5	3= Poor financial capacity	1	2	3	4	5
4. Strong bargaining power		1	2	3	4	5	4= Lack of transparency	1	2	3	4	5
5. Reliable storage facility		1	2	3	4	5	5= Poor managerial skills	1	2	3	4	5
6. Market information		1	2	3	4	5	6= Poor financial management skills	1	2	3	4	5
7. Low cost credit (loan)		1	2	3	4	5	7= Not audited on time	1	2	3	4	5
8. Easy access to credit		1	2	3	4	5	8= No timely payment of dividend	1	2	3	4	5
9. Increasing savings habits		1	2	3	4	5	9= Corruption	1	2	3	4	5
10. Technical assistance		1	2	3	4	5	10= Nepotism	1	2	3	4	5
11. Getting dividend		1	2	3	4	5	11= No general meeting	1	2	3	4	5
99. Others (specify)		1	2	3	4	5	99= Others (specify)	1	2	3	4	5

17. Total cost of *Teff* production per cycle in 2010 E.C (2017/18)18. Potential problems in *Teff* production

17.1. How many *Teff* growing cycles do you had in 2010 (2017/18) harvest period? ***(Choose one from the options)*** 1= Once in a year 2= Twice in a year 3= Three times in a year	**Cost component for one growing cycle (season)**	**17.2. What is the average cost per cycle in Birr?**	**List of potential problems in *Teff* production**	**18.1. Would you please rank the five major problems that prevent you from producing *Teff* crops in 2010 E.C (2017/18) from "1" to "5" considering the severity of the problem?** ***(Choose and circle one for each potential problem)*** **Ranking** 1 = No problem at all 5= Highest (severe) problem				
				No problem				Highest problem
	1. Fees for land		1. Shortage (absence) of oxen	1	2	3	4	5
	2. Cost of hiring oxen		2. Low yield of *Teff* crops	1	2	3	4	5
	3. Purchase of manure		3. Small land size (shortage of cultivatable land)	1	2	3	4	5
	4. Purchase of improved seeds		4. Poor soil fertility (infertile or slope steep)	1	2	3	4	5
	5. Purchase of fertilizers		5. High rainfall (flood)	1	2	3	4	5
	6. Purchase of pesticides / herbicides		6. Drought or insufficient rainfall	1	2	3	4	5
	7. Labour cost for land ploughing, sowing, weeding, harvesting and threshing		7. Shortage of chemical inputs	1	2	3	4	5
	8. Machinery cost (if used)		8. Shortage of improved *Teff* seed	1	2	3	4	5
	9. Loading and unloading		9. High price of inputs	1	2	3	4	5
	10. Transportation costs		10. Poor financial capacity to purchase inputs	1	2	3	4	5
	11. Energy (electricity, fuel, gas)		11. Invasion of weeds	1	2	3	4	5
	12. Storage costs		12. Pest and insects	1	2	3	4	5
	13. Cleaning costs		13. Shortage of labour	1	2	3	4	5
	14. Bagging costs		14. High cost of labour	1	2	3	4	5
	15. Renting costs		15. Absence of working tools	1	2	3	4	5
	99. Other costs		16. Animal damage	1	2	3	4	5
			17. Theft of produce	1	2	3	4	5
			99. Others (specify)	1	2	3	4	5

19. Infrastructure and transportation

**19.1. Where is your <u>major marketplace</u> for *Teff* outputs? *(Choose one from the options)* 1= Farm gate 2= Tabia (Kebele) market 3= Woreda (district) market 4= Zone Market 5= Regional market 6= Addis Ababa central market (Ehil veranda) 7= Foreign market	**19.2. What is the name of the nearest market place where you sale your *Teff* crops?**	**19.3. How far is the nearest major market place from your village in kilometers?**	**19.4. How long it takes you to reach the nearest <u>major market</u> from your village? *(Choose one from the options)* 1= Less than 1 hour 2= From 1 hour up to 2 hours 3= From 2 hours up to 3 hours 4= From 3 hours up to 4 hours 5= 4 hours and above	**19.5. Do you have access road to the nearest *Teff* market place?** 0= No 1= Yes	**19.6. If your answer to question 19.5 is YES, what type of road is it?*(Choose one from the options)*** 1= Dirt 2= Gravel 3= Asphalt 4= Combination of dirt and gravel 5= Combination of dirt and asphalt 6= Combination of grave and Asphalt 7= Dirt, gravel and asphalt 99= Others (specify)

**19.7. How do you get to the nearest *Teff* market place <u>most often</u>? *(Choose one from the options)* 1= On foot 2= By pack animals 3= Bicycle or motorcycle 4= By vehicle 5= Both on foot and by vehicle	**19.8. Do you have transport facilities to access to the nearest market if you intend to sale products there?** 0= No 1= Yes	**19.9. Would you please identify the <u>major three means of transport</u> you usually use to transport *Teff* crops to the marketing point most often (based on frequency of use)?** 1= Head/back loading 2= Pack animal 3= Animals' cart 4= Bicycle or motorcycle 5= Bajaj 6= Renting vehicles 7= Public transport 8= Own vehicle 99= Others (specify)	**19.10. How much does it cost (round trip cost in Birr per person) if you have to travel by car to the nearest market place?**	**19.11. How much does it cost you to transport a quintal of *Teff* to the nearest market place?**	**19.12. How do you evaluate the cost of transport to yourself and your *Teff* crops to the market? *(Choose one from the options)*** 1= Cheap 2= Fair 3= Expensive 99= Can't say
		1st________ 2nd ________ 3rd ________			

19.13. How manytimes did you travelled in 2010 (2017/18) to the nearest market to sell your *Teff* outputs?	**19.14. How much quintals of *Teff* crops would you sell on average in one travel to the market?**	**Type of *Teff* crops**	**19.15. How much is the average selling price per quintal in Birr in 2010 (2017/18) for your different *Teff* output in the market?**	**Name of service providers**	**19.16. What is the distance in km to reach the nearest place of service provider from your residence?**	**19.17. How many minutes/ hours/ days do you normally travel to reach the nearest service providers?**	**19.18. What types of problems do you experience in moving your produce to market? (Multiple response is possible)** 1= Lack of transport facilities 2= High cost of transport 3= Poor infrastructure facilities 4= Small capacity of transport facilities 99= Other (Specify)
		1. *Manga Teff*		1. Farmers' training centers			
		2. White *Teff*		2. Extension office			
		3. Red *Teff*		3. Cooperatives office			
		4. Mixed *Teff*		4. Paved or all-weather road			
				5. District offices			
				6. Nearest town			
				7. Zonal market			
				8. Regional market			
				9. Addis Ababa (Ehil veranda)			

19.19. Do you own your own storage facilities? 0= No 1= Yes	**19.20. If your answer to question number 19.19 is YES, what is its capacity of your storage in quintals?**	**19.21. If your answer to question number 19.19 is NO, where do you store your *Teff* crops? (Multiple response is possible)** 1= Renting stores 2= Friends' store 3= Government shed 99= Others (specify)	**19.22. If you are renting stores, what is the rental cost per month per quintal?**	**19.23. For how many months do you store *Teff* products before selling?**	**19.24. What are the major three problems you experienced in storing of your *Teff* crops (based on severity of the problem)?** 1= Lack of storage facilities 2= High cost of storage 3= Small size of storage 4= Inappropriate location 5= Long distance to the market 6= Poor ventilation 7= Insects and rats 99= Other (Specify)
					1st________ 2nd ________ 3rd ________

20. Market information

20.1. Do you have prior market /price information before taking your *Teff* products to the market? 0=No 1= Yes	**20.2. Do you receive market information prior to sales?** 0=No 1= Yes	**20.3. What are the main challenges in getting up-to-date and relevant market information? *(Multiple response is possible)*** 1= There is no reliable source of information 2= It is not timely 3= Inconsistency 4= Irregularity 99= Others (specify)	**Source of Information**	**20.4. Have you been using as asource of information?** 0= No 1= Yes	**20.5. If your answer to question 20.4. is YES, what type of information did you obtained from such sources? *(Multiple response is possible)*** 1= Price 2= Dates for sales 3= Potential buyers 4= Market opportunity 99= Others (specify)	**20.6. If your answer to question 20.4. is YES, what seems the degree of reliability of the information?** ***(Choose one for each source of information)*** 1= Low 2= Medium 3= High	**20.7.Would you please rank the <u>major three source of information</u>as 1st, 2nd and 3rd(from the given list of source of information) according to thefrequency of use of the information?**
			1. Radio				1st ___________ 2nd___________ 3rd___________
			2. Television				
			3. Mobile				
			4. Brokers				
			5. Assemblers				
			6. Traders (retailers and wholesalers)				
			7. Cooperatives				
			8. Extension agents				
			9. Experts in Woreda office				
			10. Model farmers				
			11. NGOs				
			12. ECX board				
			99. Others (specify)				

21. Marketing of *Teff* crops

21.1. Have you ever been involved in selling *Teff* crops? 0= No 1= Yes	**21.2. If your answer to question 22.1 is YES, at what season do you usually sell your *Teff* crop?** ***(Choose one from the options)*** 0= Immediately after harvest 1= One month after harvest 2= Two months after harvest 3= Three months after harvest 4= Four months after harvest 5= Five months after harvest 6= Six months after harvest 7= Seven months after harvest 8= Eight months after harvest 9= Nine months after harvest 10= Ten months after harvest 11= Eleven months after harvest 12= After a year 13= More than a year	**21.3. Do you perform price surveys before selling *Teff*?** 0= No 1= Yes	**21.4. Do you always find a market for the *Teff* you produced?** ***(Choose one from the options)*** 1= Never (no) 2= Rarely 3= Yes, sometimes 4= Yes, mostly 5= Yes, always	**21.5. What share of your *Teff* products did you supply to the market?** ***(Choose one from the options)*** 1= Up to 20 percent of *Teff* yield 2= From 20 up to 40 percent of *Teff* yield 3= From 40 up to 60 percent of *Teff* yield 4= From 60 up to 80 percent of *Teff* yield 5= 80 percent and above of *Teff* yield

Type of *Teff* crops	**21.6. What is the total amount of *Teff* produced [by type] by your household in quintal in 2010 E.C (2017/18) harvest period?**	**21.7. What is the amount of *Teff* crops consumed [by type] by your household in quintal in 2010 E.C (2017/18) harvest period?**	**21.8. What is the amount of *Teff* crops [by type] left for seed in kilogram?**	**21.9. Have you sold *Teff* crops [by type] in 2010 E.C (2017/18) harvest period?** 0= No 1= Yes	**21.10. If your answer to question 21.9 is YES, what is the amount of *Teff* crops supplied to the market [by type] in quintals?**	**21.11. If your answer to question 21.9 is YES, what is the average selling price [by type] per quintal?**
1. *Manga Teff*						
2. White *Teff*						
3. Red *Teff*						
4. Mixed *Teff*						

Type of buyers	**21.12. Would you please rank the major buyers of your *Teff* crops in 2010 E.C (2017/18) year from "1" to "5" considering the frequency and volume of purchase?** ***(Choose and circle one from the ranking)*** **Ranking** 1 = Not a buyer 5= Highest buyer					**21.13. What is the amount of sales of *Teff* crops in quintals in 2010 E.C (2017/18) harvest period by each type of buyer?**	**21.14. Did you contact agents or brokers in search of buyers to your *Teff* crops in 2010 E.C (2017/18) year?** 0= No 1= Yes	**21.15. If your answer to question 22.14 is YES, would you please identify the main type of services you get from such agents or brokers? (Multiple response is possible)** 1=Providing market information 2= Linking with buyers 3= Facilitates negotiation and agreements 4= Access to transport facilities 99= Others (specify)	**21.16. If your answer to question 22.14 is YES, how do you evaluate the services of agents or brokers?** 1= Very poor 2= Poor 3= Average 4= Good 5= Very good
	Not a buyer				Highest buyer				
1= Rural consumers	1	2	3	4	5				
2= Urban consumers	1	2	3	4	5				
3= Brokers	1	2	3	4	5				
4= Assemblers	1	2	3	4	5				
5= Cooperatives	1	2	3	4	5				
6= Retailers	1	2	3	4	5				
7= Wholesalers	1	2	3	4	5				
8= Millers	1	2	3	4	5				
9= Processors (*Injera* bakers)	1	2	3	4	5				
10= Export (International buyers)	1	2	3	4	5				
11= Ethiopia Commodity Exchange (ECX)	1	2	3	4	5				
99= Other (specify)_____	1	2	3	4	5				

21.17. If you contacted agents or brokers in search of buyers to your *Teff* crops, how much money did you pay for the agent/ broker in 2010 E.C (2017/18) harvest time per quintal?	**21.18. If you pay money for agents or brokers, how do you evaluate the cost of the service?** 1= Cheap 2= Fair 3= Expensive 9= I don't know	**21.19. Which channel are you using mostly to sell your *Teff* produce in 2010 E.C (2017/18) harvest period?** ***(Choose one from the options)*** 1= *Teff* producers → consumers 2= *Teff* producers → brokers/ rural assemblers→ consumers 3= *Teff* producers → millers → consumers 4= *Teff* producers → retailers → consumers 5= *Teff* producers → wholesalers → consumers 6= *Teff* producers → wholesalers → retailers→ consumers 7=*Teff* producers → brokers/rural assemblers → retailers→ consumers 8= *Teff* producers → brokers/rural assemblers → wholesalers → consumers 9= *Teff* producers → primary cooperatives→cooperative union → consumers 10=*Teff* producers → primary cooperatives→wholesalers → retailers →consumers	**21.20. In terms of the market channels you use regularly to sell *Teff* crops, what are the main benefits?** **(Multiple response is possible)** 1= I have long-term contract 2= I receive better prices 3= Lesser cost of transport 4= They provide me inputs 99= Other (specify)	**21.21. Do have any preference to sell your *Teff* crops to certain buyer groups?** 0= No 1= Yes

21.22. Did you get enough buyers for all of your *Teff* products in 2010 E.C (2017/18) harvest period? 0= No 1= Yes	**21.23. How difficult is it to look for buyers?** 1= Very difficult 2= Difficult 3= Fair 4= Easy 5= Very easy	**21.24. On average, how long it takes you to find a buyer for your *Teff* crops in 2010 E.C (2017/18) harvest period?**	**21.25. How do you mostly decide the selling price of your *Teff* crops?** ***(Choose one from the options)*** 1= It depends on the price of other farmers 2= It depends on the market I am selling 3= It depends on the production costs 4= It depends on the transaction costs 5= It depends on the established contract 99= Others (specify)	**21.26. How is the price for *Teff* crops mostly determined in the market while you sale to your buyers in the market?** ***(Choose one from the options)*** 1= I set the price 2= I negotiate with the buyer 3= It is market driven 4= It is decided by brokers 5= It is decided by rural assemblers 6= It is decided by buyers 7= It is decided by cooperatives or unions 8= It is decided by Ethiopia Commodity Exchange (ECX) 9= Government officers set the price 99= Other (Specify)

21.27. Do you think you have received fair price for your *Teff*crops? 0= No 1= Yes	21.28. Did you receive all your money in one payment or in instalments? 1= One payment 2= Instalments	21.29. Have you ever met a bad price reduction (unfair price) in the market? 0= No 1= Yes	21.30. If your answer to question 21.29. is YES,would you please mention the major reasons for such unfair price? (Multiple response is possible) 1= Excess supply of *Teff* in the market 2= Lack of demand for *Teff* crops 3= Price collusion (conspiracy/ monopoly) 4= Lack of transport and storage facilities 99= Others (specify)	21.31. If you face bad price (unfair price) in the market, what do you do mostly with the Teff crops? *(Choose one from the options)* 1= Consumed by family members 2= Distributed to family members freely 3= Distributed to family members at very cheap price 4= Sell at a very cheap price 5= Reserved/stored in warehouse and sell later 6= Processing (extend shelf life of the product) 99= Others (specify)

21.32. Do you have longstanding customers for selling *Teff* crops? 0= No 1= Yes	21.33. Do you have any legally binding contract (agreement) with buyers? 0= No 1= Yes	21.34. If your answer to question 21.33.is YES, what is the form of contract? 1= Oral (verbal) 2= Written	21.35. If you have legally binding contractual agreement, is there any problem with enforcement of such contracts? 0= No 1= Yes	21.36. If your answer to question 21.35. is YES, would you please mention the reasons for such problem of enforcement of the contract? (Multiple option is possible) 1= Vague contracts 2= Interpretation problems 3= Delay in implementation 4= Delay in court decision 99= Others (specify)	21.37. Do you sale *Teff* crops on credit in 2010 E.C (2017/18) harvest period? 0= No 1= Yes	21.38. If your answer to question 21.37 is YES, what portion of your sales volume goes for credit? *(Choose one from the options)* 1= Less than 20 percent of my *Teff* sales volume 2= From 20 up to 40 percent of my *Teff* sales volume 3= From 40 up to 60 percent of my *Teff* sales volume 4= From 60 up to 80 percent of my *Teff* sales volume 5= 80 percent and above of my *Teff* sales volume

21.39. If your answer to question 21.37 is YES, for how long do you wait for the payment?	**21.40. How do you see the default rate in repayments for credit sales?** 1= Very low 2= Low 3= Average 4= High 5= Very high	**21.41. If your answer to question 21.40 is very high or high, what could be the potential reason for the default in payments? (Multiple response is possible)** 1= Unwilling to pay 2= Shortage of capital 3= Bankruptcy 4= Lack of market 99= Others (specify)	**Cost components**	**21.42. What does it cost you to sell a quintal of *Teff* in the market in relation to the following cost components?**	**21.43. If you did not sell *Teff* in 2010 E.C (2017/18) production season, what is your reason for not selling? (Multiple response is possible)** 1= Less amount of produce 2= Lack of market 3= The price is not fair 4= Lack of transport and storage facilities 99= Other (specify)
			1. Packing		
			2. Loading unloading		
			3. Transportation		
			4. Storage		
			5. License and taxes		
			6. Telephone costs		
			99. Other costs		

21.44. How do you evaluate the changes over time in relation to the availability of *Teff* crops in the market where you operating? 1= Decreased 2= No difference (the same) 3= Increased 99= I don't know	**21.45. How would you compare your household standard of living in relation to other households in this community?** 1= Much worse 2= Somewhat worse 3= About the same 4= Somewhat better 5= Much better	**21.46. Are you happier, the same or less happy with life than you were 5 years ago?** 1= Less happy 2= The same 3= Happier	**21.47. How do you evaluate the contribution of *Teff* crops to the improvement of your livelihood in general?** 1= Very low 2= Low 3= Average 4= High 5= Very high

Potential problems of *Teff* marketing	**21.48. Would you please rank the major marketing problems you faced in selling *Teff* crops from "1" to "5" considering the severity of the problem?** ***(Choose and circle one from the ranking for each option)*** **<u>Ranking</u>** 1 = No problem at all 5= Highest (severe) problem			
	No problem			**Severe problem**
1. Poor market linkage by the government	1	2	3	4	5
2. Low price for *Teff* crops	1	2	3	4	5
3. Problem of brokers	1	2	3	4	5
4. Problem of middlemen (wholesalers and retailers)	1	2	3	4	5
5. Long channel of marketing	1	2	3	4	5
6. Poor bargaining power of producers	1	2	3	4	5
7. Lack of market for *Teff* products	1	2	3	4	5
8. Lack of market information	1	2	3	4	5
9. Storage problems	1	2	3	4	5
10. Loading unloading problems	1	2	3	4	5
11. Transportation problem	1	2	3	4	5
12. Scaling problems	1	2	3	4	5
13. Absence of standardized grading systems	1	2	3	4	5
14. Absence of quality control mechanisms	1	2	3	4	5
15. Adulteration problems	1	2	3	4	5
16. Problem of finance	1	2	3	4	5
17. Problem of infrastructure (road, mobile, power, etc.)	1	2	3	4	5
18. Marketing policy and regulation related problems	1	2	3	4	5
99. Others (specify)___________________	1	2	3	4	5

22. Perception and practice of farmers to global market of *Teff* crops

22.1. Do you have information in relation to the demand for *Teff* crops at global market? 0= No 1= Yes	**22.2. If your answer to question 22.1. is YES, would you please identify the <u>three main sources of your information</u>?** 1= Radio 2= Television 3= Brokers 4= Assemblers 5= Retailers 6= Wholesalers 7= Cooperatives 8= Extension agents 9= Woreda experts 10= Marketing agency 11= Ethiopia Commodity Exchange (ECX) 99= Others (specify)	**22.3. Are there *Teff* exporters in your locality?** 0= No 1= Yes 99= I don't know	**22.4. Do *Teff* exporters contact you to sell your crops for export?** 0= No 1= Yes	**22.5. Have you been involved in global *Teff* marketing?** 0= No 1= Yes	**22.6. Have you supplied *Teff* crops to exporter companies?** 0= No 1= Yes	**22.7. If your answer to question is 22.6 YES, which type of *Teff* crop is <u>highly demanded</u> in global market?** **(Choose one from the options)** *1= Manga Teff* 2= White *Teff* 3= Red *Teff* 4= Mixed *Teff*
	1st ______ 2nd______3rd_______					

Type of *Teff* crops	**22.8. If you supplied *Teff* crops to exporter companies, how much quintals of each type of *Teff* crops you supplied in 2010 E.C (2017/18)?**	**22.9. If you supplied *Teff* crops to exporter companies in 2010 E.C (2017/18), what is the average selling price per quintal for each type of Teff crop?**	**22.10. How do you evaluate the price offered by exporters to farmers as compared to local buyers?** 1= Very low 2= Low 3= The same (no difference) 4= High 5= Very high 99= I don't know	**22.11. What is the effect of *Teff* export in the improvement of the livelihood of farmers?** 1= Decreased 2= No difference (the same) 3= Increased 99= I don't know	**22.12. Do you think that farmers benefit from selling *Teff* crops to international market?** 0= No 1= Yes	**22.13. Would you please identify the <u>three main factors</u> that can help farmers in promoting *Teff* crops to global market?** 1= Strong market linkage 2= Revisions of export policy 3= Use of modern farming system to increase *Teff* production 4= Creating strong cooperatives 5= Training farmers 6= Promote foreign investment 99= Others (specify)
1. *Manga Teff*						1st ________ 2nd________3rd_________
2. White *Teff*						
3. Red *Teff*						
4. Mixed *Teff*						

23. Consumption of *Teff* crops and Livelihoods

Types of crops	23.1. Would you please rank the consumption of cereal crops in accordance to the volume of consumption by your family in a given month? Ranking 1= No consumption 2= Low consumption 3= Average consumption 4= High consumption 5= Very high consumption	23.2. What is the average amount of crop consumed in kilogram within a given month by your family in 2010 E.C (2017/18) crop season?	23.3. Do you meet the family *Teff* food consumption requirement from your own production in good harvest period? 0= No 1= Yes	23.4. Do you meet the family *Teff* food consumption requirement from your own production in bad harvest year? 0= No 1= Yes	23.5. If you didn't fulfil your *Teff* requirements from your own production, how do you mainly feed your family in case of food shortfall? (Choose one from the options) 1= Purchasing 2= Borrowing 3= Safety net 4= Donations 5= Remittances 99= Others (specify)	23.6. Have you ever involved in purchasing of crops for your household consumption? 0= No 1= Yes	23.7. Have you purchased crops for your household consumption in 2010 E.C (2017/18) crop season? 0= No 1= Yes
1. *Teff*							
2. Wheat							
3. Maize							
4. Sorghum							
5. Barley							
6. Rice							
7. Small millet							
99. Other cereal crops							

Type of cereal crops	**23.8. If you purchase crops for family consumption in 2010 E.C (2017/18) crop season, what is the average amount of crops you bought in kg?**	**23.9. If you purchase crops for family consumption in 2010 E.C (2017/18) crop season, what was the average price per kilogram?**	**23.10. What is the amount of *Teff* crops you bought (in kg) in one shopping at a time?** ***(Choose one from the options)*** 1= Up to 20 kg 2= From 20 up to 40 kg 3= From 40 up to 60 kg 4= From 60 up to 80 kg 5= From 80 up to 100 kg 6= 100 kg and above
1. *Teff*			
2. Wheat			
3. Maize			
4. Sorghum			
5. Barley			
6. Rice			
7. Other cereal crops			

23.11. What is the average milling price per quintal of *Teff* in the market?	**23.12. In a given week, how manytimes you bake injera to feed your family?** **(Choose one from the options)** 1= Once per week 2= Twice per week 3= Three times per week 4= Four times per week 5= Five times per week 6= Six times per week 7= Daily	**23.13. In one baking of injera for household consumption, on average how much injeras are baked at a time?**	**23.14. From your experience, how much injeras can you bake from one kilogram of *Teff?*** **(Choose one from the options)** *1= One injera* *2= Two injeras* *3= Three injeras* *4= Four injeras* *5= Five injeras* *6= Six injeras* *7= Seven injeras* *8= Above seven injeras*	**23.15. How frequently does your household consume *Teff Injera*?** **(Choose one from the options)** 1= Once per day 2= Twice per day 3= Three times per day 4= Once per two days 5= Once per three days 6= Once per week 7= No consumption of *Teff injera*	**23.16. How many pieces of *Teff Injera* normally does your family on average eat at one meal?** **(Choose one from the options)** 1= One *Injera* 2= Two *Injeras* 3= Three *Injeras* 4= Four *Injeras* 5= Five *Injeras* *6=* Six *Injeras* 7= Seven *Injeras* 8= More than seven *Injeras*

24. Major opportunities and challenges of *Teff* production and distribution (Open ended questions)

24.1. Would you please outline the major opportunities of *Teff* production?

1. ____
   ____
2. ____
   ____
3. ____
   ____

24.2. Would you please outline the major challenges of *Teff* production?

1. ____
2. ____
3. ____

24.3 Would you please outline the major opportunities for *Teff* marketing?

1. ____
2. ____
3. ____

24.4. Would you please outline the major challenges for *Teff* marketing?

1. ____
2. ____
3. ____

24.5. Other issues you want to say in relation to *Teff* production, distribution and marketing?

1. ____
2. ____
3. ____

Thank you in advance for your time and initiatives in providing information!!!

APPENDIX 5: DISTRICT LEVEL INFORMATION SHEET

University of South Africa (UNISA)

College of Human Sciences, School of Social Sciences

Department of Development Studies

<u>District Level Information</u>

Part One: General information

1. Name of district: ________________________
2. Zone of district: ________________________
3. Region of the district: _____________________
4. Number of *Kebeles* in the district: ____________________
5. Number of sub *Kebeles* in the district: ___________________
6. Number of male heads of household in the district: _____________________________
7. Number of female heads of household in the district ___________________________
8. Total population of the district: Male ___________Female___________Total: ___________
9. Total cultivated area and production in 2010 E.C. harvest period in hectare:
   a. Cereal crops: ____________Total production of cereal crops in quintal_____________
   b. Spices: _________________ Total production of spices in quintal_________________
   c. Vegetables: _____________ Total production of vegetables in quintal ______________
   d. Fruits: __________________Total production of fruits in quintal ___________________

Part Two: *Teff* production at district level

1. Number of male households involved in *Teff* production in 2010 harvest period: __________
2. Number of female households involved in *Teff* production in 2010 harvest period: _________
3. Total cultivated area for *Teff* production in 2010 harvest period in hectare: _______________
4. Total *Teff* production in quintals in 2010 at district level by type of *Teff*:
   a. *Manga Teff* production in quintals: ________________________
   b. White *Teff* production in quintals: ________________________
   c. Red *Teff* production in quintals: __________________________
   d. Mixed *Teff* production in quintals: ________________________
   e. Total *Teff* production in quintals: __________________________
5. Which method of farming best describes your district level *Teff* production system?
   (Choose one from the options)
   a. Farming with rain fed

b. Basically, rain fed but supplemented with irrigation

c. Farming with irrigation

6. What are the major three opportunities of the district for *Teff* production?

a. ____

b. ____

c. ____

7. What are the major three challenges of the district for *Teff* production?

a. ____

b. ____

c. ____

Part three: Marketing of *Teff* crops at district level

1. Number of household farmer involved in supplying *Teff* crops to the market in 2010 E.C.

a. Male households: ____________________

b. Female households: ____________________

2. Number of quintals of *Teff* supplied to the market in 2010 by type of *Teff* crops

a. *Manga Teff* supplied to the market in quintals: ____________________

b. White *Teff* supplied to the market in quintals: ____________________

c. Red *Teff* supplied to the market in quintals: ____________________

d. Mixed *Teff* supplied to the market in quintals: ____________________

e. Total *Teff* supplied to the market in quintals: ____________________

3. Average price per quintal in 2010 by type of *Teff* crops in local markets at district level

a. *Manga Teff*: ____________________

b. White *Teff*: ____________________

c. Red *Teff*: ____________________

d. Mixed *Teff*: ____________________

4. The district level *Teff* production is fully satisfying the demand of *Teff* crops at district level.

a. Never (no) b. Rarely c. Yes, sometimes d. Yes, mostly e. Yes, always

5. What are the major three opportunities for *Teff* marketing in the district?

a. ____

b. ____

c. ____

6. What are the major three challenges of the *Teff* marketing at district level?

a. ____

b. ____

c. ____

Thank you for your collaboration and time!!!

APPENDIX 6: *KEBELE* LEVEL INFORMATION SHEET

University of South Africa (UNISA)

College of Human Sciences, School of Social Sciences

Department of Development Studies

<u>Kebele Level Information</u>

Part One: General information

10. Name of district:_____________________
11. Zone of district: _______________________
12. Region of the district: _______________
13. Name of *Kebele*:_____________
14. Number of male heads of household in the *Kebele*: _____________
15. Number of female heads of household in the *Kebele*: _____________
16. Total population of the *Kebele*: Female= _________, Male=________, Total= ___________
17. Total cultivated area and production in 2010 E.C. harvest period in hectare:
    a. Cereal crops :______ ha; total production of cereal crops in quintal: ________ quintal
    b. Spices:___________ ha; total production of spices in quintal: ________ quintal
    c. Vegetables:________ha; total production of vegetables in quintal: ________ quintal
    d. Fruits: ___________ ha; total production of fruits in quintal: ____________ quintal

Part Two: *Teff* production at *Kebele* level

***Teff* production**	**2008 E.C.**		**2009 E.C.**	
	Hectares	***Teff* production in quintals**	**Hectares**	***Teff* production in quintals**
a. Manga *Teff* production in quintals				
b. White *Teff* production in quintals				
c. Red *Teff* production in quintals				
d. Mixed *Teff* production in quintals				
e. Total *Teff* production in quintals:				

8. What are the major three challenges of *Teff* production at *Kebele* level?

a. ______________________________

b. ______________________________

c. ______________________________

Part Three: *Teff* Marketing at *Kebele* level

***Teff* marketing**	**2008 E.C.**	**2009 E.C.**
a. Manga *Teff* supplied to the market in quintals:		
b. White *Teff* supplied to the market in quintals:		
c. Red *Teff* supplied to the market in quintals:		
d. Mixed *Teff* supplied to the market in quintals:		
e. Total *Teff* supplied to the market in quintals:		

What are the major three challenges of the *Teff* marketing at *Kebele* level?

a. ______________________________

b. ______________________________

c. ______________________________

Thank you for your collaboration and time.