The effects of government agricultural development support on the livelihoods of small-scale farmers in South Africa

by

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Declaration

I, Mahlako Nthabeleng Mokgomo, hereby declares that the effects of government agricultural development support on the livelihoods of small-scale farmers in South Africa is my work and that all the sources used herein have been appropriately acknowledged in the form of complete references and that I have not previously submitted the dissertation for a degree at another university.

Ms Mahlako Nthabeleng Mokgomo

October 2019

Dedication

I dedicate this dissertation to my parents, Mr Maduke Alfred Mokgomo and Mrs Ramathetje Priscilla Mokgomo, who have always encouraged and inspired me to make fair use of all available opportunities while they are still alive.

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I would first like to express my gratitude to Almighty God who gave me the opportunity, wisdom, good health and strength to complete this dissertation. For the Bible says “When the time is right, I, the Lord, will make it happen’’ (Isaiah 60:22).

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Abstract

Over the past couple of years, the South African government has been offering varied support to households that are engaged in small-scale farming, with the objectives of improving their livelihoods, income and food security. Although the various rounds of the General Household Survey (GHS) gathered information on the type of agricultural support received by the farmers, their production, agricultural income and food security status, there is limited empirical evidence on the extent to which the agricultural support programme is yielding the intended results. Very little is also known about how the beneficiary households perceive the agricultural support programme as either relevant or otherwise. This study fills these gaps in the literature using the GHS data spanning the period 2013 to 2016 to assess how government agricultural development support influences the livelihoods of small-scale farmers in South Africa. This broad objective is divided into two specific objectives: (1) to assess the effects of government agricultural development support on agricultural income, production and food security of beneficiary small-scale farmers in South Africa; and (2) to assess the usefulness of the government agricultural development support for the beneficiary small-scale farmers in South Africa. By combining descriptive analysis with Propensity Score Matching (PSM) and logistic estimation techniques to address these objectives, the results indicate that from the year 2013 to the 2016 survey years, the proportion of households who have access to agricultural development support has decreased marginally by about two percent. Access to support has remained higher among males than females; farmers who have low levels of education than those with high levels of education. Across provinces access to agricultural support is high in the Eastern Cape, KwaZulu-Natal, Northern Cape, North -West and Mpumalanga, but very low in the Free State, Limpopo, Gauteng and Western Cape. The agricultural development assistance given by the South African government is effective in reducing food insecurity, as well as in improving the production and income of the beneficiary small-scale farmers. However, the results suggest that the agricultural support system is having a heterogeneous impact on beneficiary small-scale farmers, depending on their gender and geographical locations.

Keywords: *Agricultural development Support; Food security; Livelihood; Logistics; Production; Propensity Score Matching (PSM); Small-scale farmers*

Abbreviations

Alliance for a Green Revolution in Africa	AGRA
Average Treatment Effect	ATE
Common Agricultural Policy	CAP
Community-Based Organisation	CBO
Comprehensive Africa Agriculture Development Programme	CAADP
Comprehensive Agricultural Support Programme	CASP
Coupled Direct Payment	CDP
Department of Agriculture, Forestry and Fisheries	DAFF
Department of Land Affairs	DLA
Department of Rural Development and Land reform	DRDLR
Dwelling Unit	DU
East Nusa Tenggara Timur	ENTT
Enumeration Area	EA
Farmers Support Programme	FSP
Food and Agricultural Organisation	FAO
General Household Survey	GHS
Land Redistribution for Agricultural Development	LRAD
Local Government Area	LGA
Marginal Value Product	MVP
Micro Agricultural Finance Institutions of South Africa	MAFISA
Millennium Development Goals	MDG
New Partnership for African Development	NEPAD
Non-Governmental Organisation	NGO
Primary Sampling Unit	PSU
Proactive Land Acquisition Strategy	PLAS
Programme for Africa's Seed Systems	PASS
Propensity Score Matching	PSM
Purchasing Power Parity	PPP
Randomised Control Trial	RCT

Regional Agricultural Policy	RAP
Rural Development Report	RDR
Settlement and Land Acquisition Grant	SLAG
Southern African Development Community	SADC
Statistics South Africa	Stats SA

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CHAPTER 1: INTRODUCTION

1.1. Background

A large proportion of the world's population lives in rural areas where poverty, hunger and deprivation are most severe. The 2016 Rural Development Report (RDR) indicated that three out of every four low-income households in developing countries resides in rural areas where they, directly and indirectly, depend on agriculture for a living (Ogbeide-osaretin *et al*.,2019). With more than 70% of the world's less fortunate population residing in rural areas and depending on agriculture for their livelihood, somewhat suggests that the role of agriculture with regards to enhancing the livelihoods of households and small-scale farmers is essential (Ogbeide-osaretin *et al*.,2019).

Agricultural development support has remained one of the core strategies of governments in developing countries for improving the livelihood of farmers, particularly small-scale farmers who are directly involved in agricultural production. Improved food production, food security and higher rural income have been the main targets of governments in developing nations (Liu, 2014). Following these targets, foreign support together with the governments of developing nations have made substantial investments to improve the physical infrastructure, expand irrigation, enhance flood control, organise agriculture research and extensions in the rural areas (Liu, 2014). These investments varied from direct interventions, including the distribution of fertilisers, seeds, and other inputs to farmers. Indirect interventions include the creation of market access and provision of extension services, with the sole objective of improving the livelihood of farmers.

Overall, the agricultural sector has developed considerably in the past few decades where the industrialisation and globalisation driven by the advances in technology have shaped the production of food (Idsardi, 2014). The green revolution is a testimony to the effectiveness of agricultural development support, which contributed to a significant reduction in poverty and transformation of the economy of many Asian and Latin American countries during the 1960s and 1970s (Pinstrup-Andersen, 1993). Although this strategy was successful in these countries, it was the opposite in Africa due to environmental, political and economic differences (Aloyce *et al*., 2014; Dawson

et al., 2016; Diao *et al*., 2010; Toenniessen *et al*., 2008). The debate amongst the international development communities about the role of agriculture, particularly the development of small-scale farms in Africa was triggered by the introduction of green economy policies (Diao *et al*., 2010).

Following the productivity gains of the green revolution in Asia and Latin America, and widespread rural poverty in Africa, the Rockefeller Foundation and the Bill and Melinda Gates Foundation collaboratively launched the Alliance for a Green Revolution in Africa (AGRA) in 2006 (Diao *et al*., 2010). The goal of this policy is to devise appropriate ways to improve production and income of small-scale farmers with the focus on upgrading Africa's seed systems. The Programme for Africa's Seed Systems (PASS) which came into effect in 2007, is the first initiative under AGRA aimed at creating new varieties of seeds and making improved seeds much more accessible to farmers in Africa, especially to farmers in rural areas.

At the regional level, the Southern African Development Community (SADC) members acknowledged that the agricultural sector remains central to poverty reduction, growth and sustainable food security in the region (SADC, 2011). This sector provided livelihoods such as food, income and employment for nearly 70% of the SADC population (SADC, 2011). The most recent policy on agricultural development is the Regional Agricultural Policy (RAP) established in Gaborone, Botswana, in 2013 (McDermott *et al*., 2013). The overarching objective of the RAP is to enhance sustainable regional growth of agricultural and socio-economic development (SADC, 2011). South Africa is one of the SADC participating countries. Since 1994, the South African government initiated several agricultural development support initiatives meant to address past injustices. Agriculture was identified as one of the sectors to be developed through the land reform programmes, while also providing post-settlement support to those who would benefit from land reform. As in every developing country, the agricultural sector plays a vital role in South Africa's socio-economic development. The contributions spanning from job creation, poverty alleviation, food supply for both urban and rural residents serve as a source of raw materials to other sectors of the growing economy and engender foreign exchange (Greyling, 2012; Hall, 2009; Machethe, 2004; Musvoto *et al*., 2015). Given these contributions, the role of government in supporting the agricultural sector is crucial for economic development.

The efforts to support South Africa's agricultural sector follows the dualistic system of agriculture inherited after 1994, of which the land ownership pattern was racially skewed. The land restitution policy was to ensure that unfairly dispossessed people of the post-1913 Land Act were entitled to either restitution of that property or were appropriately compensated. While before 1994, 87% of the well-developed agricultural land was possessed by Whites who operated capital intensive commercial agriculture that contributed up to 95% of agricultural output. Blacks were predominantly small-scale farmers who owned only 13% farmland with a 5% agricultural output contribution (OECD, 2006; Pienaar & Traub, 2015; Thamaga-Chitja & Morojele, 2014). Earlier studies show that the agricultural output of small-scale farmers in South Africa is generally low as a result of some constraints (Altman *et al*., 2009; Baiphethi & Jacobs, 2009; Marín-González *et al*., 2018; Matshe, 2009).

Among these constraints is limited access to finance, lack of access to markets, poor infrastructure, low levels of education, lack of production inputs such as seeds and fertiliser, climate change, droughts, soil erosion and water pollution and this suggests that sufficient and adequate agricultural development support must address these challenges and improve the livelihood of small-scale farmers through improved agricultural production, income and food security. Although agricultural production is heterogeneous between small-scale farmers, numerous studies indicated that farmer's characteristics such as age, level of education, farming experience, marital status, household's size and gender affect their farm's productivity (Abur, 2014; Ifeoma & Agwu, 2014; Sekhampu, 2013). Contrary, heterogeneity exists on the different types of support because individual farmers receive additional support, which leads to different outcomes on productivity, income and food security.

The sole purpose of this study is to assess the effectiveness of agricultural development support on the livelihood of small-scale farmers in South Africa. The 2016 GHS showed that small-scale farmers received agricultural development support from the government, the private sector, Community Based Organisations (CBOs) and Non-Governmental Organisations (NGOs). Assistance included training, extension services, grants loans in the form of money, loans in the form of input, free inputs, vaccination, and other unspecified forms of support. The link between these and the

livelihood of small-scale farmers is shown through improved income, productivity and food security.

1.2. Problem statement

Transformation of small-scale farmers to large scale commercial farmers requires intervention either by government or cooperatives or joint ventures collaborations. Nonetheless, the outcomes of most of the interventions by the government institutions have been suboptimal, partly due to several institutional capacities, enforcement constraints, climate change, weather variability and other factors which makes it difficult for production (Blignaut *et al*., 2014; Cilliers, 2015; Sikwela & Mushunje, 2013). Population dynamic also plays a significant role in the distribution of funds to smallholder farmers (Cilliers, 2015). The unemployment rate recorded in the third quarter of 2017 was 27.7% while the proportion of the population living below $1.90 per day at Purchasing Power Parity (PPP) was 15.9% as of 2016 (Stats SA, 2017).

These socio-economic challenges are most severe in the rural areas which are predominantly occupied by small-scale farmers whose livelihoods depend directly and indirectly on agriculture. Small-scale farmers are constrained by institutional bottlenecks, which include limited access to information, lack of technical skills, high marketing and transaction costs, resulting in low quality and production volumes. Lack of policy cohesion and coordination has led to duplication, uncoordinated efforts and inadequate progress towards national and international development targets of food security (Blignaut *et al*., 2014). Although access to agricultural support is crucial for enhancing agricultural productivity, income, enhancing food security and alleviating poverty of the households, lack of these support services has been identified as a significant reason for the low performance of small-scale production (Sibisi, 2015). Possibly, no guarantee receiving such support will necessarily translate into improved productivity and living standards of small-scale farmers.

1.3. The motivation of the study

Many small-scale farmers have received agricultural development supports but remain unproductive. This situation raises a concern about the interventionist and one-dimensional approach used by the government over the years, which could engender continuous dependence of farmers on such supports. Although there seems to be a

consensus that lack of monitoring and institutional coordination have engendered the ineffectiveness of the numerous agricultural development support policies and programmes, one possible challenge is the limited number of empirical studies that have assessed the effectiveness of these policies from a nationally representative perspective. The available studies on this topic have been mostly limited to either provincial or district levels (Magadani, 2014; Sikwela & Mushunje, 2013; Xaba & Dlamini, 2015).

1.4. Research questions

This study addresses the following research questions:

1. What are the effects of government agricultural development support on the livelihoods of beneficiary small-scale farmers?
2. To what extent is government agricultural development support useful to small-scale farmers?

1.5. Research objectives

The main objective of this study is to assess how government agricultural development support influences the livelihood of small-scale farmers and to provide evidence of the support offered thereof.

The specific objectives of this research are:

- To assess the effects of government agricultural development support on agricultural income, production and food security of beneficiary small-scale farmers in South Africa.
- To assess the usefulness of government agricultural development support on beneficiary small –scale farmers in South Africa.

1.6. Ethical considerations

The study involves the use of secondary data which is already accessed from the National Income Dynamic Survey. However, it follows the guidelines and procedures of the Research and Higher Degrees Committee in the Department of Agriculture and Animal Health of the University of South Africa.

1.7. Chapter outline

Chapter 1 provided the introduction to and background of agricultural development support and policies at global, regional and local levels.

Chapter 2 discusses empirical literature on agricultural development policies and programmes in South African perspectives and how they affect the livelihood of households and small-scale farmers.

Chapter 3 explains the methodology used to achieve the objectives of the study. Under this section, a comprehensive explanation of the research design, sampling process, sample size, and the data used in the analysis will be presented.

Chapter 4 presents the results (obtained using descriptive analysis, the PSM approach, and logistic estimation techniques) and discusses the findings concerning existing literature.

Chapter 5 summarises the study, draws some conclusions, and provides policy-relevant recommendations based on the findings of the study.

The next chapter of the thesis presents the literature review, together with the theoretical framework of the study.

CHAPTER 2: LITERATURE REVIEW

2.1. Introduction

Small-scale farmers play an essential role as both producers and consumers in developing economies, due to the 35% contribution towards world's food supply, they require access to production inputs, research, extension services, infrastructure and markets to enable them to graduate from small-scale to commercial farming (Baloyi, 2010; Hudson *et al.,* 2016). Such a transformation is necessary to enable these farmers to expand their contribution to the economy from small-scale to large-scale producers and employers. Evidence from Zimbabwe, Malawi and Kenya suggests that comprehensive farming support is the best strategy to advance from small-scale to commercial agriculture (Baloyi, 2010).

Government has increased budget spending on the agricultural sector in supporting small-scale farmers (Aliber & Hall, 2012; Khapayi & Celliers, 2016; Vink, 2012). However, Khapayi and Celliers (2016) asserted that till date, there had not been satisfactory evidence that these efforts have been successful. As already highlighted in page three (problem statement), Small-scale farmers in most rural areas are unable to engage in commercial farming due to several constraints, including access to finance, access to markets, poor infrastructure, low levels of education, high production inputs costs of seed and fertiliser, climate change, droughts, soil erosion and water pollution (Khapayi & Celliers, 2016; Mpandeli & Maponya, 2014; Ortmann & King, 2007; Hassan & Sikhweni, 2014; Von Loeper *et al*., 2016).

This chapter reviews the existing empirical literature on agricultural development support programmes and the impact of these programmes on the beneficiary small – scale farmers in South Africa. The chapter further discusses the existing theoretical framework on market failure, which underpins the objectives and the empirical findings of this study. The first subsection provides the full explanations of the concepts that are frequently used in this study, followed by the overview of agriculture in South Africa and its contribution to the economy. The final subsection provides a brief conclusion of the main findings from the literature.

2.2. Definition of concepts

This section provides the full definition of the concepts that are used frequently in this study.

2.2.1. Agricultural development

According to IFAD (2016), agricultural development is “defined as the state in which the quality of life and economic well-being of farmers, herders and agricultural workers are improved by focusing on the exploitation of land-intensive natural resources such as agriculture, livestock, forestry and fisheries”. It further involves an improvement in the agricultural services, agricultural incentives, technologies, resources such as land, irrigation, human capital and rural infrastructure which are used in agricultural production.

2.2.2. Livelihood

The term livelihood has remained a commonly used and applied concept at the household level. It was stated that 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 shocks and stresses and maintain and enhance its capabilities and assets both now and in the future” (chambers and Conway, 1991 cited by Scoones, 2009).

2.2.3. Small-scale farmer

According to Pienaar (2013), the concept “small-scale farmers” comprises two groups, namely: the emerging smallholder, and the subsistence, farmer. Similarly, “emerging smallholder farmers” is a term loosely used to describe farmers who are in the former homeland areas and are predominantly Black. “Subsistence farmers” refers to the category of farmers who produce agricultural goods for consumption by their households (Pienaar, 2013). In many instances, some studies interchangeably used the term “smallholder farmer” to represent “small-scale”, “resource-poor”, “emerging”, and “peasant” farmer (Sinyolo and Mudhara, 2018). Kirsten and Van Zyl (1998) defined a small-scale farmer as the one who operates on a scale which is too small to attract the provision of the services requires to be able to increase productivity significantly.

2.2.4. Food security

The World Food Summit “defines food security as a state where all people, at all times have physical and economic access to sufficient, safe and nutritious food to meet their dietary requirements and food preferences for an active life” (FAO, 1996).

2.3. Overview of the Agricultural sector in South Africa

The dualistic nature of the agricultural sector of South Africa is well documented in the literature (Aliber & Cousins, 2013; Greyling, 2012; Idsardi *et al*., 2008; Peach, 2015; Pienaar & Traub, 2015; Pienaar, 2013). The sector comprises commercial and small-scale farming, where the commercial sector utilises up to 86.2 million ha of the land while the small-scale sector occupies only 14.5 million ha for agricultural production (Pienaar, 2013). There are approximately 35,000 commercial farmers in South Africa with the capacity to generate up to 95% of the agricultural production. However, the number has been declining in the past two decades from 60,000 in 1994 to 45,000 in 2002 and 39,966 in 2007 (Bernstein, 2013; Hall, 2009). This trend is primarily attributed to the consolidation of landholdings into larger units of ownership and production, to enable farms acquired by neighbours to have become part of a larger farming enterprise (Bernstein, 2013; Hall, 2009).

The literature further indicates that the small-scale sector is made up of approximately 2.5 million low-input and labour-intensive small-scale farmers (Pienaar, 2013). This figure indicates that there are more small-scale than commercial farmers in South Africa. These small-scale farmers are mainly concentrated in the rural provinces of Limpopo, Eastern Cape, KwaZulu-Natal, North West, and Free State. According to Bagherzadeh (2007), most of these small-scale farmers, particularly those who benefited from the government support programmes, are willing and striving to become commercial farmers.

2.4. Agricultural sector contribution to livelihoods

The agricultural sector plays a pivotal role in the economy of South Africa due to its contributions to livelihood. The sector’s contributions include job creation, poverty alleviation, food security for both urban and rural areas, and provision of raw materials for other sectors of the economy and to the generation of foreign exchange (Greyling, 2012; Hall, 2009; Machethe, 2004; Musvoto *et al*., 2015). According to the GHS 2016

report, approximately 77% of the sampled households were engaged in agriculture production for different food sources while approximately 5.9% were involved in agricultural production to earn extra income (StatsSA, 2016).

Agriculture is often identified as the sector which supports the creation of much employment (Machethe, 2004). Approximately 8.5 million people in the country, directly and indirectly, depend on agriculture for employment and income (DWS, 2016). This evidence somewhat suggests that the agriculture sector plays a crucial role in enhancing the livelihood of many households in South Africa. Figure 2-1 illustrates the trend of employer contributions from different industries in South Africa. Agriculture has not been contributing much towards employment, due to drought which affected the Western Cape, Eastern Cape and Free State province between 2014 and 2017 growing seasons. Between 2008 and 2017, the employment share of the agricultural sector surged by 6%, compared to utility (55%), finance (51%), mining (42%), social services (38%), transport (29%) and construction (24%). There is an element of hope that, if given the needed support, the agricultural sector can significantly contribute to the reduction in the growing unemployment rate in South Africa.

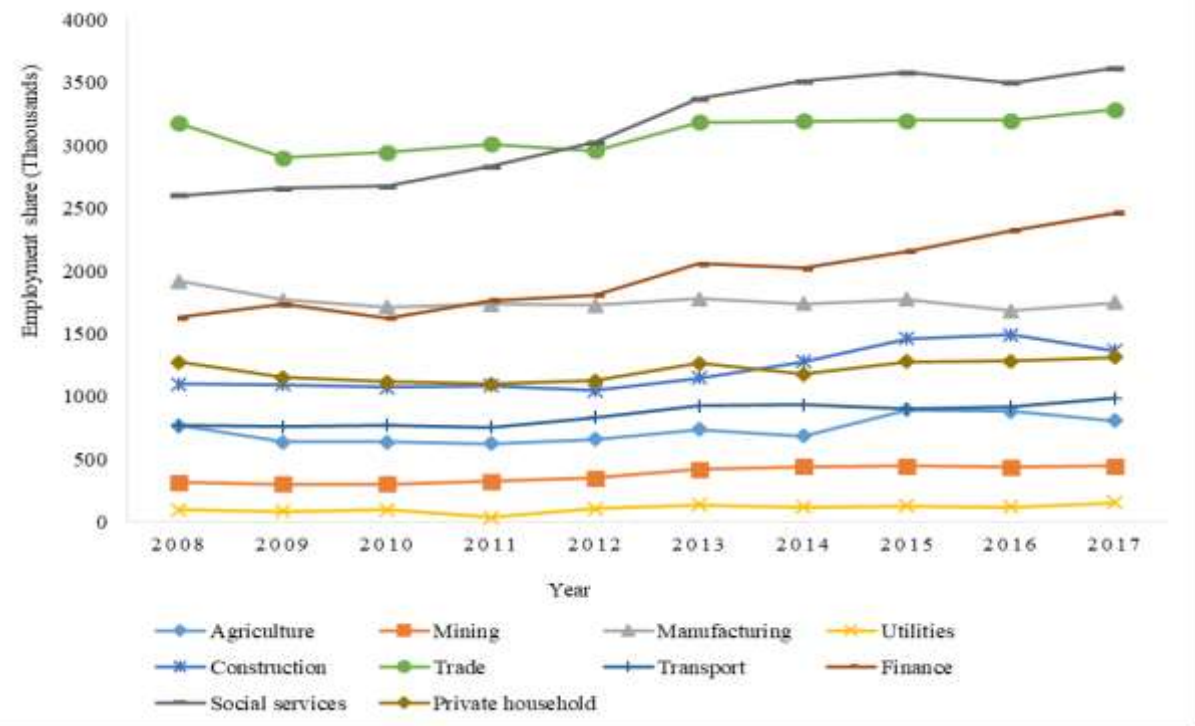

Figure 2.1: Employment by industries in South Africa (Source: Stats SA (2017))

Nationally, it is documented that South Africa can improve national food sufficiency by combining their production and food imports, which has contributed to improved food access and a decline in hunger (FAO, 2015). Nonetheless, available statistics from the 2005 National Food Consumption Survey revealed that 52% of the population were deemed food insecure. In 2008, the South African Social Attitudes Survey indicated that 25.9% of the population were food insecure (Labadarios *et al*., 2011). The latest statistics, according to the 2016 GHS by Statistics South Africa (Stats SA) has indicated that the rate of food insecurity has reduced to 22.3% (StatsSA, 2016).

Due to various indicators and measures used by different surveys in assessing food security, these surveys produce different results because of different investigations of food security dimensions, including food access, amount of income that households spend on food, hunger, poverty, household food production, employment status, different methodologies and sample sizes used in assessing food security (Altman *et al*., 2009; Baiphethi & Jacobs, 2009; Hart, 2009). Despite adequate food supply and distribution at the national level, access to and affordability of food at the household level remain constrained. It is estimated that poverty, income rates, inequality, and unemployment cause approximately 20% of households to be food insecure (Faber *et al*., 2011). However, one difficulty faced in precisely estimating and monitoring progress towards household food security is partly due to scarcity of data, differences in the sampling and methodology used in existing surveys that report on food security (Altman *et al*., 2009).

Domestic production depends mostly on the total performance of the agricultural sector. However, this is also dependent on the country's capacity to import, store, process and distribute food (Faber *et al*., 2011). South Africa is generally considered to self-sufficient in field crops, horticulture and livestock production. Evidence suggests that the country has maintained positive self-sufficiency ratios for fruits, maize, potatoes, sugar, dairy, and beef, but negative ratios for wheat, poultry, pork and mutton (FAO, 2017). As a result, the country depends on imports to satisfy domestic demand for these specific product groups. For instance, South Africa's average annual production of wheat is estimated at around 1.7 million tons, while the annual average total commercial wheat demand is just over 3 million tons. The country relies on about

40%-50% of imports of domestic consumption in order to meet total commercial demand (Grain SA, 2017).

According to Drimie and McLachlan (2013), recent reviews suggested that there is a need for adequate solutions to address the complex challenges that currently confront the country's food system. Among such challenges are the rapidly changing context which includes long wave stresses such as climate change and short-wave shocks such as food price volatility. The risk of food insecurity in South Africa complicated by intensifying conditions of political, socio-economic, and environmental vulnerability are often silent (Drimie & McLachlan, 2013). A combination of these conditions and external threats has the potential to cause widespread suffering and deepen food insecurity in South Africa if left unattended. Overall, South Africa covers 1.2 million km2, of which only 13.7% is used for crop productions, while 20% of the land is arable and conducive for agricultural production (Bernstein, 2013). The arable land in the country is underutilised and mostly used for grazing. South Africa faces multiple problems of water scarcity, uneven and unreliable rainfall where only 10% of the country receives approximately 750 mm of rainfall a year. Approximately 1.3 million ha of the cultivated land is under irrigation, while more than 50% of fresh water is used for agricultural purpose (ACB, 2017; Bernstein, 2013; Pienaar, 2013).

2.5. Agricultural development support and livelihood in South Africa

From studies conducted by (Crush *et al*.,2011; Joshi *et al*.,2011; Huet *et al*., 2012), it has been primarily documented that the rates of poverty and food insecurity in developing countries are high. Before the introduction of the Green Revolution, approximately 50% of the population in developing nations were food insecure and lived in poverty (Anderson and Jackson, 2005). Green Revolution came into effect in the 1960s in Asia and Latin America to address the issues of hunger in those developing nations. This effort involved the introduction of new technology such as bio-engineered seeds, chemical fertiliser, pesticides, and intensive irrigation to increase crop yields in the agricultural sector in order to increase its production through different measures (Ahmad *et al*., 2004; Pinstrup-Andersen, 1993). In the 1960 and 1970s, the Green Revolution rapidly spread through developing countries in Asia and Latin America where genetic improvement of staple food crops such as maize, wheat, and rice combined with corresponding agronomic practices, supportive policies and

reinforced institutions enhanced overall production of food to commensurate with the pace of population growth (Toenniessen *et al*., 2008).

Over the years, support services have encouraged the adoption of new technologies and practices which have contributed to significant improvement in the productivity of many crops. For instance, all the countries that adopted the Green Revolution have experienced a surge in their agricultural output. Generally, the yields (in kilograms per hectare) of developing countries increased strongly between 1960 and 2000. The growth of wheat, rice, maize, potatoes and cassava were 208%, 109%, 157%, 78% and 36% respectively (Pingali, 2012). The success of the Green Revolution was mainly associated with government subsidies, credit, improved infrastructure and the uptake of technologies through research and extension services (Aloyce *et al*., 2014). Irrespective of these achievements of small-scale farmers in Asia during the Green Revolution, there is the uncertainty that the dominant small-scale farmers in most African countries can replicate this model and deliver agricultural growth (Pretty *et al*., 2011).

Learning from Asia and Latin America's success story of the Green Revolution, Africa's Green Revolution was introduced during the 1970s and 1980s in order to address the challenges facing the agricultural sector. According to Toenniessen *et al*. (2008) and Aloyce *et al*. (2014), Africa's Green Revolution experience has not been as sustainable as expected despite the significant funding and effort to support agricultural development on the continent. Africa and Latin America differ in the conditions and environment for improving agricultural production. Some parts of Africa face several specific challenges, such as rainfall being too low, too high or erratic; insufficient irrigated land; more dispersed rural population; scarcity of labour; limited labour-saving mechanisation; high input costs; and few roads and railroads providing access to markets. (Aloyce *et al*., 2014; Dawson *et al*., 2016; Toenniessen *et al*., 2008)

Following Asia and Latin America's productivity gains from the Green Revolution, the Rockefeller Foundation and the Bill and Melinda Gates Foundation collaboratively launched AGRA in 2006. The aim was to develop a feasible approach to improve the production and income of small-scale farmers with a focus on upgrading Africa's seed systems. The first initiative under AGRA started in 2007: PASS is aimed at creating

new varieties of seeds and enhance farmers' access to improved seeds in Africa and more importantly, farmers in the rural areas. PASS is targeted at developing 100 new varieties of the crop in five years, with the view to doubling or tripling the yields, increase the income and lift African farmers and their families out of poverty and hunger within 20 years (Blaustein, 2008; Toenniessen *et al*., 2008).

AGRA was integrated into the framework of the Comprehensive Africa Agriculture Development Programme (CAADP), an initiative launched by the New Partnership for African Development (NEPAD) in July 2003 to facilitate the achievement of the food-security-related targets of the Millennium Development Goals (MDG). These food-related targets which constitute components of the first goal of the MDG, sought to reduce by half the proportion of people who lived on less than $1.25 a day; and to reduce by half the proportion of individuals suffering from hunger within the period 2000 to 2015 (FAO. IFAD and WFP, 2015).

The adoption of the CAADP as a framework by members of the African Union at the Maputo Summit in July 2003 was to accelerate agricultural development and food security. Within that framework, African governments were required to expand resources for agriculture and rural development to at least 10% of their national budgets to achieve 6% growth of the agriculture economy by 2015 (Ajayi *et al*., 2011). As of November 2013, a total of 13 countries (Burundi, Burkina Faso, the Democratic Republic of Congo, Ethiopia, Ghana, Guinea, Madagascar, Malawi, Mali, Niger, Senegal, Zambia, and Zimbabwe) had been able to meet or exceed the 10% target in one or more years since 2003, even though Africa as a whole had not met the CAADP targets (Naphtal, 2018).

Agricultural development support programmes remain instrumental in alleviating poverty, food insecurity and increasing agricultural production of households in developing countries such as South Africa. Thus, the government's role in supporting the agricultural sector is vital for employment creation and economic development of the country (Xaba & Dlamini, 2015). Small-scale farmers in developed nations such as the United States and certain countries in Europe have full government support, which has caused developing countries to have the feeling and perception of the unequal playing field for farmers (Sibisi, 2015). South Africa is one of the countries

that have reduced their support to farmers over the last three decades, making farmers in the country one of the least supported in the world (Sibisi, 2015). According to OECD (2017) South Africa, New Zealand, Chile and Brazil provided deficient levels of support to producers, with the [1]Producer Support Estimates approximately 5% in the period 2014 – 2016, whereas countries such as Norway, Iceland and Japan support their producers at approximately 50%.

According to the literature, the support for small-scale farmers in South Africa began in the 1980s by the Development Bank of Southern Africa (DBSA) with the critical purpose of addressing constraints of farmers in the [2]homeland areas (Kirsten & Van Zyl, 1998). This effort, named Farmers Support Programme (FSP), was a tool that the government developed to assist small-scale farmers in the homeland areas to improve their agricultural production, food security and income through comprehensive agricultural support (Peach, 2015; Sikwela & Mushunje, 2013). The FSP provided small-scale farmers with comprehensive agricultural support including production inputs through credit, mechanisation services, agricultural infrastructure, extension and research services, training and marketing. According to Kirsten (1994), Peach (2015) and Vink, (2012), the FSP was successful because farmers who participated in this programme gained improved access to inputs, extension services and mechanisation along with increased production. However, little attention was given to market development and institutional capacity-building.

Although the FSP was successful at the end of the era of apartheid in 1994, the well-developed agricultural land was owned by Whites who operated capital intensive commercial agriculture that contributed up to 95% of agricultural output, while Blacks, who were predominantly small-scale farmers, owned only 13% of the agricultural land with a contribution of 5% of agricultural output (OECD, 2006; Pienaar & Traub, 2015;

[1] Producer Support Estimates can be "described as the annual monetary value of the gross transfer from consumers and taxpayers to agricultural producers, measured at the farm gate level, based on the implementation of the policy measures that support agriculture" (OECD, 2017).

[2] Homelands are "described as those areas characterised by low standards of living compared to most parts of South Africa due to poor infrastructural development and welfare services coupled with high levels of poverty" (Niyimbanira, 2016). Ten homelands (Transkei, Bophuthatswana, Ciskei, Venda, Gazankulu, KaNgwane, KwaNdebele, KwaZulu, Lebowa and QwaQwa) were established in South Africa.

Thamaga-Chitja & Morojele, 2014). Since then, the South African government had developed comprehensive land reform policies and programmes to redress the historical injustice of land dispossession, denial of access to land, and forced removals of households. Policies were meant to ensure that the property of people who were victims of unfair dispossession following the 1913 Land Act was entitled to either restitution of that property or compensation.

Policies and programmes implemented under land reform can be classified into three types, namely land tenure, redistribution and restitution. While land tenure involves addressing the challenges associated with the administration of land in the communal areas of the former homelands, which has the highest concentrations of poverty in the country, land redistribution is aimed at providing previously disadvantaged Black South Africans with land for settlement and small-scale farming purposes. It was further intended to handover 30% of agricultural land belonging to Whites, to individuals who were previously disadvantaged by 2014 (Palmer and Sender, 2006). Redistribution of land is generally considered as having the potential to improve the livelihoods of the rural poor significantly and to propel economic development (Hall *et al*., 2003). The government established the farmers support programmes mainly meant for the land reform beneficiaries, but also none land reform beneficiaries, taking cognisance of the fact that not all small-scale farmers are beneficiaries.

The land redistribution programme had three phases, of which the first programme came into effect in 1994 and the last one, the Settlement and Land Acquisition Grant (SLAG), in 2000. The SLAG was aimed at improving land tenure security and extending property ownership and access to land to the historically disadvantaged and the poor. The grant also targeted at assisting individuals who, in the first instance, have land needs and security of tenure issues (DRDLR, 2001). This Grant was only available for settlement, tenure, and non-agricultural projects such as ecotourism projects. It offered grants of R16,000 to qualified persons for purchasing and developing agricultural land, of which households earning R1,500 was targeted (DRDLR, 2001). The transfer and procedure of this programme were slow between 1995 and 1999, where only 41 of 79,696 claims were settled under the Restitution of Land Rights Act (No. 22 of 1994). The slow implementation was due to compulsory resolution of all land claims within the Land Claims Court (Bäckstrand *et al*., 2012).

This programme was, however, unsuccessful due to several challenges. Dlamini (2014) and Nxumalo (2013) mentioned that the redistribution projects were beset with severe problems such as too large groups, inadequate and insufficient post-transfer support. Most of the redistribution projects were not economically viable and did not appear to provide an appropriate process of transition from small-scale farming to medium or large-scale commercial farming. The provincial Land Affairs branches and Departments of Agriculture were not sufficiently coordinated (Nxumalo, 2013). All these challenges resulted in the programme has had little effect on job creation in rural areas or transformation of the holding of agricultural land, which compelled the [3]Department of Land Affairs (DLA) to end the programme since it was unable to meet its objectives (Nxumalo, 2013).

Following the inability of SLAG to meet its objectives, in 2001, the Department of Land Affairs (DLA) developed a new redistribution grant, Land Redistribution for Agricultural Development (LRAD). The primary purpose of the introduction of this programme was to narrow the post-transfer support gap that existed under SLAG. This programme was regarded as a tool for advancing the policy objectives of distributing 30% of commercial agricultural land to people who were previously disadvantaged by 2014 (Gildenhuys, 2016). LRAD was designed to transfer agricultural land to specific individuals or groups and deal with commonage projects, which aim to improve people's access to municipal and tribal land, mainly for grazing purposes. The programme was also aimed at empowering its beneficiaries to enhance their economic and social welfare through more productive use of land acquired through the redistribution programmes (Gildenhuys, 2016).

This programme was also slow in handing over land to previously disadvantaged people, but following a 1999 amendment of the Restitution Act to allow for the acceptance of outcomes of negotiation processes and settlement of land claims following section 42D of the Act, the number of settled claims increased from 41 in 1999 to 75,000 in 2008 (Bäckstrand *et al*., 2012). Antwi and Oladele (2013) evaluated this programme's effects on the livelihoods of beneficiaries and found low achievement of some of the vital livelihood indicators such as low quality of infrastructure, little skills

[3] The DLA is now called the Department of Rural Development and Land Reform (DRDLR).

training, unsatisfactory contribution to food security, insufficient savings, and financial restraints. In contrast, Nxumalo (2013), highlighted that limited access to capital and market, lack of mentorship, limited financial management skills, and poor infrastructure have contributed to the failure of this programme. It was further mentioned that government funds were not allocated based on the needs of the farmers. All these problems led to phasing out the programme and to the start of the third phase of the redistribution programme, namely the Proactive Land Acquisition Strategy (PLAS), which was launched in 2006 and is running to date (Nxumalo, 2013).

The main objectives of PLAS are to contribute to the higher path of growth, employment and equity (DLA, 2006). This programme is aimed at accelerating the process of land transfer and ensure the productive use of land acquired (DLA, 2006). There is not enough evidence on the assessment of PLAS. A year after the implementation of PLAS, the Department of Agriculture, Forestry and Fisheries (DAFF) responded to the challenge of weak post-settlement support by introducing the Comprehensive Agricultural Support Programme (CASP) during 2004/2005. The programme is meant to support post-settlement to targeted people who would benefit from the land reform and other formerly disadvantaged subsistence, emerging, and commercial farmers who acquired their land through private means and were engaged in value-adding enterprises (GCIS, 2015).

CASP is a conditional grant, funded by the national government, to complement provincial funding for accelerated delivery of support services to farming communities (Bäckstrand *et al*., 2012). The focus is on six key pillars: on- and off-farm infrastructure, training and capacity building, (2) technical advice and assistance, (3) marketing and business development, (4) information and knowledge management, and (5) financing mechanisms (Sibisi, 2015). CASP targets the livelihood of these farmers by seeking to increase their productivity and income, reduce poverty, and create employment (Sibisi, 2015). According to Sibisi, (2015), CASP has made significant progress towards the achievement of some of its objectives, specifically the enhancement of access to support services, increase in agricultural production and increase in income for beneficiaries. However, with regards to the promotion of commercialisation, access to market, employment, and achievement of food security, the progress made has been inadequate. Land reform programmes have contributed to improvement in the

income and livelihoods of the small-scale farmers who received land, despite the lack of government support for planning and production. These farmers have earned income from crops and livestock production. In contrast, Binswanger-Mkhize (2014) argued that the implementation of the land reform policy has been deficient as far as land transferred for agricultural production and the creation of livelihoods are concerned. Minimal progress has been made to-date in meeting the objectives of land redistribution such as the creation of livelihoods for the poor in rural areas and the agricultural sector development.

Other overlapping, but not identical, auxiliary programmes that have been introduced since 1994 to support small-scale farmers, are: Micro Agricultural Finance Institutions of South Africa (MAFISA), established in 2004, to provide agricultural production loans to small-scale farmers in the field of agriculture, forestry and fisheries (GCIS, 2015); the ILLIMA/LETSEMA Programme which was introduced in 2009, is focused on increasing food production and reforming irrigation schemes and other projects meant for contributing to value addition, and provision of production inputs to subsistence and small-scale farmers (GCIS, 2015); the 2013 Fetsa Tlala food initiative ("Defeat Hunger"), which was launched to bolster food and nutrition security and address the fundamental causes of food insecurity, and to increase food production by making 1 million ha of land available to maximise food cultivation during the 2018-2019 production period (GCIS, 2015).

Apart from the land reform support programmes, other government departments and NGOs are also involved in supporting small-scale farmers. On the government side, there are the DAFF, DRDLR, provincial departments of agriculture (PDAs), National Agricultural Marketing Council (NAMC (National Agricultural Marketing Council)), the Agricultural Research Council, Land and Agriculture Development Bank (Land Bank), and various other province-based parastatals, including the Eastern Cape Rural Development Agency and KwaZulu-Natal's Agribusiness Development Agency. NGOs include Grain South Africa, the National Woolgrowers Association (NWGA), Maize Trust, Winter Cereal Trust, and the Potato Industry Development Trust. The private agribusinesses which are more focused on inputs supply and storage facilities include NWK, VKB, OVK, MGK, Senwes, Suidwes, Afgri, NTK, GWK, Monsanto, Pannar, Syngenta, Omnia, and Sasol Nitro. Despite this sizeable support from

different Organisations, access to agricultural support in South Africa remains a significant challenge which limits the small-scale farmers' growth, especially those in the former homeland areas (Sebopetji and Belete, 2009).

The next subsection provides the overview of the types of support that the small-scale farmers received as reported by the 2016 GHS. The survey indicates that South Africa's small-scale farmers receive several agricultural development support initiatives from government, the private sector, CBOs and NGOs. The types of support investigated in the survey are training, extension services, grants, loans in the form of money, loans in the form of input, free inputs, vaccination, other unspecified forms of general government support, and access to support from sources other than the government. The GHS presents a comprehensive list of questions as to whether the household received various types of agricultural support from the government, followed by two other questions on the usefulness of government support in general, and access to support from sources other than the government.

2.6. Impact of agricultural extension services on small scale farmers

It is documented that small-scale farmers in rural areas have low levels of education, lack of information and other farming skills. Thus, this makes extension services and agricultural training support essential for the development of the sector. Tsado *et al*. (2014) argued that farmers could increase their productivity and improve their incomes when they are trained and encouraged to adopt improved technologies in their production activities. According to Aliber *et al*. (2016), agricultural training appears to be another name for, or like, extension services. However, in the agricultural sector, agricultural training refers to the short courses provided by accredited service providers and agricultural colleges.

Muzah, (2018) indicated that there is a different form of extension services, including farmer field schools, training and visit systems, innovation platforms and fee-for-services. The courses involve mostly technical aspects such as broiler production, management-related courses such as marketing and financial management. Focusing on rice farmers in the North Central Zone of Nigeria, Tsado *et al*. (2014) investigated the impact of the training programme on their income and welfare. The results showed that participants in the training programme had a significantly higher income than their

counterparts who were non-participants. The results suggest that participation in the programme improved the income of rice farmers in the study area.

The extension services are meant to enhance and stimulate productive use of land through the provision of services such as training on production methods, marketing and organisation of farmers into groups for inputs purchasing, output marketing and access to finance (Aliber & Cousins, 2013). This service is mainly provided by various statutory and non-statutory institutions of the national and provincial departments of agriculture, with the focus towards small-scale farming. Currently, there are 3,200 extension officers in the country. Other studies on the agricultural extension services focused mainly on the country-specific and district level with different applications of the methodology. For instance, at the country level, Sattaka *et al*. (2017) examined the glutinous rice farming households, food security, and the extension services in areas producing glutinous rice in Vietnam. The study found extension services to be very active and comprehensive. It was further observed that the services were playing a vital role in advancing the sustainable production of glutinous rice and contributing to food and cultural security in the country. Ragasa and Mazunda, (2018), examined the impact of the interplay between fertiliser subsidy and access to extension services on farmer's productivity and food security in Malawi. The results showed that fertiliser subsidy positively impacted farmer's productivity and food security, but access to extension services remained insignificant in explaining the productivity and food security of the respondents.

Pan *et al*. (2018) evaluated the causal impacts of a large-scale agricultural extension programme on food security of smallholder female farmers in Uganda. The results revealed significant increases in agricultural production, savings and wage income of the farmers, which enabled them to improve their food security. In South Africa, Abdu-Raheem and Worth (2011) explored the role of agricultural extension in realising the goals of addressing food insecurity and alleviating poverty in rural households. The results revealed that extension services are essential in addressing food insecurity and alleviating poverty through technology transfer and innovation, development of human and social capital and increase in market access.

At the district level, Kipkurgat and Tuigong (2015) investigated the food security implications of agricultural extension services among small-scale farmers in the Wareng district, Kenya. The results showed that extension services improved the living standards and food security of farmers. Nonetheless, the extension service had widened the wealth gap between farming households that were supported and those who were not supported. Similarly, Boyne (2003) estimated the effects of agricultural extension services on-farm agricultural productivity in the Mbale district of Uganda. They observed that except for maize output, the services significantly increased bean and rice production, and gross farm revenue and profit.

2.7. Impact of Credit/loans on the productivity of small-scale farmers

Access to credit is believed to influence the household's livelihood indicators such as agricultural productivity, food security and technology adoption (Spio, 2006). Despite its significant contribution, a lack of financial capital is a significant challenge for small-scale farmers in South Africa. Small-scale farmers receive little financial support compared to the commercial farmers, even though initiatives such as Land Bank, Ithala Bank and Uvimba Finance were able to provide credit. Despite the availability of these financial supports, several small-scale farmers were unable to access credit because they were unable to provide the collateral due to high transaction costs (Sikwela & Mushunje, 2013).

In 2004 the South African government introduced MAFISA, which is designed to address the financial needs of the smallholder farmers and agribusinesses (Sinyolo *et al*., 2016). MAFISA offers services such as offering loans for production, facilitating saving mobilisation and the building capacity of member-owned financial institutions. DAFF allocates the MAFISA capital at the lowest interest rate to accredited financial institutions such as National Emergent Red Meat Producers Organisations, Mpumalanga Agricultural Development Corporation, Gauteng Enterprise Propeller, Eastern Cape Rural Finance Corporation, Kaap Agri, Peulwana and Hlanganani which lend to farmers (Sinyolo *et al*., 2016).

Studies on credit and grants support mainly focuses on the country-specific and district levels. At the country-specific, Awotide *et al*. (2015) examined the impact of access to credit on agricultural productivity (cassava) in Nigeria and concluded that access to

credit had significantly improved cassava productivity. In South Africa, Spio (2006) examined the characteristics and factors that determine small-scale farmers' access to credit. The results showed that agricultural productivity differs between credit borrowers and non-credit borrowers. However, access to credit can increase the output of the farmers. Another study by de Rosari *et al*. (2014) analysed the production, consumption, and investment impacts of demand and allocation of credit and capital support in the East Nusa Tenggara Timur (ENTT) province of Indonesia. The findings of that study suggested that the allocation of credit and capital supports increased cattle production, consumption expenditure and investment of the beneficiary household. The results of a closely related study by Girabi and Mwakaje (2013) which investigated the impact that microfinance had on agricultural productivity of smallholder farmers in the Iramba district of Tanzania showed that farmers who benefited from the credit realised higher agricultural productivity compared to their counterparts' non-credit beneficiaries.

2.8. Impact of agricultural support on income, food security and productivity of small-scale farmers

Agricultural input subsidies were among the principal instruments of the agricultural development strategies in Sub-Saharan Africa in the 1970s and 1980s (Jayne & Rashid, 2013). These strategies were mostly phased out in the 1990s in response to the imposition of the structural adjustment programmes on developing countries by the World Bank and International Monetary Fund (Jayne & Rashid, 2013). However, following the first African Fertilizer Summit in Nigeria in 2006, the agricultural input subsidies were reinstated by most countries, and their reintroduction gained momentum. In South Africa, a large proportion of farmers are into small-scale farming activities, and they predominantly reside in poverty- and food insecure-prone rural areas. One way of reducing poverty and food insecurity in these areas is through the enhancement of agricultural production (Sibande *et al*., 2015).

Baiphethi and Jacobs (2009) argued that subsistence and smallholder agriculture could be an essential venture in reducing rural and urban households' vulnerability to food insecurity by improving their livelihoods and helping to reduce exorbitant food price. Food security alleviation can be achieved by motivating farmers to adopt sustainable intensification of production using improved inputs (Baiphethi & Jacobs,

2009). Kato and Greeley (2016). argued that, due to limited and low income of these households, they are hardly able to afford the improved farm inputs that would enable them to produce food and cash crops on a large scale to meet household food and income security. As a result, agricultural input subsidies remains a policy instrument used by governments in developing countries to promote the use of fertilisers and hybrid seeds.

With regards to the review of the literature on agricultural inputs, Sibande *et al*. (2015) assessed how the implementation of the fertiliser subsidy programme in Malawi affected kilocalories per capita per day, the annual food security status of households, the number of household food secure months and households' total annual per capita consumption expenditure. The results revealed that the fertiliser subsidy improved households' food security. However, the effects were heterogeneous across the distribution of the population. A similar study was conducted in Senegal, where Seck (2017) assessed the potential impact of fertiliser subsidy on farmers' productivity. The results showed that subsidy programmes seem to be useful as they appear to be associated with increased productivity. In Tanzania, Aloyce *et al*. (2014) examined the productivity and food security impacts of the agricultural input voucher scheme on smallholder farmers. The author found higher agriculture productivity and less food insecurity among farmers who had access to the agricultural input vouchers compared to those who were not assisted. In the Gaza area in Mozambique, Nyyssölä *et al*. (2014) studied the effectiveness of a farming development project with a focus on improvement in the livelihoods of impoverished farmers who adopted new varieties of existing seeds and improved technology, like fertilisers. The author found that the aid intervention contributed to some immediate improvement in the production and stability of food security following the farmers' intensive use of the fertiliser.

2.9. Theoretical framework

Market Failure underpins the empirical analysis of this study because the objectives of the study fit well into the central tenet this theory. The theory postulates that, under certain conditions commodity production and distribution in a competitive market characterised by pursuing of own self-interest of relevant agents, will result in the allocation of a socially inefficient commodity (Roemer and Trannoy, 2015). Datta-Chaudhuri (1990) describes market failure as a signal of the inability of a market

economy to reach specific desirable outcomes in resource allocation. These expositions suggest that whenever a market failure occurs, the government's intervention in regulating the market to achieve a more optimal distribution of resources is necessary.

Jenal and Cunningham (2015) explained that the term "market failure" does not necessarily mean that a market is not working at all, but that it is not working because it is not producing goods that are wanted. Market failure may occur due to either supply or demand-side factors. It is a pervasive phenomenon in agriculture, especially in developing countries (Cuevas, 2014). Winters *et al*. (1998) discoursed that market failure is the product of the cost of the transaction through a market exchange which creates a disutility that is greater than the utility gain that it produces and mostly results in the market not being used for the transaction.

As a significant feature of the agriculture industry market failure manifests itself in many forms including but not limited to, unpredictable prices, unstable supply, low and volatile income for farmers, environmental costs of intensive farming (negative externalities), agriculture as an essential component of the life of rural residents (positive externalities), and monopsony power of food purchasers (Spriggs & Van Kooten, 1988). Price volatility of agricultural commodities is driven by a combination of factors, such as, supply is price inelastic in the short term because production is time demanding; (2) demand is price inelastic because food is a necessity, and higher prices do not usually deter people; (3) climatic conditions can alter the supply of agricultural products. Any of these factors resulting in market failure can affect the prices of agricultural products and the revenue of farmers in one way or the other (Clark *et al*., 2018).

A sharp reduction in price due to any of the mentioned factors may cause a fall in farmers' revenue. A glut in supply equally may throw farmers out of business because prices can fall significantly below cost. Similarly, the cobweb theory predicts that prices can become stuck in a cycle of continually increasing volatility. The cyclical volatility of prices could occur if prices in a particular year fall below certain levels, forcing many farmers out of business (Clark, 2016). Drawing on welfare economics theories, agricultural economists have proposed several theories to explain how the

government can intervene to address the market imperfections often associated with the agricultural economic system. Such interventions include direct income support, implementation of regional labour market policies, and the abolition of price support policies (Nedergaard, 2006). The government can build buffer stocks to support price stabilisation, and institute price floors and price ceilings to regulate supply and stabilise farmers' income. The government can also set minimum prices (price floors) to guarantee farmers' basic income by subsidising food prices. However, minimum prices may encourage oversupply and lead to excess production that may go waste. Another tool at the disposal of government to cushion the income and enhance the production of farmers is subsidies for farmers who adhere to more environmentally friendly methods of production. Import tariffs have also proved to be a useful policy tool to protect domestic farmers, although they cause the domestic price of agricultural produce to increase, leading to lower trade.

In the context of developed countries, one school of thought, led by Herrmann *et al*. (2004), posited that two main factors largely influence agricultural support policies. The first factor is the country's position as either a net exporter or net importer of agricultural products. Net importing countries of agricultural products usually provide higher support to farmers than their counterparts net exporting countries. The second factor is the farmer and non-farmer income differences. This school of thought assumes that the maximisation of a social welfare function based on egalitarian value preferences which are relatively stable reflects the behaviour of the political system. Like economic models, the model of this school of thought has been criticised because in general, as well as specific contexts the model is unable to address several questions related to the characteristics of agriculture (Nedergaard, 2006).

To propose a model to support the Common Agricultural Policy (CAP) introduced by the European Union, Nedergaard combined the traditional welfare economic theory of agriculture with the rational choice theory (Nedergaard, 2006). The model considers individual decision-makers in the market (producers and consumers) as the unit of analysis, at the microeconomic level. Within the political-economic system, the microeconomic model of supply and demand considers the political decision-makers such as politicians and bureaucrats, and political partners who constitute producers and consumers as the decision-units.

The principal assumption of the model is that politicians and bureaucrats are the ones who supply political decisions, while producers and consumers demand political decisions. Like the neo-classical microeconomics theory, maximisation of the utility function regardless of the unit of analysis remains the principal objective of all parties. At the micro-level, market failure takes place when economic actors resort to potential rent-seeking behaviour in the political system, a situation which translates into government failures, and consequently affect the microeconomic level (Nedergaard, 1995; Nedergaard, 2006). The model depicts a structural causality between factors within the economic and political systems. It is assumed that several economic interests in the political system that try to build coalitions due to differences in political decisions translate into different cost and benefits for the various groups in society (Nedergaard, 2006). The model postulates that market failure in the agricultural markets, due to the intense political voice of farmers, could attract political intervention, a situation which will be eventually decided by the equilibrium between the supply of political decisions by politicians and bureaucrats on the one hand, and the demands of the farmer-producers, consumers, and taxpayers, on the other hand (Nedergaard, 2006). The importance of the redistribution of resources through government intervention is a common theme that runs through both the welfare economic theory and its later applied version in the agricultural industry. Therefore, government intervention to address any possible market failures that could contribute to sub-optimal and inefficient production.

Giles *et al*. (2015) argued that government intervention is necessary to address public concerns regarding the inequality in the distribution of income, which is a sign of market failure. Government intervention in agriculture is aimed at the development of the sector. For instance, many countries developed their agricultural sector using various forms of direct or indirect government subsidies (Vilkė, 2017; Stiglitz, 1987). According to Stiglitz (1987), most governments in developed nations subsidise farmers, while developing nations tax farmers with the ultimate rationale of stabilising prices, supporting the use of fertiliser, building irrigation systems, offering extension services, and providing credit rates that are often below the market rates. These supports often have counterproductive impacts by imposing enormous financial burdens on the government and generating allocative inefficiencies in low-income

countries. The definition of market failure has been based on the two theories, which included the public goods and externalities explained below.

Based on the principles of market failure, it can be deduced that the economic agents who are mostly affected by this phenomenon are the small-scale farmers who often have face high cost of the transaction to be able to access markets (Cuevas, 2014). Transaction costs have a significant influence on small-scale farmers' resource allocation decisions. Pingali (2007) argued that high transaction costs deter small-scale farmers from entering the market, and this deprives them of the benefits associated with commercialisation in agriculture. As mentioned in the previous paragraphs, other factors from the small-scale farmers' perspective that could lead to market failures include changes in climatic conditions and price volatility. These require the government's interventions to reduce such transaction costs to encourage more farmers to participate in competitive markets. Therefore, a subsequent increase in productivity and thus help in meeting the South African government's broader objectives of ensuring poverty alleviation in the country. While government intervention is considered necessary to correct the market failure in agricultural production, it comes with its problems. Studies suggest that the cost of subsidising agriculture in especially in developed countries is high. It is estimated that the cost of supporting agricultural producers in advanced countries in 2000 was about $245 billion, which was five times the total development assistance received by developing countries (Clark *et al*., 2018). It has also been found farmers who own large amounts of land and have virtually no incentive to follow more environmentally friendly procedures are the ones who often receive subsidies. Minimum prices have been found to contribute to over-supply, while tariffs on agriculture often lead to lower-income for food exporters in the developing countries and these have been barriers to trade (Apergis & Rezitis, 2003; Nicita, 2009).

2.10. Chapter summary

The role of the government is pivotal in all economic activities, including agriculture. With adequate government policies, agriculture can significantly contribute to the economic development of South Africa. Limited progress is made on land reform, income, increased production, and the livelihood of some of the beneficiaries have been improved. From the literature reviewed, most of these agricultural supports

positively affect agricultural production, food security and income of small-scale farmers. It has also been observed that small-scale farmers are unable to graduate from small-scale farming to commercial farming due to several challenges such as limited access to finance, lack of access to market, poor infrastructure, their low levels of education, lack of production inputs such as seeds and fertilizer, climate change, droughts, soil erosion and water pollution.

CHAPTER 3: RESEARCH METHODOLOGY

3.1. Introduction

This chapter discusses the research methodology used in addressing the objectives of this study. It comprehensively explains the research design, sampling process and sample size, as well as the data used in the analysis, is presented. The chapter is divided into five subsections which begins with the research design and data in section 3.2, followed by the specification of the theoretical model in section 3.3, and description of the specification of the empirical estimation techniques in section 3.4. The final section concludes the chapter with a synthesis of the chapter content.

3.2. Research design and data

The GHS is a nationally representative household survey conducted annually by Stats SA since 2002 (StatsSA, 2016). It is a household-level survey instrument used to determine the progress of development in South Africa. It is used regularly to gauge the performance of programmes and the quality of service delivery in several key service sectors in the country (StatsSA, 2016). Drawing on the research design of the GHS, the research design used in this study is both cross-sectional and quantitative. It is quantitative in the sense that it follows an approach that involves the testing of impartial theories by assessing the associations among variables. The variables are consequently measured, usually on instruments that allow numbered data that can be evaluated using sound statistical procedure (Baxter and Jack, 2008). The design is also cross-sectional in a sense it involves the collection of data from a study population at a single point in time to assess the relationship among variables (Baxter and Jack, 2008).

The GHS followed a multi-stage sampling design approach. The initial stage was based on a stratified sampling design which used probability proportional to size in selecting the Primary Sampling Units (PSUs). This PSU is the census Enumeration Area (EA). The second stage involved the sampling of the Dwelling Units (DUs) using systematic sampling approach. After allocating the sample to the nine provinces of the country, the sample was further stratified based on geographical location (primary stratification) of households, and by population attributes using the 2011 census data

(secondary stratification) (StatsSA, 2016). The data collection process also involved a visit by the enumerators to the sampled DUs in each of the nine provinces (StatsSA, 2016).

The visit meant to inform the sampled DUs about actual data collection, which took place four weeks later. As presented in Table 3-1, pooled data on a 19,620-sample size is expected to be used for the analyses. The study pools the last four rounds of the GHS data for the analyses because, over the years, the survey has gathered the same information, but not from the same households and individuals. The observations of some variables on agricultural development support for some of the surveys are to allow for parametric analysis. As a result, they are pooling the four rounds as composite data will improve the sample size.

Table 3.1: Surveyed households and sampled households for agricultural development

Year	Total household sample	Sampled households	% share in the total sample
2013	25 786	5 901	22.89
2014	25 363	5 819	22.94
2015	21 601	4 209	19.49
2016	21 228	3 691	17.39
Total	93 978	19 620	20.88

This study relies on secondary data from the last four rounds of the GHS (2013, 2014, 2015, and 2016), because the surveys contain detailed information on agricultural development supports that government give to the small-scale farmers, the food security status of households, including those of small-scale farmers, agricultural income from the sales of farming products and services, and production of livestock. This detailed information makes the GHS an ideal source of data for the analyses of this study. The GHS data has been used in several studies covering agricultural

support, food security, poverty and health (Aliber, 2009; Altman *et al*., 2009; Ataguba *et al*., 2011; Rogan, 2018).

3.3. Theoretical model

The theoretical model that supports the empirical analysis of this study is adapted from the theory of net farm exits as espoused by (Goetz & Debertin, 2001; Kimhi, 2000; Kimhi & Bollman, 1999). The model proposes that when deciding on either quitting or continuing to engage in farming, farmers weigh the utility derived from continuing to farm with the utility that they would derive from quitting and becoming unemployed in the farming industry. This decision can be presented by matching the present value of expected future utility that a farmer would derive from farming at time t as Vtf, with that of quitting as Vtq. The farmer will quit if Vtf < Vtq but he/she continues to farm if Vtf > Vtq.

The farmer's utility depends on his/her consumption levels, which in turn are dependent on his/her income or returns to labour (and capital) invested per unit of time invested in agriculture or off-farm work. Maximisation of utility is subject to three constraints: budget constraint considering farm income (including direct payments), off-farm wage and non-labour income; (2) time allocation constraint that allows the farmer to spend all available labour on-farm, off-farm and leisure time; (3) existing farm production technology.

The farmer maximises a utility function (U), which is a function of goods consumed (C), leisure time (L), non-pecuniary benefits of being self-employed (S), and exogenous shifters (α). This can be functionally specified as:

$U = u(C, L, S;\ \alpha)$

This maximisation of this utility is subject to income constraint (equation 1) and time constraint (equation 2).

$P\gamma(K, R;\ \beta) + G - \emptyset K + \varphi V - f(T) + A = C$ Pγ

$D = L + R + V$ (2)

From equation 1 and 2 P denotes farm output price; γ is the farm production function;

K is the quantity of variable non-labour inputs;
R is the number of days worked on-farm;
β is a vector representing other fixed characteristics of the farmer.

Similarly, G denotes total farm government programme payments such as direct payments; ∅ is the vector of prices of the variable representing non-labour inputs; φ represents the daily wages from off-farm market work, and V is the number of days invested in off-farm employment. Finally, f(T) is total transaction costs of working off the farm; and A denotes unearned (non-labour) household income; while D is the total time (hours, days, or weeks) available.

Assuming the objective of the rational small-scale farmer is to maximise his/her household income (equation 1), optimal labour allocation requires that the Marginal Value Product (MVP) of the labour used on-farm must be equal to the expected level of (off-farm) market wage. If the farmer decides to shift all available time from on-farm activities to off-farm activities, R will be equal to zero (R = 0). The value of on-farm labour MVP (i.e. the increase of revenues coming from an additional day worked on-farm) can be specified as equation (3).

$$MVP = p = MPP \qquad (3)$$

From equation 3, MPP = ∂Q/∂df represents the marginal physical productivity of farm labour. Agricultural development policies can affect labour allocation decisions in two main ways: the first is by decreasing the level of risk associated with farming; the second is by directly supporting farm income. However, this study focuses on the second effect of agricultural development because direct payments affect labour allocation decisions in a more indirect way than price policies. The effect of direct payment changes according to the nature of payments as direct payments can be coupled to the production level, to the amount of land or heads of livestock, or can be separated from production.

Assuming the total amount of direct payment that a farmer receives (G) may be affected, directly or indirectly, by the number of days worked on-farm (df) and by other

farm-specific characteristics (γ), such as current and past production patterns and farm location, this yields a generic and very simplified equation 4:

$$G = g(df; \gamma)$$

Suppose direct payments are coupled to production (Coupled Direct Payment (CDP), farmers are motivated to produce and to use more resources, including labour. A surge in the use of labour on-farm may contribute to an increase in the total amount of direct payments received by the farmer.

$$\partial G / \partial df > 0 \quad (5)$$

Equation 5 depicts that agricultural development support (CDPs) received by farmers has the potential to induce an upward shift of their marginal value product and consequently, their income and food security.

3.4. Estimation techniques

All the necessary recoding of the existing variables, and generation of the indicators of food security, income and production, were done at this stage of the analyses using the STATA version 14 software package. The stage involved the descriptive and econometric analyses. The descriptive analyses involved the use of graphs to provide details of the socioeconomic characteristics of the respondents. Demographics and geographic variations in respondents were captured based on the socio-economic characteristics and access to the programme, its production, income and food security effects.

Objective one assesses the effects of the government agricultural development support on agricultural income, productivity and food security of beneficiary small-scale farmers in South Africa. Ideally, an assessment of this nature requires pure Randomised Control Trial (RCT), which is designed purposely for testing a hypothesis under optimal setting devoid of confounding factors (Saturni *et al*., 2014). However, the same objective can be achieved using a quasi-experimental approach if there is observational data from surveys such as the GHS. As a result, this study uses a quasi-

experimental approach to address the first objective. Like experimental designs, Quasi-experimental research designs are meant for testing causal hypotheses.

A quasi-experimental approach involves the identification of a comparison group (control group) that is as similar as possible to the treatment group (experimental group) in terms of baseline (pre-intervention) characteristics (Leatherdale, 2019). The comparison group captures what would have been the outcomes had the programme or policy not been implemented, and it is what is known as counterfactual. The difference between the treatment and control groups are ascribed to the effect of the intervention.

The process requires the use of an Average Treatment Effects (ATE) model where a dummy variable indicating the treatment condition (1 for a household that received the agricultural development support and 0 otherwise) is directly included in the regression equation. The outcome variable (in this study: productivity, income and food security index) of the estimation equation is observed for both observations (0, 1) of the dummy (policy) variable.

One of the approaches predominantly used in the literature in the modelling of quasi-experimental studies of this nature is the Propensity Score Matching (PSM) estimation method which also was applied in this analysis to quantify the impact of the government's agricultural development support on the livelihood of small-scale farmers. PSM identifies small-scale farmers who were assisted that are like those who were not assisted, based on observable characteristics. The first step in computing the PSM involves the estimation of the predicted probability that small-scale farmers will be selected for assistance. From equation 5 of the theoretical model, the equation for the logistic regression can be specified as:

$p(x_i)$ = Probability $(A_i = 1|x_i)$, (6)

The logistic regression is employed estimating the propensity score [p(x_i)], by regressing the agricultural development assistance (1 = assisted and 0 = not assisted) on the observed observable covariates. The next step in the estimations process involves the choice of a matching estimator which can be done using several matching

algorithms. However, this study applies three algorithms (i.e. Nearest Neighbour Matching, Kernel Matching, and the Radius Matching technique) to ensure that the estimates are robust. The statistical significance of the ATE on the quantities treated was tested using bootstrapped standard errors that account for the disparities caused by the matching process. The mathematical framework for the different algorithms for the PSM estimations and other relevant equations have been discussed extensively by (Becker & Ichino, 2002; Caliendo & Kopeinig, 2008; Heckman *et al*., 1997; Rosenbaum, 2002).

The observable pre-treatment covariates that were used to identify similar individuals in the sample are presented in Table 3.1. The choice of the covariates was informed by two main conditions, as discussed in the literature: Firstly, only variables that simultaneously influence the treatment status (a receipt of agricultural development support) and the outcome variables (production, food security and income from agricultural activities) should be used, and secondly, the included variables should not be confounded (Sianesi, 2004; Smith & Todd, 2005). The condition of confoundedness requires that the regression (outcome variable(s)) should be independent of the treatment variable conditional on the propensity score. Thus only variables that are unaffected by treatment should appear in the model. On the other hand, the basis for excluding a variable from the analysis if there is evidence that the variable is unrelated to the outcome variable, or it is not a proper covariate. Following the recommendations in the literature about these two conditions, only the relevant variables were included in the models used for generating propensity score estimates (Rubin & Thomas, 1996).

Despite its quality of producing robust estimates, one of the downsides of the PSM that needs to be highlighted is the likelihood of hidden bias. Hidden bias may occur in the presence of unobserved variables that affect both the variable of interest (receiving assistance) and the regression (Rosenbaum, 2002). For instance, the PSM estimates can be over-estimated in conditions where households that were assisted were also likely to improve their productivity, income and food security. The hidden bias was addressed by firstly, including important observable individual and household level characteristics in the generation of the propensity score specification to minimise any tendencies for omitted variable bias. Also, the matching process was implemented

around the region of standard support (Heckman *et al*., 1997). Finally, different matching algorithms were estimated to ensure the consistency of the results.

With regards to the second objective of this study, the ordered probit model was used to assess the views of the beneficiary households on the effectiveness of the agricultural development support that they received in the past twelve months. For instance, the GHS collected information on the perception of the beneficiary households about the usefulness of the agricultural development support that they received from the government in the twelve months preceding the survey. The variable that captured this information is categorical with observations ranging from not useful, to somewhat useful and very useful.

Conditional on that a farmer received agricultural development support from the government the logistic regression was used to assess the usefulness of the support, because the dependent variable of interest (usefulness of the agricultural development support) is binary, assigned the value one if the respondent finds the support useful, and 0 otherwise. Following an earlier study (Katchova & Miranda, 2004), the logistic regression model is specified as:

$$\ln\left(\frac{p}{1-p}\right) = \alpha + \beta_i X_i \qquad (7)$$

p is the probability that a respondent will find the support useful, α is the intercept of the usefulness of the support, β_i is a vector representing the slope parameters, and Xi is a set of correlation parameters of the usefulness of agricultural support including age, education, geographical location, and race of the farmer. The estimated constant and slope parameters can be interpreted in the form of either odds ratios or marginal effect. However, in order to make the interpretation simpler, this study uses the marginal effects instead of the odds ratio. As this subsection has described in detail the theoretical and empirical methods, the next subsection explains the variables included in the models for the analysis.

3.5. Measurement of variables and a priori expectations

Considering the objectives of the study, one of the policy variables of interest in the analysis is agricultural development assistance. During the survey, the respondents were asked if their household had received any agricultural-related assistance from the government during the previous 12 months such as training, extension services, grant (loans), agricultural inputs for production, dipping and vaccination services for livestock and any other assistance to improve their productivity. From this list of variables, agricultural development assistance was computed as a binary to take on the value one if the household responded that it received at least one form of assistance, and zero if nothing materialised.

Food insecurity as another dependent variable was computed as a score from ten questions on food security in the GHS. The household was asked if: In the past 12 months, any adult had suffered from hunger, any child experienced hunger or starvation, Minors which end up in streets, and if money shortage were experienced, reduction in meal portions, food reduction for several days. More details about the questions asked in the questionnaire are attached in the sample at Appendix 1.

Questions 1-3 had six possible responses (Never; Seldom; Sometimes; Often; Always; and Not applicable) while questions 4-10 were binary (Yes or No). Questions 1-3 were recorded as binary to take on the value one if the household's response was either Seldom, Sometimes, Often, or Always, and 0 if they Never responded or Not applicable. Questions 4-7 were also recorded to take on the value one if the response was Yes, and 0 otherwise. These seven binary variables were used to compute a score of food security. Following Asmah and Orkoh (2017), this study computed the food security score by summing the positive responses and divided the results by the total number of variables. The final score was multiplied by 100% to enhance the interpretation of the estimates. The food security index ranged from 0 (Highly Food Secure) to 100 (Highly Food Insecure). The Cronbach's alpha value was used to test the reliability and consistency of the seven items as a single scale, measuring the score of food insecurity. The rule of thumb requires that a value of 0.80 and above should be considered as good measure. Different Cronbach's alpha values were computed for the index of the pooled sample. The estimated Cronbach's alpha value for the 2013 survey was 0.908 with an average interim covariate of 0.077, while the

values for the 2014 survey was 0.900 and the covariate 0.0745. 2015's alpha value was 0.903 and the covariate 0.076, while 2016's was 0.903 with a covariate of 0.075. The alpha value for the pooled sample of the four rounds of the survey was 0.904, with an average interim covariate of 0.076.

In addition to these two variables, agricultural income, which is a continuous variable, was computed as the income that households receive from agricultural activities such as the sale of agricultural products in the past twelve months. This study intended to investigate the household production of both livestock and food. However, the survey did not collect information on food production. The analysis is restricted to only livestock. Information on four main types of livestock (cattle, sheep, goats, and pigs) was available, which was used to compute the average livestock produced by households. Initially, the observations for these four types of livestock were captured as categories of intervals (0, 1-10, 11-100, 100 and above). Following (Espey *et al.*, 2010), the mid-point value for each category was allocated as the actual production per household.

The dependent variables were also modified from how they were initially captured in the survey. For instance, land size ranged from less than 500 m2 to 20 ha or more. However, the categories had few observations, and the variable land size was categorised into three categories (1 = less than 500 m2; 2 = 500 m2 - 999 m2; and 3 = 1 ha and above). Responses such as Do not Know and Not Applicable were recorded as missing. Similarly, land ownership was recorded as binary, taking on the value one if the land used for the agricultural activity belonged to the farmer, and 0 otherwise. The observation that takes on the value 0 comprises rented land, sharecropping, tribunal authority, state land, and others. Responses such as Do not Know were recorded as missing.

The variable population group, household head, was categorical with four options:1 African/Black; 2 Coloured; 3 Indian/Asian; and 4 White. Education measures the level (categories such an ABET and Grade 12) of education that the respondent indicated that he or she completed. In the GHS, the responses ranged from Grade R/0 to a higher degree (Master's or Doctorate). The responses were categorised into one no education; 2 necessary education/primary; 3 secondary's; and four higher. Basic

education included grades 1 to 9; Secondary covered Grade 10/Standard 8/Form 3 to Diploma with Grade 12/Standard 10; and Higher education comprised those who completed at least a Higher Diploma at a Technikon/University.
Age was measured in the GHS as a continuous variable which ranged from 2 to 107 years. However, this study focused on respondents who were engaged in agricultural activities. Marital status was also captured in the GHS as one being legally married; 2 having lived together like husband and wife; 3 being divorced; 4 having separated, but still legally married; 5 being widowed; 6 being single, but had been living together; 7 being single and had never been married, and eight unspecified response. During the analysis, married respondents were classified, and cohabiting were categorised as an informal relationship. Those who were divorced, widowed, had separated, were classified as being single. Also, respondents who were single and had never been married were categorised as single.

Although the context and scope of this study may differ from previous studies, it is a priori expected that age of the respondent, being male, and being Black/African should have positive effects on one's access to the programme. On the contrary, the higher level of education, large land size for farming, being the landlord, and being White, Coloured, or Indian/Asian should have a negative correlation with the probability of being assisted. The reason for these expectations is that there is a strong positive correlation between land size, level of education, and race on the one hand, and income level and living standards that warrant assistance, on the other. The association between households' geographical location and the probability of the respondent receiving assistance remains indeterminate since the characteristics of the province, and those of the beneficiaries of support play an essential role.

It is also expected that the agricultural development assistance should reduce food insecurity, and increase agricultural income and livestock productivity (cattle, sheep, goats and pigs) of small-scale farmers who were beneficiaries of the programme. The priority signs of the correlates of the usefulness of the programme remain indeterminate because they largely depend on the individual's prior intervention, living conditions and other complementary factors that will enable him/her to optimise the assistance received.

3.6 Chapter summary

This chapter thoroughly discussed the methodology, the data used in the analysis, and the variables included in the models and the analysis. The theoretical exposition showed that if direct payments such as loans, grants and inputs are coupled with production (CDP), they motivate the beneficiary farmers to produce and to use more resources, including labour. An upsurge in the use of labour on-farm may increase the total amount of direct payments received by the farmer, resulting in a somewhat cyclical flow of resources and productivity with its indirect positive impact on the livelihood of the farmers.

CHAPTER 4: RESULTS AND DISCUSSION

4.1. Introduction

This section which presents and discusses the results of the data analysis, is divided into two main parts. The first subsection provides a detailed description of the distribution of the government's agriculture assistance, the usefulness of the assistance and other variables of interest across the characteristics of respondents.

4.2. Descriptive analysis

The rationale behind the South African government's agricultural support policies and programmes is to make the sector more robust by increasing equity amongst the farmers with regards to gender, race, modern technology and other agricultural support (Hart & Aliber, 2012). Figure 4.1 depicts a considerable reduction in the percentage of farmers in households that receive assistance, from 16% in 2013 to 14% in 2016. The decline is also due to the changes in the political landscape of the country and the changes in policies related to the funding of different sectors and not only agriculture.

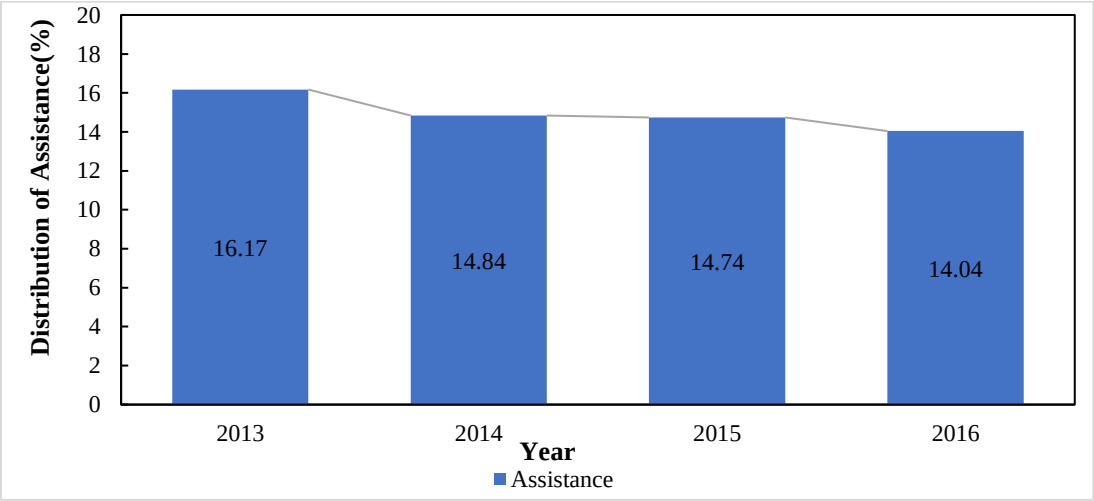

Figure 4.1: The distribution of government assistance to farmers from 2013 to 2016

Based on the survey response it is clear that majority of smallholder farmers are not aware of the funding or support which the government offers due to lack of information dissemination from the stakeholders in government as they usually return funds which are not used for the support programs every year. There is a perception that most of

the farmers who usually obtain support from the government are males. The results from the distribution analysis as depicted in Figure 4.2 also shows that during the four years of analysis male farmers have the high percentage of farms receiving government support or who are familiar with the government support program. Figure 4.2 also illustrates the reduction in assistance for males from 16.58% (2013) to 15.80% (2016), while among females is from 15.83% to 14.44%. Despite the general reduction, the proportion of male beneficiaries of the programme remains relatively higher than their female counterpart. This reduction over the years has implications for productivity, food security and income of the farmers as their livelihoods largely depend on their production which, in turn, depends on the extent and sustainability of the assistance that they receive. This distribution somewhat reflects access to agricultural development assistance across gender (Figure 4.2).

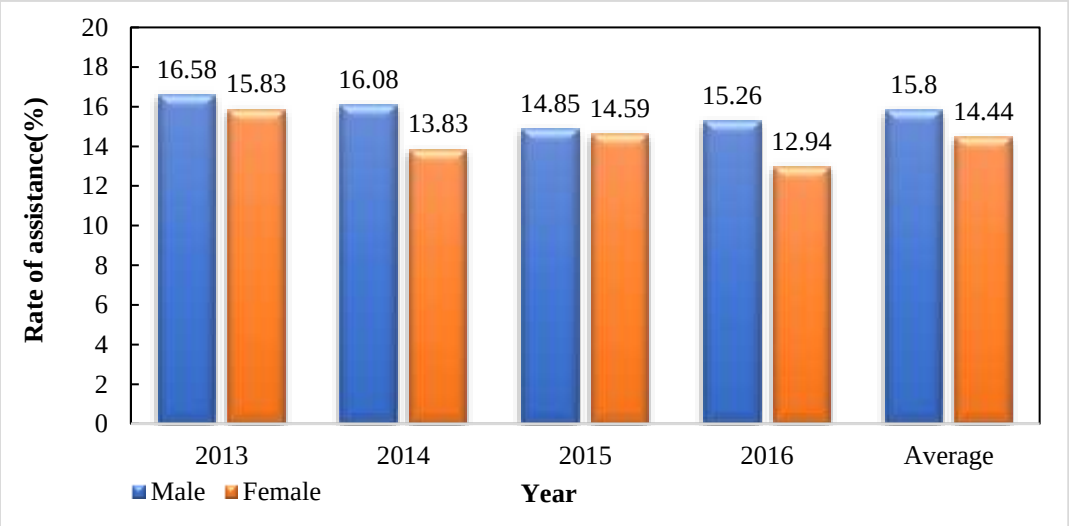

Figure 4.2: Distribution of assistance based on the gender of the recipient

Farmers in rural areas have lower levels of education and lack of information on marketing and other farming skills. Figure 4.3 shows that 15% received assistance, which is significantly lower than 84.94% who did not receive assistance. The rate of assistance is higher among respondents who have lower levels of education than among those who have higher levels of education. This relationship can be linked to the income status of the recipients since education and income are positively correlated. As a result, every policymaker who seeks to ensure equity would support those farmers who have low income, possibly due to their low levels of education. This result can support the conclusion of a similar study by Altman *et al*. (2009), Baiphethi

and Jacobs (2009), and Marín-González *et al*. (2018) who indicated that agricultural output of small-scale farmers in South Africa is generally low due to several constraints that they face, one of which is low levels of education. Khapayi and Celliers (2016) also cited low levels of education as a significant factor that prevented emerging farmers' progression from subsistence to commercial agricultural farming in the Eastern Cape province, because they were unable to interpret the requisite market information for proper production planning and marketing. The amount of assistance which is offered to farmers is evenly distributed as depicted in Figure 4.3. Therefore, it is an indication that the education level does not play much role into who gets the assistance or not; the power lies with the government.

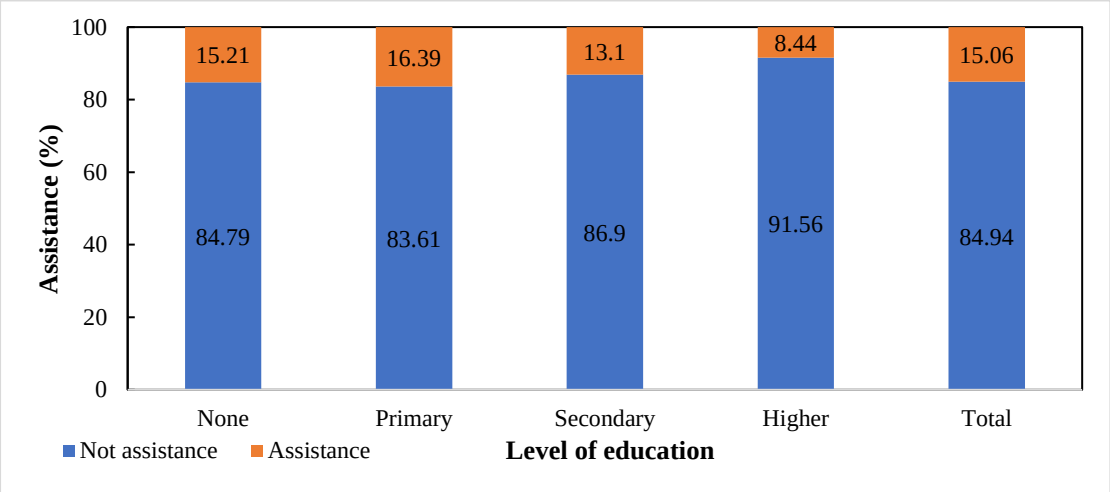

Figure 4.3: Correlation between the level of education and usefulness of assistance

The distribution across the population group of the recipient as depicted in Figure 4.4, which also shows that Africans/blacks constitute the largest proportion (15.4%) that received assistance. The rate of assistance to Whites remains the lowest. There is a low rate of assistance offered to white farmers due to their financial standing. The percentage of farmers who never received funding is very high throughout all the demographics, as depicted in Figure 4.4. The rate of assistance is not based on gender, race and level of education as illustrated in Figure 4.2, 4.3 and 4.4, and therefore the discretion still lies with the budget availability and also willingness of the government to support the farmers or the agricultural industry at large.

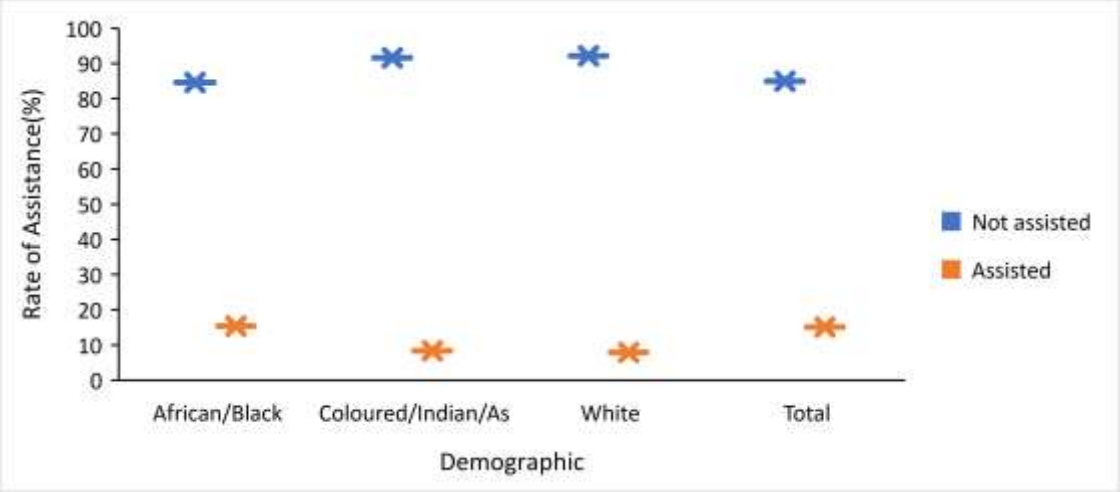

Figure 4.4: Receipt and usefulness of assistance by demographic group

The results regarding the assistance can be observed from Figure 4.5 the province with the highest number of households that received government agricultural assistance is Eastern Cape (30.16%), followed by KwaZulu–Natal (23.06%) and Northern Cape (15.54%), while Gauteng, Limpopo and Free State had the lowest proportion of beneficiary households. This distribution is in line with the report of the 2016 Community Survey which showed that majority of households that were engaged in agriculture activities in South Africa were in KwaZulu-Natal (23,0%), Eastern Cape (21,3%) and Limpopo (16,6%). Free State, Western Cape and Northern Cape reported the lowest numbers of households engaged in agriculture, with 6,8%, 3,0% and 2,1% (of country's total) respectively. The unique feature of the provinces with the largest proportion of households that received assistance is that they are predominantly rural and have higher rates of poverty. The 2016 RDR suggests that most of the low-income households in the developing nations reside in rural areas where they, directly and indirectly, depend on agriculture for a living (Ogbeide-osaretin *et al*.,2019).

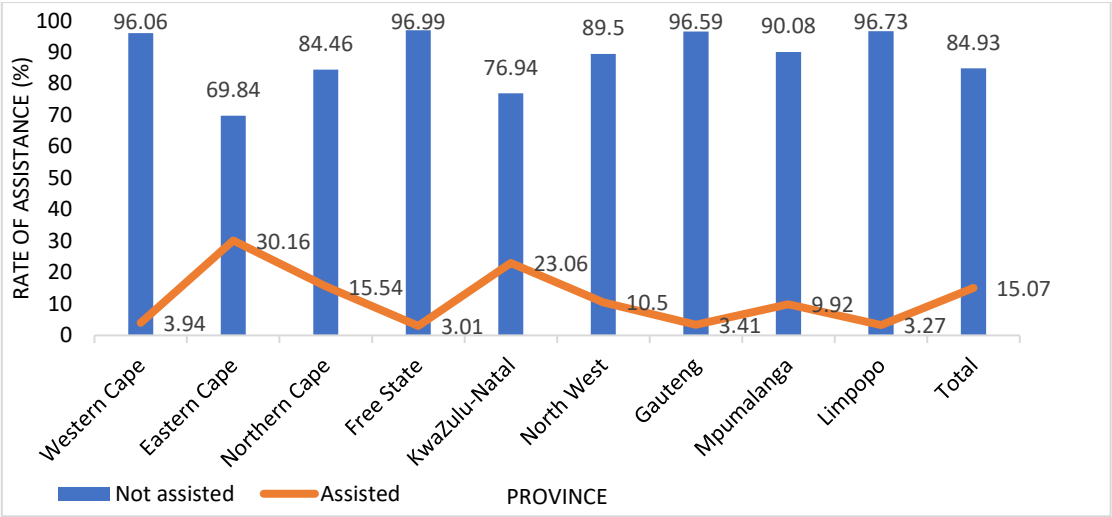

Figure 4.5: Receipt and usefulness of assistance by province

Figure 4.6 shows that assistance is higher among respondents who are married and those who have never married than among those who are single or in some form of informal relationship. Across all marital status categories, gender imbalance is visible. The observed unequal gender access to agriculture assistance corroborates an earlier study by Hart and Aliber (2012). They asserted that those conceptualising and providing agricultural and technological support services to black female farmers ought to reconsider gender mainstreaming of their programmes because in its current form and structure it appeared to have not considered women's circumstances. The heterogeneities of the characteristics of the beneficiary households require that the government prioritises complementary policies that ensure optimisation for both the recipients of assistance and South Africa at large.

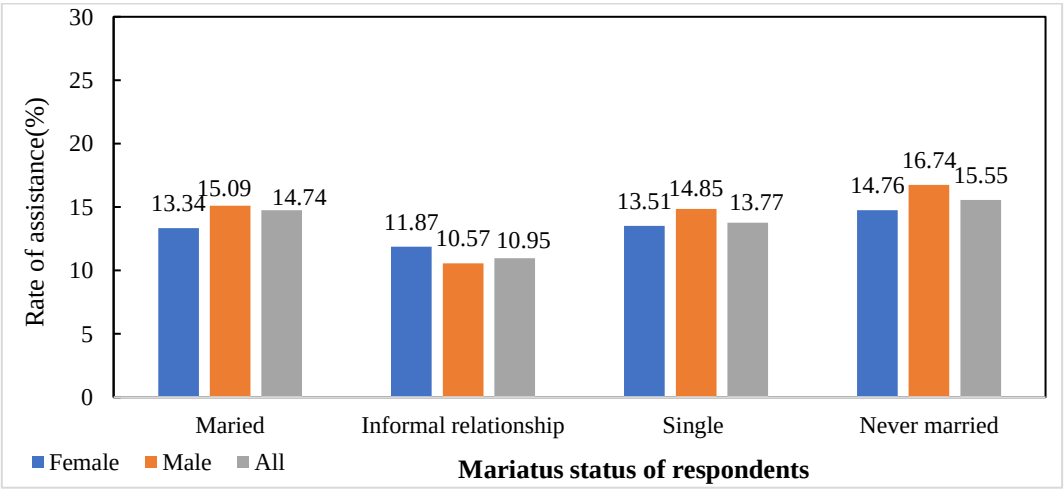

Figure 4.6: Assistance offered based on marital status

Figure 4.7 depicts the distribution of average cattle, goat, sheep and pig production across the years in which the surveys were conducted. Observe from the results that apart from pig production, the production of the remaining three livestock types increased from the 2013 survey period to the 2015 survey period, before decreasing marginally in the 2016 survey period. Despite the marginal decrease, production in 2016 more than doubled for especially cattle, goats and sheep compared to the 2013 values. Observe further that in 2013 and 2014 cattle production was higher than the production of other livestock. However, in 2015 and 2016, goat production was the highest. This marginal reduction in livestock production could be ascribed to several factors, including climate variability, particularly the 2016 drought, which affected grazing fields and contributed to diseases, which affected production.

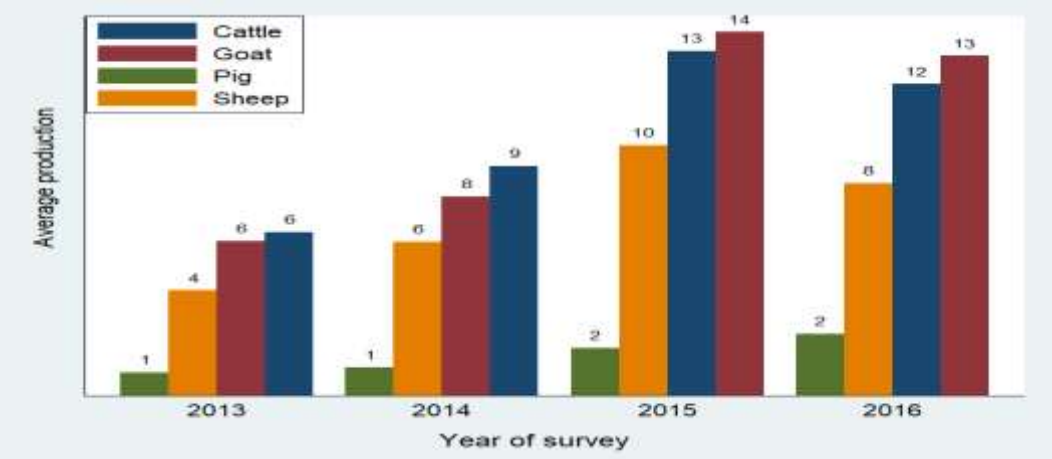

Figure 4.7: Average livestock production by year of survey (the numbers indicate the number of new animals produced during the year)

Across respondent gender, it is depicted in Figure 4.8, that production is generally lower among females than males. Unlike pig production, there is a significant difference in the number of cattle, sheep and goats produced by males compared to females. The inference that can be drawn from these results is that the implementers of the policy would have to consider gender as an essential factor in the implementation of the policy to ensure that women are given the needed assistance that will enhance their ability to optimise agricultural development support. Concerning the geographical location of the respondent farmers, the results (Figure 4.9) indicate differences in production, partly due to differences in climatic conditions across

provinces, access to support, and individual-specific characteristics, including gender, education and production capacity.

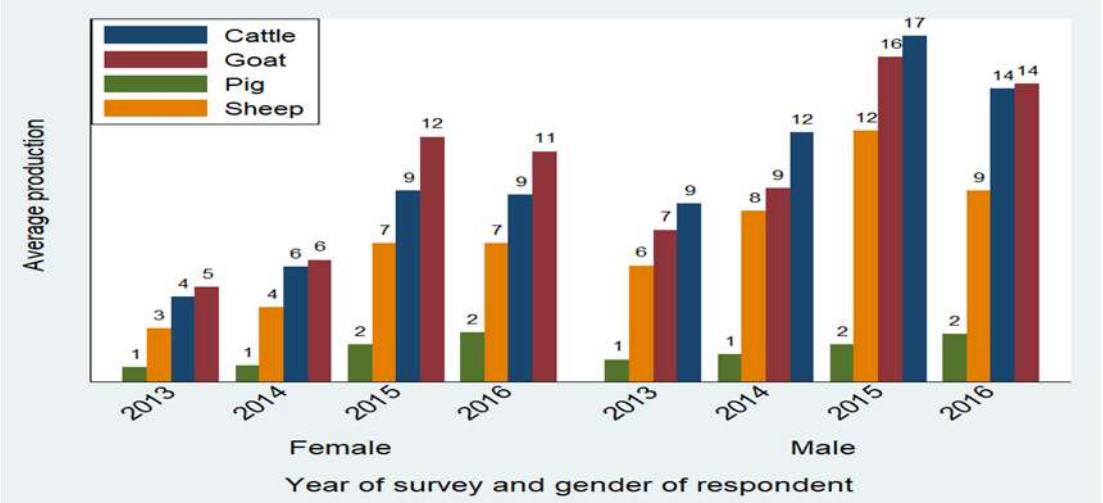

Figure 4.8: Average livestock production by gender of respondents and year of survey (the numbers indicate the number of new animals produced during the year)

For instance, the production of sheep is high in Northern Cape, Western Cape and Eastern Cape, but very low in KwaZulu-Natal, Gauteng, Mpumalanga and Limpopo. Similarly, the production of cattle is high in North - West, KwaZulu-Natal, Mpumalanga and Western Cape, but very low in the Free State, Gauteng and Limpopo, which means that the implementation of the policy would require a critical consideration of these geographical heterogeneities to ensure equity and equality in access to the inputs and output.

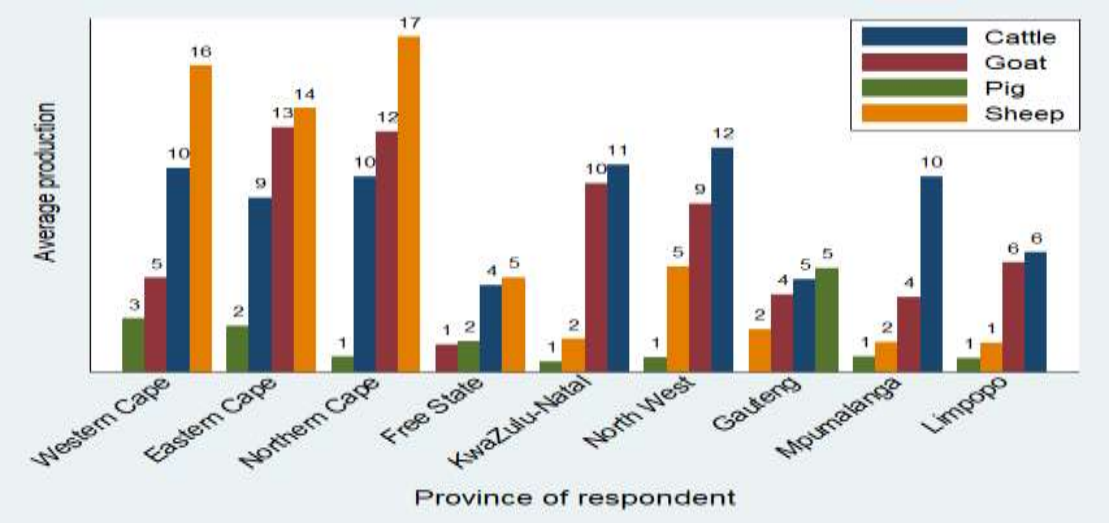

Figure 4.9: Average livestock production by the province of respondents (the numbers indicate the number of new animals produced during the year)

In addition to the observed disparities in production across gender and province, Figure 4.10 shows marked differences between farmers who received assistance and their counterparts who had no access to it, in terms of production of all types of livestock. This observation is consistent across respondent gender. However, the production gap among males is higher than the gap among females. While it is evident from these results that the agricultural support programme has the potential to be effective in helping small-scale farmers to increase their productivity, some fundamental factors such as gender and geographical differences need to be given critical attention for the programme to yield its intended results.

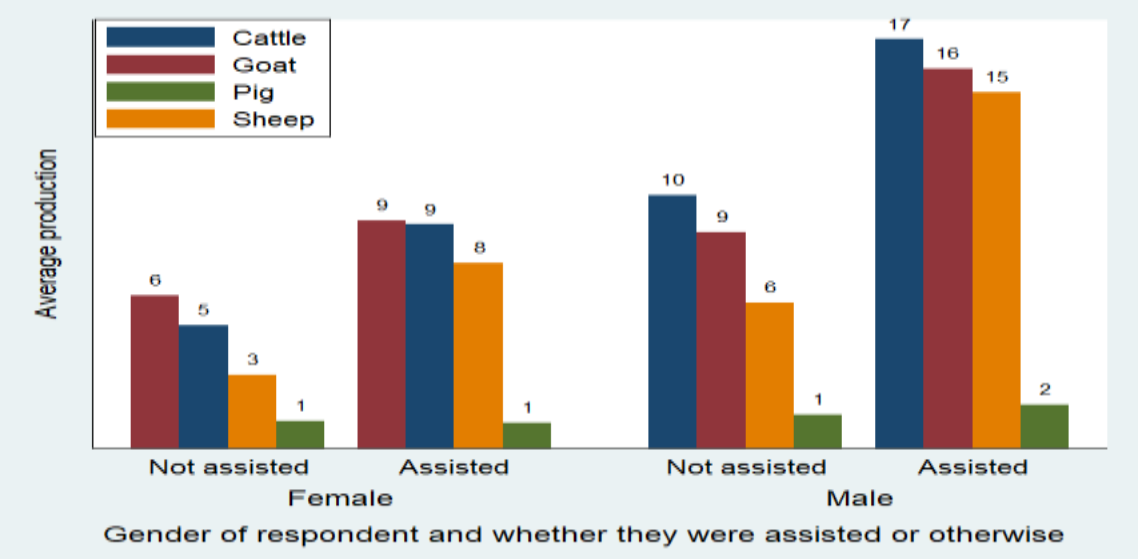

Figure 4.10: The difference in the production rate between those who received assistance and those who did not receive (the numbers indicate the number of new animals produced during the year)

Aside from livestock production, small-scale farmers' income from agricultural activities has consistently increased from 2013 to the 2016 survey period. More importantly, farmers who received assistance have seen a significant increase in their agricultural income compared to those who did not receive the support. As expected, the gender inequality in earnings from agricultural activities is depicted in Figure 4.11, and this is consistent across all the survey periods. Since 2015, the average income of males who were assisted was more than twice that of their female counterparts. Considering the respondents who never received any support, the gap is relatively low compared to those who were assisted. These trends support the assertions made in the preceding paragraphs that there is the need for gender mainstreaming in the implementation of the programme to ensure that it does not worsen the already existing inequalities among small-scale farmers.

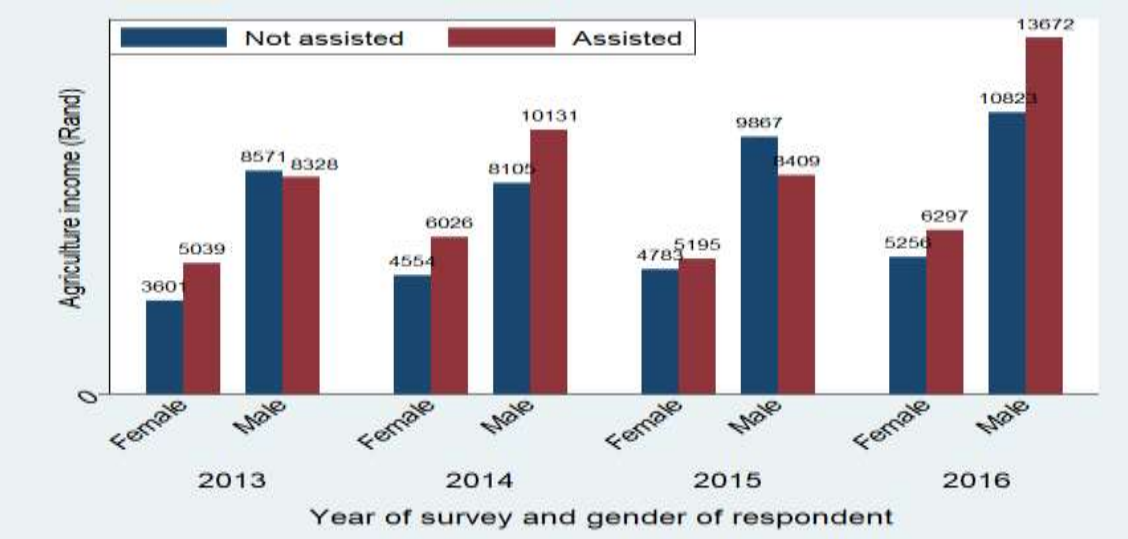

Figure 4.11: Average agricultural income by gender and assistance status of the respondent

Across the geographical location of the respondent, Figure 4.12 shows that the impact of the support does not have the same effect on the income of the beneficiary farmers. Concerning the literature, Girabi and Mwakaje (2013) assessed the agricultural productivity impact of microfinance of small-scale farmers in the Iramba district of Tanzania. They found that small-scale farmers who had access to the credit realised higher agricultural productivity compared to non-credit beneficiaries. In some South African provinces, farmers who never received any assistance had higher agricultural income than those who were assisted. For instance, in the Eastern Cape, Mpumalanga and Limpopo, male farmers who were not supported had higher average income than their counterparts who were supported. Similarly, female farmers in the Western Cape, Northern Cape, North West and Gauteng who were not supported, had higher average agricultural income than those who received support.

Province-specific factors affecting the full realisation of the impact of the programme among all the beneficiary farmers are considered while implementing and evaluating the effectiveness of the programme. Apart from climatic conditions, institutional bottlenecks, corruption in the form of diversion of the resources intended to support the farmers, and other individual challenges faced by the farmers due to their geographical location, need to be assessed and addressed.

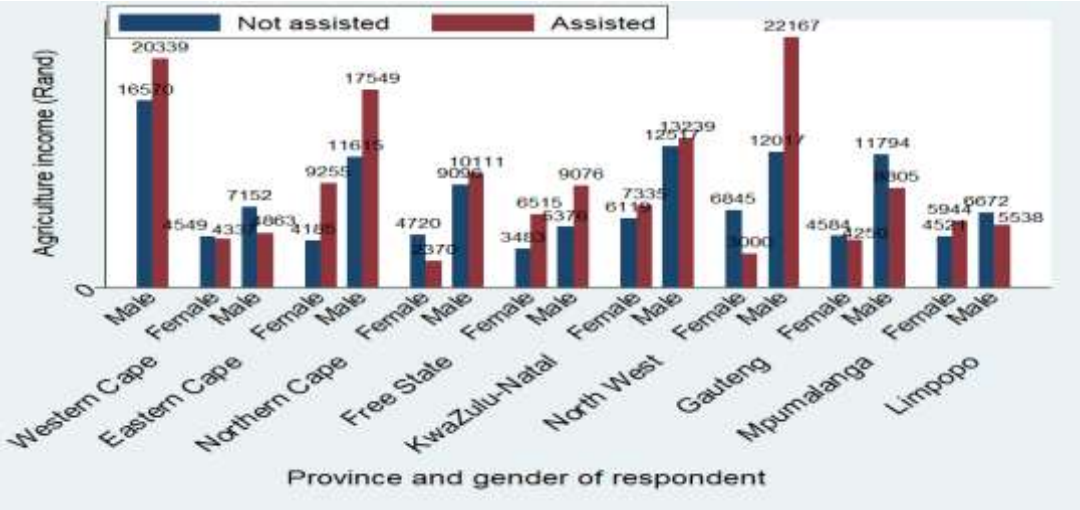

Figure 4.12: Average agricultural income by gender and province of respondent

Consistent with the distribution of production and agricultural income across the year of survey and support status of respondents, the results in Figure 4.13 indicate that food insecurity has reduced within the four years. However, the sudden increase in food insecurity among females in the 2016 survey period significantly, raises concern for more policy effort. The figure shows that food insecurity is relatively higher among females than males, possibly due to the observed low income and productivity among females. Another observation that needs extra policy effort is that the food insecurity gap between respondents who were assisted and those who were not assisted has narrowed. It is an indication of the growing ineffectiveness of the programme in achieving its intended purpose.

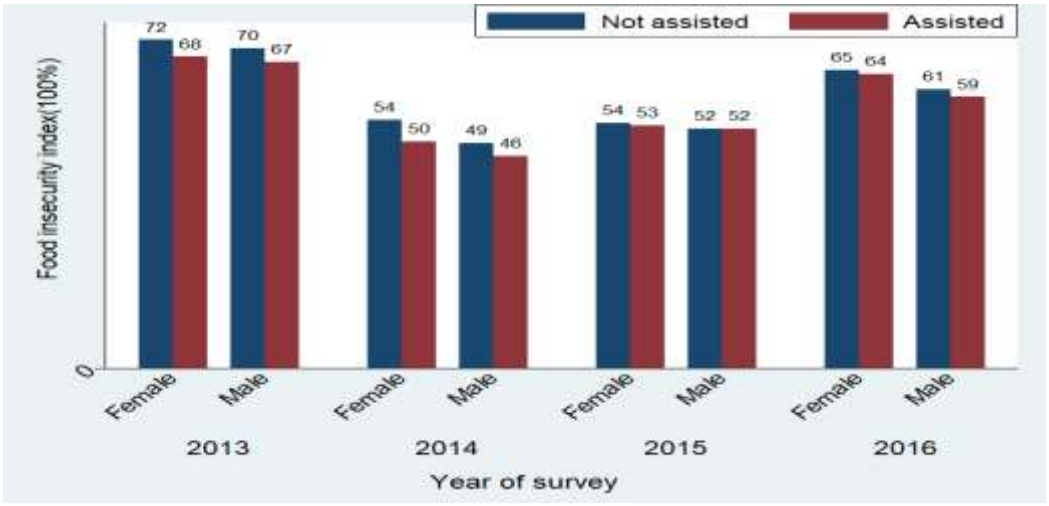

Figure 4.13: Food insecurity by gender and assistance status of the respondent

The results across the geographical location of respondents in Figure 4.14 depicts some heterogeneities observed in the previous paragraphs. In the Western Cape, information available on food insecurity was for only those who never received assistance. In the Eastern Cape and Northern Cape, food insecurity is unusually higher among both males and females who received the support than those who never received any support. In Gauteng, food insecurity is higher among females who received support than those who did not receive support. Two factors can explain these and similar observations across production and income: Firstly, those respondents may have already had high levels of food insecurity. Secondly, unequal production capacity, unequal access to support and regional variation in climatic conditions could also have played a role.

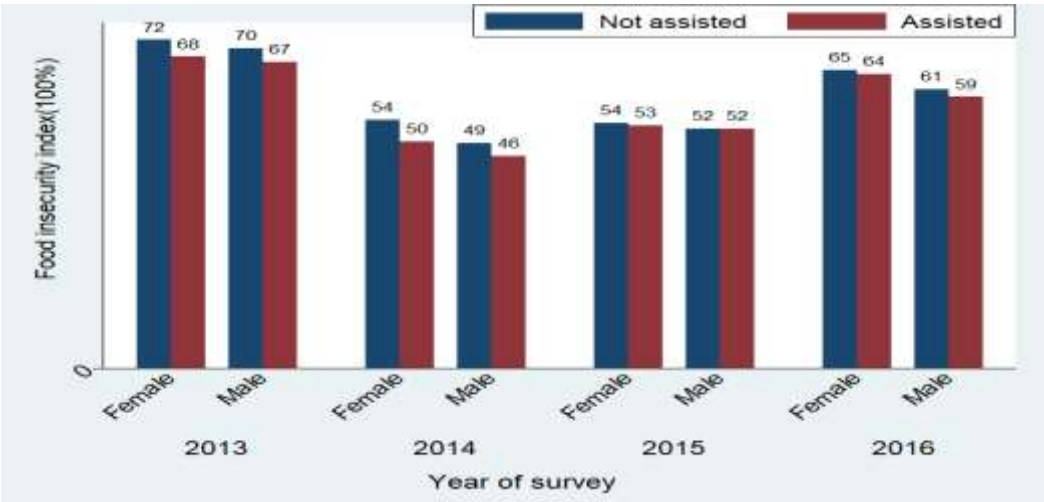

Figure 4.14: Food insecurity by province and assistance status of the respondent

The descriptive analysis showed elements of gender and geographical differences in access to agricultural development support. These differences reflect the distribution of income, production and food security among small-scale farmers who benefited from the programme. In summary, the results raise concern for gender mainstreaming in the implementation of agricultural development policies and programmes, taking into consideration the geographical and racial diversities which have implications for the effectiveness of the programme.

4.3. Regression estimates

The first objective of this study is to assess the effect of the government's agricultural support programme on income, productivity and food security of the beneficiary small-scale farmers in South Africa. The discussion of the estimates is preceded by a brief discussion of the factors that determine farmers' probability of being selected for agricultural support. The results in Table 4.1 shows that age is a significant determinant of a farmer's probability of being considered for support. The significance of age as a determinant could also mean the experience in farming, which is a factor that implementers of the programme consider.

Education is negatively associated with the probability of being selected for agricultural development support, as it is also depicted in Figure 4.3. The effect of education is significantly higher for respondents who have higher levels of education and is contrary to expectation because one would argue that those educated can put the assistance into better use for optimum outcome. However, from the perspective of the principles of distributive justice, the observed negative effect of education is intuitively acceptable in the sense that those who have low levels of education are more likely to be poor and need extra support to earn a living.

Apart from education and age, the population group of respondents is significantly associated with the probability of receiving agricultural development assistance. Observe from Table 4.1 that a Black/African farmer is more likely to be assisted compared to a White farmer. Like Whites, a farmer who is either Indian/Asian or Coloured, is less likely to receive assistance. From the gender perspective, the results show that a male is more likely to receive support than a female. This observation highlights the need for the government to consider gender mainstreaming and racial diversity in the implementation of the policy in order not to deepen the existing inequality in resource ownership and productivity in South Africa. Land size is an indication of farmers' access to and use of resources. In this analysis, land size for agricultural activities appears to be a significant determinant of farmers' access to agricultural development support. A farmer who owns the land of at least 500 m^2 is significantly more likely to receive support compared to his/her counterpart whose farming land is less than 500 m^2. The coefficients are significantly higher for farmers whose land is more significant than 1 ha. This suggests that although the

implementation of the policy built on egalitarian principles, it also maintains an element of efficiency and economy of scale.

Regarding the effect of land ownership on access to the support, the results reveal that compared to farmers who do not own their lands for farming, landlords are less likely to be assisted. Nonetheless, one reason for the observed negative effect of land ownership is that it qualifies as a surrogate for wealth or income level which is a criterion for selecting the farmers who should or should not benefit from the programme. It can be deduced that those who own land have the potential to produce without much assistance.

Table 4.1: Determinants of farmers' access to agricultural development support

Agricultural development support	GHS2013	GHS2014	GHS2015	GHS2016	Pooled sample
Age	0.001***	0.001***	0.002***	0.002***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Male	0.024***	0.033***	0.023***	0.050***	0.030***
	(0.005)	(0.005)	(0.006)	(0.006)	(0.003)
Primary education (Ref: None)	0.001	0.007	0.005	-0.003	0.003
	(0.006)	(0.006)	(0.007)	(0.007)	(0.003)
Secondary education	-0.011	-0.004	-0.008	-0.005	-0.007**
	(0.007)	(0.007)	(0.008)	(0.009)	(0.004)
Higher education	-0.053***	-0.055***	0.024	-0.036*	-0.035***
	(0.020)	(0.018)	(0.024)	(0.021)	(0.010)
African/Black (Ref: White)	0.079***	0.051**	0.061***	0.048**	0.066***
	(0.022)	(0.025)	(0.021)	(0.022)	(0.011)
Coloured/Indian/Asian	-0.058**	-0.069**	-0.029	-0.042*	-0.042***
	(0.023)	(0.032)	(0.023)	(0.024)	(0.012)
Land: 500 m^2-999 m^2 (Ref: <500 m^2)	0.081***	0.041***	0.104***	0.008	0.061***
	(0.009)	(0.008)	(0.010)	(0.009)	(0.005)
1 ha or more	0.190***	0.090***	0.178***	0.192***	0.162***
	(0.015)	(0.014)	(0.018)	(0.020)	(0.008)
Landlord	-0.015**	0.012**	-0.004	-0.028***	-0.004
	(0.006)	(0.006)	(0.007)	(0.007)	(0.003)
Eastern Cape (Ref: Western Cape)	0.186***	0.319***	0.144***	0.172***	0.209***
	(0.044)	(0.016)	(0.043)	(0.037)	(0.019)
Northern Cape	0.074	-0.007	-0.112***	-0.134**	-0.034*
	(0.049)	(0.014)	(0.043)	(0.035)	(0.019)

Free State	-0.087**	-0.003	-0.123***	-0.055	-0.073***
	(0.044)	(0.013)	(0.042)	(0.036)	(0.018)
KwaZulu-Natal	0.180***	0.236***	0.007	0.073**	0.131***
	(0.044)	(0.015)	(0.042)	(0.036)	(0.019)
North West	-0.105**	0.017	-0.112**	-0.073**	-0.072***
	(0.044)	(0.016)	(0.045)	(0.036)	(0.019)
Gauteng	-0.073*	0.013	-0.126***	-0.033	-0.057***
	(0.044)	(0.016)	(0.042)	(0.036)	(0.019)
Mpumalanga	-0.024	0.098***	-0.025	0.036	0.015
	(0.044)	(0.015)	(0.042)	(0.036)	(0.019)
Limpopo	-0.120***	0.008	-0.126***	-0.059*	-0.079***
	(0.043)	(0.013)	(0.042)	(0.035)	(0.018)
Survey year	--------	--------	--------	-------	Yes
Observations	19,143	19,600	14,020	11,097	64,001

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Farmers' geographical locations are significant in determining their access to the programme. Consistent with the descriptive analysis, a farmer in either Eastern Cape or KwaZulu-Natal is more likely to be assisted compared to his/her counterpart in the Western Cape. On the contrary, a farmer in the Northern Cape, Free State, North-West, Gauteng, Mpumalanga and Limpopo is less likely to receive assistance. The differences in the socio-economic factors that influence farmers' access to the programme have unspoken implications for the extent to which the programme will be enough. The next subsection discusses the effect of the programme on the livelihood of the beneficiary households with a focus on their income, productivity and food security. An earlier study conducted by David *et al*. (2018) suggested that the incidence of both income and multidimensional poverty are higher in the Eastern Cape, Limpopo and Kwazulu-Natal. The simultaneous dominance of these three provinces in the distribution of poverty and agricultural households largely justifies the regression results. It is intuitively expected that provinces that have high poverty rates and more agricultural households would be the focus of every policymaker who aims at reducing inequality.

The results highlight the need for policymakers to pay attention to the differences in the socio-economic factors such as race/population group, geographical location, level of education and household income status, which influence farmers' access to the

programme. Those factors have unstated implication for the extent to which the programme will be enough. Failure of policymakers to consider these factors in the implementation of the agricultural support programme could worsen the already high inequality in resource ownership, livelihood and welfare that permeate all societies in South Africa. The next subsection discusses the effect of the programme on the livelihood of the beneficiary households, with a focus on their income, productivity and food security.

4.4. Impact of agricultural assistance on production, income and food security

Having discussed the socioeconomic factors that determine households' access to agricultural development assistance, this study goes further to assess its impact on households' food security, production and income from agricultural activities. However, before discussing the impacts (ATE), it is essential to discuss the balancing of the propensity scores from the logistic regression, as this shows the extent to which the differences across the two groups of small-scale farmers are reduced to for efficient identification of a valid counterfactual. Figure 4.15 depicts the histograms of the predicted propensity scores for the experimental and control groups of the small-scale farmers. The figure depicts that those farmers who received assistance have equivalent matches from those in the comparison group. The graph suggests that there are overlap and similarity between the propensity scores of the two groups of small-scale farmers.

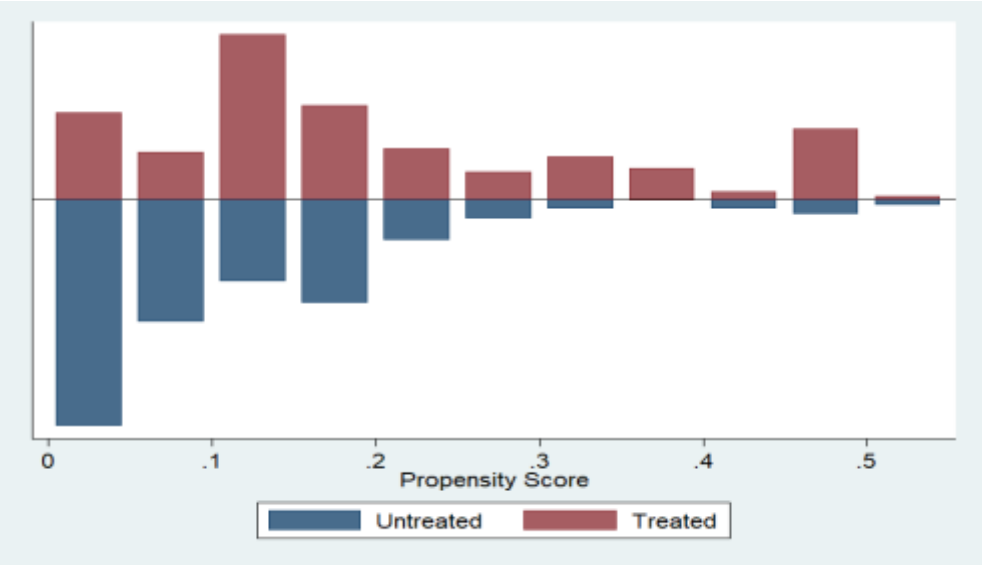

Figure 4.15: Propensity score distribution

Appendix Tables A1 and A2 are further checks for matching quality by comparing the differences between the two groups of farmers as far as the overall covariance distribution and the model fit (pseudo-R^2 and LR test), before and after the matching, are concerned. The results suggest that the pre-matching differences in the observable characteristics across the two groups of farmers are significantly reduced after the matching, and it is evident by the insignificance of the post-matching values. The analysis of the impact of the programme is relevant in the sense that it sheds light on aspects of the programme that need extra policy focus. Before the discussion of the estimates, it is essential to indicate that the variable “food security” is an index of a list of variables based on a set of questions on household food security conditions in the data set. The index ranges from 0 (food secure) to 100% (to food insecure) with the equal weight assigned to the variables used for the computation of the index. Similarly, the indicator/independent variable “assistance/support” is a binary variable which takes on the value one if the household receives at least one support of a list of governmental agricultural supports and other non-governmental agencies, and 0 if it does not receive any assistance. It is, therefore, a priori expected that there should be a negative correlation between the two variables. Thus, as a household which receives support, its food insecurity should reduce.

The estimates of the three propensity matching approaches (Table 4.2) indicate that other factors being constant, a household that receives agricultural development support is about 1% – 1.5% less food insecure than a household that does not benefit from the programme. In other words, a household that receives the support is about 1% – 1.5% more food secure than a household that does not receive any support. These results corroborate the argument of Kidane *et al*. (2006) that the root causes of chronic food insecurity should be the priority objectives for development and that policymakers whose countries have been facing chronic food insecurity should aim to improve productivity and boost demand for the products and labour of food-insecure households. There is a need for reallocation of budgets toward rural populations whose livelihoods depend mainly on their agricultural activities.

Table 4.2: ATE of agricultural development support

Dependent variable	Nearest Neighbour Matching	Kennel Matching	Radius Matching
Food insecurity (index: 0-100)	-1.485***	-1.532***	-1.099***
	(0.602)	(0.760)	(0.447)
Agricultural income (Rand)	59002.380***	59671.78***	51989.66**
	(21174.18)	(21802.84)	(22548.75)
Cattle production	2.763***	2.323***	2.819***
	(0.392)	(0.510)	(0.315)
Goat production	1.293***	1.216**	1.754***
	(0.372)	(0.568)	(0.315)
Sheep production	4.1998***	3.932***	5.021***
	(0.415)	(0.647)	(0.303)
Pig production	0.0998	-.0067	0.150*
	(0.106)	(0.179)	(0.083)

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Like the results on food security, the estimates of the effect of access to the agricultural development support on the agricultural income of farmers appear to be significantly positive, meaning a household that receives at least one form of support earns income ranging from R52,000 to approximately R60,000 more than a household that does not receive any assistance. As mentioned in the section on variable measurement at the methodology, agricultural income is a continuous variable which was computed as the income that households receive from agricultural activities, such as the sale of agricultural products, in the past twelve months. The results on both food security and agricultural income suggest that the agricultural support programme is indeed beneficial to small-scale farmers. According to Spio (2006), access to credit is believed to have a significant impact on household livelihoods indicators such as agricultural productivity, food security and technology adoption.

The estimates of production of livestock confirm the observed results on food security and income of the beneficiaries of the programme. Keeping other factors constant, a small-scale farmer who receives at least one form of assistance can produce two to three more cattle than his/her counterpart who receives no assistance. Similarly, a

farmer who receives any form of support from the programme can produce at least one more goat than a farmer who receives no support. Furthermore, at a 1% level of significance, a farmer who is assisted produces approximately four more sheep than a farmer who receives no support. It is evident from the results that at the conventional levels of significance, the programme has a positive impact on the production of all livestock except the pig.

The insignificance of access to the agricultural support programme on pig production reflects the descriptive analyses which show that pig production is generally low in all households across the country. The low production also implies that few households are engaged in pig production. It, therefore, makes sense from statistical perspectives that the sample size for pig production would be too small to produce significant estimates. This result supports a similar observation by de Rosari *et al*. (2014) who analysed the demand allocation of credit and capital supports by farm households and its impact on production, consumption and investment in the ENTT province of Indonesia. The results, however, revealed that credit and capital allocation support increased cattle production, consumption expenditure and the investment of the household.

Based on these findings, the government must pay attention to the implementation process of the programme, taking into consideration the gender, racial and geographical diversities which may influence households' access to support, and the extent of effectiveness of the support on their livelihoods. Many times, households face several challenges in their quest to access the support of this nature. Such challenges include unfair distribution that favours only the friends and relatives of the implementers of the programme, corruption, which leads to misallocation of the supports and misappropriation of funds earmarked for the implementation of the programme. Aliber and Hall (2012) investigated the problems of supporting smallholder farmers in South Africa, and the findings are such that the budgetary allocation to the sector in the last decade has increased remarkably. Nonetheless, the distribution of these resources has been uneven to the extent that few farmers benefit, and the impact is minimal. Another challenge is that small-scale farmers receive little financial support compared to commercial farmers because they are unable to provide collateral and afford high transaction costs.

There is a need for effective monitoring and evaluation to ensure that support given to the households are put into efficient and effective use for their benefits and the benefit of the entire country. More importantly, the Ministry of Agriculture and its allied bodies must establish a mechanism to track all inappropriate actions of both the institutions/bodies responsible for the implementation of the programme and the beneficiary households or small-scale farmers. If such practices go unchecked, the government's rationale for rolling out the programme would not be realised.

4.5. The usefulness of agricultural development supports to farmers

Although the analysis shows that the agricultural development support programme has positive effects on the livelihoods of beneficiary households, this study further validates the findings by assessing respondents' perception of the relevance of the programme. During the survey, beneficiary households were asked to indicate the extent to which they find the programme useful. The responses ranged from Not Useful to Very Useful. These responses were categorised as either Useful or Not Useful in this analysis and regressed on the individual, household and community-level variables. Like the correlates of access to the support, age shows a positive association with the probability that a respondent will find the programme useful. To some extent, age can be considered as a proxy for experience, which is an essential factor that influences the extent to which a support beneficiary can make fair use of the assistance for their benefits and the success of the programme.

A study conducted by Ahmed *et al*. (2015) on the socio-economic characteristics and food security condition of semi-urban households in the Biu and Bama Local Government Areas (LGAs) in Borno State, Nigeria showed similar results that the average age of respondents was 45 years and that they spent an average of eight years in formal education. With an average monthly income level of approximately N40,000 and average assets base of N194,000, the food security line was estimated to be N66.17 per day per adult equivalent. These translated into about44% of the households being food secure. The study further revealed education, farm size, income, contacts with extension agents, cooperative membership, family labour, assets, farm enterprise, farming experience and food diversity were among the variables that significantly explained the variations in food security condition of households in the study area.

The discussion of the results on access to the agricultural support programme has revealed that though males are more likely to receive support, they do not find it more useful. It can be seen from the pooled results that at 1% level of significance, a male is 2% likely to perceive the support as not being useful. This result highlights the need for further reassessment of other complementary issues that need to be addressed to make the programme more useful to beneficiary households, as in the case of Dei Antwi *et al*. (2018), who determined the food security status and analysed factors that influence it. Among households that produce cocoa in the Wassa Amenfi West District of Ghana, the results showed that characteristics such as gender of household heads, age of household heads, household size, years of schooling, annual cocoa output and non-agricultural household income, significantly influence food security status among households that produce in Ghana. The results further suggested that the policies to improve cocoa productivity would be particularly useful due to the high impact it has on household food security.

Like the estimates of gender, education is negatively associated with the probability that a respondent would find the programme useful. The pooled estimates show that at 1% level of significance, a respondent who has completed at least secondary/high school is more likely to perceive the support as not being useful compared to a respondent who has no education. This observation can be both a cause and a consequence of the characteristics of small-scale farmers. Small-scale farmers mostly have lower levels of education and income. Therefore, they are more likely to appreciate the support from the government, even if its impact on their production and income is minimal, compared to highly educated farmers who are mostly engaged in large-scale farming and may not necessarily need such supports. All the other categories of education consistently indicate a negative association with the usefulness of the programme. However, they remain insignificant, except in the individual surveys.

In many African countries, households that are engaged in subsistence agriculture depend on the support of the household members in carrying out farming activities. Thus, large family size is a necessary input for production. In this study, household size was included in the analysis to assess how it influences respondents' perception of the relevance of the support that they receive. The results reveal that large

household size positively effects on respondents' perception of the usefulness of the programme. Adeniyi and Ojo (2013) found similar results in their study on the extent and magnitude of food insecurity in the LGAs of Osun State in Nigeria which was aimed to assess the factors that affect household food security. The results showed that 69.9% of the studied population was food insecure while the food secured households had a small family size, earned a high monthly income and made use of modern farm inputs. Based on those findings, the authors advised that government's food security policy strategies should focus on households' socio-economic characteristics in order to achieve the intended objective of reducing the number of food-insecure households by a large margin.

Compared to respondents in the Western Cape, respondents in households located in all other provinces, except Gauteng, found the support useful. There are, however, some heterogeneous results across the individual survey years. For instance, considering models for the survey year 2013, the estimates of Gauteng and Limpopo were pessimistic. With the model for the survey year 2014, only Gauteng was negative. With regards to the survey year 2015, the estimates of all the provinces except North- West were pessimistic. In the models for the survey year 2016, the effects of Eastern Cape, Northern Cape, KwaZulu-Natal, Mpumalanga and Limpopo were positive but the effects of Free State, North- West and Gauteng were adverse.

Table 4.3: Correlates of the usefulness of government's agriculture assistance to farmers

The usefulness of agricultural assistance	GHS2013	GHS2014	GHS2015	GHS2016	Pooled sample
Age	0.001*	0.001	0.001**	0.001	0.001***
	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)
Male	-0.072***	0.004	-0.005	0.029	-0.020***
	(0.013)	(0.014)	(0.018)	(0.019)	(0.008)
Basic education (Ref: None)	-0.039***	0.020	-0.010	-0.014	-0.012
	(0.015)	(0.016)	(0.020)	(0.022)	(0.009)
Secondary education	-0.043**	0.020	-0.004	-0.029	-0.018*
	(0.018)	(0.018)	(0.024)	(0.025)	(0.010)
Higher education	0.077	0.034	-0.100	-0.154**	-0.035
	(0.052)	(0.058)	(0.063)	(0.069)	(0.031)

Household size	0.010***	0.008***	0.012***	0.003	0.009***
	(0.002)	(0.002)	(0.003)	(0.003)	(0.001)
Eastern Cape (Ref: Western Cape)	0.504***	0.732***	0.080	0.379***	0.414***
	(0.067)	(0.075)	(0.108)	(0.096)	(0.046)
Northern Cape	0.516***	0.756***	0.257**	0.438***	0.458***
	(0.072)	(0.078)	(0.105)	(0.098)	(0.046)
Free state	0.402***	0.280***	-0.221*	-0.012	0.164***
	(0.076)	(0.096)	(0.130)	(0.112)	(0.053)
KwaZulu-Natal	0.327***	0.526***	-0.110	0.307***	0.244***
	(0.067)	(0.076)	(0.109)	(0.097)	(0.046)
North West	0.115	0.250***	-0.150	-0.121	0.019
	(0.072)	(0.081)	(0.113)	(0.106)	(0.049)
Gauteng	-0.153**	-0.021	-0.463***	-0.187*	-0.218***
	(0.068)	(0.079)	(0.109)	(0.096)	(0.047)
Mpumalanga	0.382***	0.528***	-0.243**	0.231**	0.219***
	(0.070)	(0.078)	(0.111)	(0.099)	(0.047)
Limpopo	-0.017	0.484***	-0.022	0.171*	0.094**
	(0.069)	(0.082)	(0.112)	(0.102)	(0.048)
African/Black (Ref: White)	0.009	-0.017	0.342***	0.293***	0.096***
	(0.048)	(0.052)	(0.073)	(0.070)	(0.030)
Coloured/Indian/Asian	-0.174**	-0.367***	0.366***	0.344***	-0.023
	(0.070)	(0.075)	(0.096)	(0.090)	(0.041)
Informal relationship	0.050	-0.101**	-0.025	-0.075	-0.030
	(0.034)	(0.041)	(0.050)	(0.057)	(0.022)
Single	-0.026	-0.017	-0.068*	-0.039	-0.033**
	(0.028)	(0.029)	(0.036)	(0.038)	(0.016)
Never married	-0.018	-0.005	-0.050**	-0.045*	-0.023**
	(0.018)	(0.019)	(0.023)	(0.024)	(0.010)
Survey year	--------	-------	-------	-------	Yes
Observations	5,329	4,359	3,044	2,713	15,445

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Besides, the estimate of marital status shows that, compared to respondents who are married, those who are either single or have never married are less likely to find the support useful. Age, household size and getting married relate, as these are more

positively correlated. As a result, it is intuitively appropriate to find that those who are single are less likely to find the programme useful because they are less likely to be actively involved in agricultural activities. Besides, they may not have support from other household members who could contribute to the production process. In their assessment of the food security status of beneficiary households of government grants in the township of Kwakwatsi in South Africa, Sekhampu (2013) observed that households their total income significantly determined food security, size, employment and marital status of the household head, and employment status of the spouse. More importantly, household size and household head's marital status have negatively affected the household food security while age, gender, and educational attainment of the household head were found to be insignificant predictors of household food security status.

4.6. Chapter summary

This chapter presented and discussed the results of the analysis of the study. It began with a detailed description of the characteristics of the beneficiary individuals of the agricultural development programme. The final aspect covered the regression estimates of the extent to which the programme is relevant to the beneficiary households. Key findings from both the descriptive and regression analyses is that the agricultural development assistance given by the South African government is effective in reducing food insecurity, improving production and increasing income of the beneficiary small-scale farmers. However, there are gender and geographical differences in the extent of the effects. While some beneficiaries in some provinces are experiencing the positive effects of the policy, the effect on farmers in other provinces is minimal and requires critical policy attention.

Furthermore, the policy can be described as not favouring female farmers as their production, income and food security lag those of their male counterparts. Nonetheless, among female small-scale farmers, the programme had a higher impact on the production, income and food security of those who received the assistance than on those who were not assisted. In summary, the programme has a positive impact on the beneficiary farmers. However, there is a need for policy attention to address bottlenecks that affect the farmers' access to the programme and its consequential heterogeneous effect across gender and geographical location of the farmers. More

importantly, the institutions and departments that have been assigned to ensure the implementation of the programme need to evaluate it, taking into consideration gender, racial constantly and geographical diversities of the target beneficiaries.

CHAPTER 5: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1. Introduction

Small-scale farming in developing countries plays a critical role in socio-economic aspects of the rural and underdeveloped communities. However, over the years, small-scale farmers have faced challenges that require the conscious effort of the government to affect structural changes that will enhance the productivity and livelihood of the farmers. Such interventions have become crucial in recent years as farmers continue to feel the growing impact of climate change, as well as policies of global trade and its consequences for market access and prices of agricultural products. The extent to which any interventions from the government will be effective is dependent on some factors, including country-specific characteristics such as existing infrastructure, trade policies, market access and climatic conditions. The success of such policies also depends on the behavioural patterns of the farmers.

Over recent years, the government of South Africa has made efforts to assist small-scale farmers by developing programs and financial support that would boost production and income of small-scale farmers, who also contributes to production and employment in the country. Few studies have been conducted that attempted to evaluate the impact of the various supports provided by the government on the productivity and food security of the farmers. Those studies have been limited to the provinces. This study adds to the literature by using pooled data from the GHS, a nationally representative survey conducted by StatsSA.

5.2. Conclusions

Based on the results and analysis of various agricultural sectors, government support to the majority of the farmers is lacking. There are very few farmers who are getting assistance from the government, no matter how educated the farmer is, and can access information better than those who are not educated, yet assistance from the government is only offered to 15% of the whole farming community. Even though programs and policies have been established to put women and African/Black farmers ahead about the BEEE policies, it is not even working about the determination of those who get support from the government. Even though support can not only come from government, cooperatives are also not playing any role in ensuring that some few small-scale farmers transit and become large commercial farmers.

From the 2013 to 2016 survey years, the proportion of households who had access to agricultural development support has decreased marginally for (about two percent). The percentage obtained is due to a reduction in the sample sizes of the GHS within this period. It could also be attributed to human and institutional factors that are affecting the effective implementation of the programme to cover the target population. Consistently across the survey years, there are marked differences in access to the support across, gender, level of education, race and geographical location of respondents. Access to support has remained higher among males than females, farmers with lower levels of education than those with higher levels of education, Black/African than other races (Coloured, Indian/Asian and White). Access to agricultural support is high in the Eastern Cape, KwaZulu-Natal, Northern Cape, North-West and Mpumalanga, but very low in the Free State, Limpopo, Gauteng and Western Cape.

However, the gender and geographical differences in access to support reflect the livestock production capacity of small-scale farmers. Apart from pigs, the average production of cattle, sheep and goats is higher among males than females. Across the geographical location of respondents, production is high in the Western Cape, Eastern Cape and Northern Cape.

Comparing their rates of access to the agricultural development support and livestock production, KwaZulu-Natal and Mpumalanga can be considered as not being able to optimise the support. The results also show that agricultural income is higher among farmers who were assisted than among those who received no support. These results are consistent across the years of the surveys, gender and province of residence of the respondents. Generally, food insecurity is higher among females than males, and it is possible because of their lower access to agricultural development support and low production. There is also heterogeneity in the rate of food insecurity across gender and geographical location of respondents. In the Eastern Cape and Western Cape, food insecurity was higher among both males and females who received assistance and those who were not supported. As indicated in Chapter 4, these observations could be attributed to an element of reverse causality. In Gauteng, food insecurity is higher among females who received the support than their counterparts who were not assisted.

The regression analysis indicates that a wide range of socio-economic factors underlies the farmers' access to the agricultural development support programme. Prominent among the factors which are significant in the models are gender, race, age and province of residence of the respondent. Other factors are the size and ownership status of the land used for farming. The PSM analysis shows a significantly more positive impact of the agricultural development support on livestock production, income and food security of households that benefit from the programme, than those who receive no support. Despite these observed positive impacts of the programme, small-scale farmers have mixed opinions regarding its usefulness. Compared to females, males find agricultural support more useful. Similarly, respondents who have no education, and those who are married, find the support programme more useful than those with high levels of education and those who are either single or have never married. Besides, Blacks/Africans, and respondents who have a large household size, find the programme more useful than other races and those with small household size.

5.3. Policy recommendations

Following the observed marked gender, racial and geographical differences in households' access to the agricultural development support, the Ministry of Agriculture and its allied ministries and departments responsible for the implementation of the agricultural development support programmes must streamline policies to account for the lack of support to farmers in general. Addressing such differences is necessary to ensure that the programme achieves its intended overall objectives. The regression analysis reveals that despite the positive impact of the agricultural development support programmes on the livelihoods of the beneficiary households, many of those households are of the view that the programme has not been useful. Such studies will help the government to gather enough information about possible complementary policies that will enable the households that are supported to realise the full benefit of the programme.

5.4. Contribution of the study to the literature

The study provided an alternative to the approach used by the Food and Agricultural Organisation (FAO). The FAO approach uses country's food balance sheet to estimate calories intake per person calorie distribution in the population and establish a calorie

cut-off point that is used to estimate the number of undernourished people (Masset, 2011).

Another aspect of this study which makes it unique is that it uses an innovative approach to link farmers who were assisted with those who were not supported, using the type of assistance that they received as an identifier. Although the study is not a pure RCT, this approach helps to make it possible to obtain reliable and valid estimates that may not differ significantly from those of pure RCT. Finally, the contribution of this study is that, unlike the previous studies that cover only some provinces or communities within provinces, this study uses a nationally representative household survey, and pooled data across four survey periods.

5.5. Limitations of the study and areas for further studies

As a common issue in research, this study has some limitations that need to be mentioned to guide future research and policies on this topic. One of the shortfalls of this study is that it relied on observational data instead of pure RCT data. Nonetheless, this limitation does not have much bearing on the estimates since the PSM, and its bootstrapping procedure offers enough control measures to reduce any potential bias due to the use of the observational data. Future researchers could consider using observational data that follows the beneficiaries of the programme over time to gain more insight into other confounding factors that may affect the estimated impact of agricultural development support. This study was unable to address the transition from small-scale into commercial farming due to lack of information from the survey. Future studies purposely designed to assess the impact of the programme should critically consider this issue to enable policymakers to address it effectively. Subsequent rounds of the GHS could also collect information on this issue to enable researchers and polices makers to investigate it further. The study was also unable to deduce the different types of support offered for different types of farmers, for instance, there were no mentioning of drought relief funds and disaster relief funds which also form of the support system from the government to the farmers.

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ANNEXURES

Table A-1

Variable	Unmatched / Matched	Mean: Treated	Mean: Control	%bias	%reduction bias	P-value
Age	U	58.846	55.52	22.6		0.000
	M	57.196	51.557	38.3	-69.5	0.214
Male	U	.48368	.45719	5.3		0.000
	M	.44155	.40151	8.0	-51.2	0.321
Primary education (Ref: No education)	U	.50646	.45819	9.7		0.000
	M	.53684	.49264	8.9	8.4	0.330
Secondary education	U	.23028	.27082	-9.4		0.000
	M	.19303	.22275	-6.9	26.7	0.114
Higher education	U	.01155	.02221	-8.3		0.000
	M	.00196	.00705	-4.0	52.3	0.612
African/Black (Ref: White)	U	.97579	.9514	13.1		0.000
	M	1.0000	.98467	8.2	37.2	0.423
Coloured/Indian/Asian	U	.01188	.02306	-8.5		0.000
	M	0.0000	.01466	-11.2	-31.1	0.321
Landlord	U	.47035	.70998	-50.2		0.000
	M	.45776	.71053	-53.0	-5.5	0.332
Land-500 m^2-9999 m^2 (Ref: <500 m^2)	U	.17248	.08734	25.5		0.000
	M	.16257	.11961	12.9	49.5	0.233
1 ha or more	U	.08473	.02966	23.9		0.000
	M	.028	.0219	2.6	88.9	0.261
Eastern Cape (Ref: Western Cape)	U	.43848	.18012	58.2		0.000
	M	.48232	.20586	62.3	-7.0	0.645
Northern Cape	U	.03078	.02969	0.6		0.000
	M	.00688	.00708	-0.1	81.4	0.913
Free State	U	.01195	.06824	-29.0		0.000
	M	.01031	.10703	-49.8	-71.8	0.536
KwaZulu-Natal	U	.33067	.19572	31.0		0.000
	M	.42976	.38319	10.7	65.5	0.443
North -West	U	.03623	.05479	-8.9		0.000
	M	0.0000	.03074	-14.8	-65.7	0.111
Gauteng	U	.0065	. 0327	-19.0		0.000
	M	.00196	.0355	-24.3	-28.0	0.198

Mpumalanga	U	.08823	.14213	-16.9		0.000
	M	.06041	.14685	-27.2	-60.4	0.259
Limpopo	U	.05349	.28078	-64.0		0.000
	M	.00835	.07444	-18.6	70.9	0.467

Table A-2

Sample	Ps R2	LR chi2	p>chi2	MeanBias	MedBias	B	R	%Var
Unmatched	0.177	9784.92	0.000	20.0	13.1	122.2*	0.47*	100
Matched	0.046	1576.76	0.134	18.1	11.2	91.8	0.37	100

* if B>25%, R outside [0.5; 2]

APPENDIX 1

Questionnaires used the household's communities regarding food security, agricultural production and income.

Questionnaires regarding for food security:

1. In the past 12 months, did any adult (18 years and above) in this household go hungry because there wasn't enough food?

1 = Never
2 = Seldom
3 = Sometimes
4 = Often
5 = Always
6 = Not applicable (No adults in household)

2. In the past 12 months, did any child (17 years or younger) in this household go hungry because there was not enough food?

1 = Never
2 = Seldom
3 = Sometimes
4 = Often
5 = Always
6 = Not applicable (No children in household)

3.In the past 12 months, was there any young person, aged 5 – 17 years, who has left this household, and you do not know his/her whereabouts or to live on the streets?

1= Yes
2= No
3= Do not know
4= Not applicable (No children in the household)

4. Did your household run out of money to buy food during the past 12 months? Has it happened five or more days in the past 30 days?

1 = Yes
2 = No

5. Did you cut the size of meals during the past 12 months because there was not enough food in the house? Has it happened five or more days in the past 30 days?

1= Yes
2= No

6. Did you skip any meals during the past 12 months because there was not enough food in the house? Has it happened five or more days in the past 30 days?

1 = Yes
2 = No

7. Did you eat a smaller variety of foods during the past 12 months than you would have liked to because there was not enough food in the house? Has it happened five or more days in the past 30 days?

1 = Yes
2 = No

8. Please specify how many times the respondent ate the following foods during the past 24 hours.

01 = Maize, rice, sorghum, millet, bread and other cereals
02 = Potatoes, sweet potatoes, cassava
03 = Beans, peas, groundnuts, cashew nuts or other nuts
04 = Spinach and wild green leaves
05 = other vegetables, carrots, relish, tomatoes, cabbage, beetroot etc.
06 = Fruit
07 = Beef, goat, poultry (chicken), pork, fish, eggs, lamb
08 = Milk, yoghurt and other dairy products
09 = Sugar and sugar products
10 = Oils, fat and butter

Questionnaires regarding agricultural production:

1. Has the household been involved in the production of any kind of food or agricultural products during the past twelve months? (e.g. livestock, crops, poultry, food gardening, forestry, fish, etc.)

1 = Yes
2 = No

2. What kind of food production/agricultural activities is the household involved in?

01 = Livestock production (cattle, goats, sheep and pigs)
02 = Poultry production (chickens, ducks, geese and guinea fowl)
03 = Grains and food crops (maize, wheat, beans, sorghum, millet and Groundnuts)
04=Industrial crops (tea, coffee, cotton and tobacco)
05= Fruit and vegetable production
06 = Fodder, grazing/pasture or grass for animals
07= Fish farming/aquaculture
08 = Forestry
09=Game farming
10= Other

3. Why do you grow farm produce or keep stock for the household?

1 = As a primary source of food for the household
2 = As the primary source of income/earning a living
3 = As an extra source of income
4 = As an extra source of food for the household
5 = As a leisure activity or hobby, e.g. gardening

4. Did your household sell any of its produce?

1 = Yes
2 = No

5. To whom does your household sell most of its produce?

1 = Local buyers from this district
2 = Buyers from neighbouring cities and towns
3 = Formal markets in South Africa
4 = Export agencies in international buyers.
5 = Other

Questionnaires regarding agricultural assistance:

1. Has your household received any of the following kinds of agricultural-related assistance from the government during the past 12 months?

1 = Training
2 = Advice from government extension officers
3 = Grants (money that does not have to be paid back)
4 = Loans (money that has to be paid back)
5 = Inputs (seed, fertilizer) as part of a loan
6 = Inputs (seed, fertilizer, etc.) for free
7 = Dipping and vaccination services for livestock from State
The veterinarian or other Department
8 = other (specify)

2. Did your household find this agriculture-related assistance?

1 = Very useful
2 = somewhat useful
3 = Not useful

3. Did your household receive agriculture-related assistance from any other entity than the government?

1 = Yes
2 = No