The contribution of food gardens to household food security in eThekwini municipality, KwaZulu-Natal

by

MTHANDENI ERNEST NTULI

submitted in accordance with the requirements

for the degree of

MASTER OF SCIENCE

in the subject

AGRICULTURE

at the

UNIVERSITY OF SOUTH AFRICA

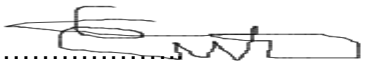
SUPERVISOR: DR M R MASEKOAMENG

CO-SUPERVISOR: DR T P MBOMBO-DWEBA

MARCH 2023

DECLARATION

I MTHANDENI ERNEST NTULI, declare that the dissertation titled: THE CONTRIBUTION OF FOOD GARDENS TO HOUSEHOLD FOOD SECURITY in ETHEKWINI MUNICIPALITY, KwaZulu Natal, is my work and has not previously been submitted by me for a degree at this or any other institution. I declare that the dissertation /thesis does not contain any written work presented by other persons, whether written, pictures, graphs, data, or any other information without acknowledging the source. I declare that where words from a written source have been used, the words have been paraphrased and referenced, and where exact words from a source have been used the words have been placed inside quotation marks and referenced. I declare that I have not copied and pasted any information from the Internet without specifically acknowledging the source, and have inserted appropriate references to these sources in the dissertation or thesis reference section. I declare that during my study, I adhered to the Research Ethics Policy of the University of South Africa, received ethics approval for the duration of my study before the commencement of data gathering, and have not acted outside the approval conditions. I declare that the content of my dissertation/thesis has been submitted through an electronic plagiarism detection program before the final submission for examination. I MTHANDENI ERNEST NTULI, declare that 'The contribution of food gardens to household food security in eThekwini municipality, KwaZulu Natal 'constitutes my original work and that I have properly cited all sources that I have utilised or taken information from.

Signature…… 

M.E NTULI

Date : …2022/12/04…….

ACKNOWLEDGEMENTS

I appreciate the inputs made to this project by the individuals and groups listed below:

- My supervisor, Dr Masekoameng, for his significant contribution, your advice and for stepping in at a critical time of my study.
- Dr Mbombo-Dweba, the co-supervisor of this study. Throughout my study, encouragement, helpful criticism, kindness, and generosity have been great.
- The participants of food gardens from eThekwini Municipality.
- Thank you to the Kwazulu-Natal Department of Agriculture and Rural Development for giving me permission to conduct the study.
- The key informants, respectively, connected me with the relevant farming households to collect data from the study area.
- I appreciate the financial support from UNISA's Master and Doctoral Bursary, which helped fund my studies.
- My wife, Londiwe Ntuli, for her unwavering support, comprehension, and faith in me.
- Athandwa Ntuli (daughter) for becoming an inspiration.
- The tolerance, and help from my friends and loved ones.
- My appreciation also goes to my family for sacrificing some of the sweetest family occasions for this work.

DEDICATION

I honour my late mother, Fisane Maria Hadebe, by dedicating this dissertation to her. The work is also dedicated to Mr V.C Ntuli, Mrs S Ntuli and my wife, Londiwe Fikile Ntuli.

.

ABSTRACT

South African citizens have limited access to fruits, vegetables which contains macro nutrients and micro nutrients. However, food gardens can provide fruits and vegetables to enhance household food security and have positive impact on people livelihoods.

The contribution of food gardens to household food security in eThekwini Municipality, KwaZulu Natal, was investigated using a mixed-method approach. Four (4) key informants and 307 food garden participants were identified using purposive and stratified random sampling. Data was collected using key informant interviews, semi-structured questionnaires, and focus group discussions. For quantitative data analysis, Statistical Package for the Social Sciences (SPSS) version 26.0 was utilized to analyse data through descriptive analysis. Qualitative data analysis was used to analyse data collected from focus group discussion.

Food gardens were dominated by older females with low incomes and low educational levels. The study revealed that majority (63.8%) of participants are recipients of social grants. Therefore, households have low income. This has negative impact on accessibility and availability of food at household level.

A variety of vegetables were planted; with most vegetables harvested in February, March, and April. The majority of respondents (90.6%) obtained low Household Food Inventory (HFI) scores, and low Dietary Diversity Score (DDS). Limited availability of fruits and vegetables at household level influence low HFI scores. The majority of households (88.6%) were classified as food insecure by Household Food Insecurity Access Scale (HFIAS). The main challenges identified included a lack of equipment, land, fencing, water, and extension services.

The evidence revealed that food gardens have not managed to buffer the households against food insecurity. Food gardens did not improve dietary level for participants. Because most respondents of this study had low HDDS, with the mean score of 4.1 and the participants dietary variety was less diverse.

Respondents (63.5%) indicated that vegetables and fruits were not available throughout the year. This indicates that food gardens did not improve household food security for participants. However, 85.0% of respondents in this study were satisfied with the contribution of food gardens to household vegetable availability. They require, government support in terms of extension services and resources are thus recommended to assist gardeners to reach their full potential.

OKUCASHUNIWE

Kuphenywe ngegalelo lezingadi zokudla ekuvikelekeni kokudla emakhaya kuMasipala weTheku, KwaZulu-Natal, kusetshenziswa indlela exubile. Abanolwazi abane ababalulekile kanye nabahlanganyeli basengadini yokudla abangama-307 bahlonzwe kusetshenziswa amasampula angahleliwe anenhloso kanye nawahlukanisa isibalo sabantu sibe ngamaqembu amancane. Imininingwane yaqoqwa kusetshenziswa izingxoxo zabanolwazi ababalulekile, uhlu lwemibuzo olungahlelekile, kanye nezingxoxo zamaqembu okugxilwe kuwo. Ukuze kuhlaziywe imininingwane yocwaningo lwezinombolo, inguqulo ye-SPSS 26.0 yasetshenziswa ukuze kuhlaziywe imininingwane ngokuhlaziywa okuchazayo. Ukuhlaziya imininingwane yocwaningo oluchazayo kusetshenziswe ukuhlaziya imininingwane eqoqwe ezingxoxweni zamaqembu okugxilwe kuwo.

Kutshalwe izinhlobonhlobo zemifino, iningi lazo livunwa ngoNhlolanja nangoNdasa. Iningi labaphendulile (90.6%) lithole amaphuzu aphansi e-HFI, ama-42.3% ane-DDS ephansi kanti ama-88.6% achazwe njengokungavikeleki kokudla yi-HFIAS.

Ubufakazi buveze ukuthi izingadi zokudla azanele njengendlela yokuvikela imindeni ekuntulekeni kokudla. Ukwesekwa kukahulumeni ngendlela yokwelulwa kwezinsizakalo kanye nezinsiza kuyaphakanyiswa ukusiza abalimi ukuthi bafinyelele amakhono abo ngokugcwele.

TSHOBOKANYO

Go batlisitswe seabe sa ditshingwana tsa dijo mo kgonagalong ya malapa ya go fitlhelela dijo tse di itekanetseng le tse di nang le dikotla ka dinako tsotlhe mo Mmasepaleng wa eThekwini, KwaZulu-Natal, ka go dirisa molebo wa mekgwa e e tswakantsweng. Go supilwe basedimosibagolo ba le bane le batsayakarolo ba le 307 ba tshingwana ya dijo, go dirisiwa mokgwa wa go tsaya sampole o o dirwang kwa ntle ga thulaganyo epe, o o itlhophelwang ke motlhotlhomisi le o o dirwang ka ditlhophatshwano. Go kgobokantswe deitha ka go botsolotsa basedimosibagolo, mananepotsolotso a a akaretsang dipotso tse di senang dikarabo dingwe tse di rileng moo mmotsolodiwa a tlhagisang maikutlo a gagwe, le dipuisano tsa setlhopha sa batho ba ba tsayang karolo ka go buisana ka ga setlhogo se se amanang le tlhotlhomiso. Mo tshekatshekong ya deitha e e tlhagisiwang ka dipalo, go dirisitswe SPSS ya mofuta wa 26.0 go sekaseka deitha ka tshekatsheko e e sobokanyang le go tlhalosa dintlhakgolo tsa deitha. Go dirisitswe tshekatsheko ya deitha e e ka ga maitemogelo a batsayakarolo go sekaseka deitha e e kgobokantsweng go tswa mo dipuisanong tsa setlhopha sa batho ba ba tsayang karolo ka go buisana ka ga setlhogo se se amanang le tlhotlhomiso.

Go jadilwe mefutafuta ya dijalo, tse bontsi jwa tsone bo kotulwang ka Tlhakole le Mopitlwe. Bontsi jwa baarabi (90.6%) bo bone maduo a a kwa tlase a HFI, 42.3% e nnile le DDS e e kwa tlase mme 88.6% e kailwe jaaka e e palelwang ke go fitlhelela dijo tse di itekanetseng le tse di nang le dikotla ka dinako tsotlhe ke HFIAS.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS AND ACRONYMS

DAFF-Department of Agriculture, Forestry, and Fisheries

KZN-KwaZulu-Natal

HDDS-Household Dietary Diversity Scale

FAO-Food and Agriculture Organization

HFI-Household Food Inventory

HFIAS-Household Food Insecurity Access Scale

HFIAP-Household Insecurity Access Prevalence

IFSS-Integrated Food Security Strategy

IFAD-International Fund for Agriculture Development

SPSS -Statistical Package for Social Science

UNICEF-United States Children's Fund

WHO-World Health Organization

WFP-World Food Programme

CHAPTER 1: INTRODUCTION OF THE STUDY

1.1. Introduction

Over 60% of the population of South Africa now lives in cities, a sign of the country's growing urbanisation (O'Neill,2021). According to Van der Merwe (2011) projections suggest that by 2030, this number will increase to 71,3 percent of South Africa's overall population. SAnews, (2015) further predicts that, 80% of South Africans will reside in urban areas by the year 2050.Urban areas already have a larger population than rural areas (Mtolo,2016). Therefore, a rise in urbanisation is likely to constrain food availability and accessibility, especially vegetables (Szabo,2016).

Income becomes the primary means of obtaining food in the absence of domestic food production (Hart, 2010; Silvia et al., 2015). However, the rate of joblessness in South Africa has increased from 32.6% to 34.4% in 2021 (Business Tech,2021). As a result, due to the rising unemployment levels, households are exposed to imbalanced diets due to low incomes (Hendriks, 2013; Kesselman, 2018). The rise in food prices further reduces people's disposable income. To cope with the rising food prices, low-income households allocate a greater part of their expenditure to food, which results in less diverse diets (Altman et al., 2009).

According to Hendriks (2013), 30 to 50% of South Africans are prone to insufficient food and consume unbalanced diets. Although South Africa's national level of food security is high, it is not the case with households (Altman, Hart and Jacobs, 2009; Jowell, 2011; DAFF, 2011; FAO, 2014; Delport, 2019). The shortfall of food in households is due to high levels of unemployment and lack of resources. In eThekwini, a study utilising the Household Food Insecurity Access Scale (HFIAS) as a tool to determine level of food security, revealed that 57.5 percent of respondents were food insecure (Bikombo ,2015). Prior studies (Jacobs et al., 2016; Okop et al.,2019; Harris et al.,2023) has demonstrated that South African diets tend to be low in fruits and vegetables, which results in a spectrum of vitamin deficits.

According to Modibedi et al. (2021) food shortages can be resolved with urban agriculture practices. Urban agriculture is a process of cultivating plants in and around cities to make food available and for use in society (Game and Primus,2015). Urban agriculture is performed in many different places around the world, including community gardens, backyard gardens, food banks, vacant lots, parks, green houses, rooftops, balconies, windowsills, ponds, rivers, and estuaries, according to Chandia (2012). Urban agriculture in the manner of vegetable gardens is regarded as one of the sustainable methods to combat poverty and food insecurity in communities with limited resources (Mcata & Obi, 2015). Urban and rural communities can

both benefit from food gardens as a preventive measure to enhance household food and nutrition security (Jacobs et al., 2016).

Food gardens can be smallholder or small-scale gardens, roof top gardens, community gardens, school gardens, home, mixed, combined, backyard, kitchen, farmyard, compound (Galhena et al.,2013). Food gardening involves the cultivation of fruits and vegetables, and which are maintained by households, communally or individually (Musotsi et al., 2008; Galhena et al., 2013; Veen, 2015).

According to Pem and Jeewon (2015), to achieve a balanced meal, the consumption of food grown vegetables and fruits should be encouraged because they are economically and socially acceptable. People can opt for food gardens since they are highly adaptable to extreme conditions and can be grown with basic technologies and inputs (Jacobs et al., 2016). In addition to this, household food security can be achieved when individual or household obtain direct access to fresh vegetables (Shisanya and Hendriks, 2011).

The benefits of food gardens are social, economic and environmental (Musotsi et al., 2008; Galhena et al., 2013). Literature (Lal,2020) indicates that natured home gardens can provide food availability and accessibility to households throughout the year (Modibedi et al., 2021). Furthermore, food gardens enhance nutrition security by making fruits and vegetables easily accessible to resource-poor households (Modibedi et al., 2021; Suri,2020; Jacobs et al., 2016). The participants of food gardens can use produce for household consumption and sell surplus to make income, thus increasing disposable income (Averbeke and Khosa, 2007; Jacobs et al., 2016), which can contribute to food security. Higher incomes have been associated with improved household food security from prior studies (Atuoye et al.,2019; Dodd and Nyabvudzi,2014).

1.2. Research problem

Despite the reported advantages of food gardens, there are few empirical research studies that have been done on how they affect South African households' food security (Jacobs et al.,2016; Walsh et al.,2020; Issahaku et al.,2023). Of the few studies that have been conducted, most focused on rural areas. For example, Mcata and Ajuruchukwu (2015) conducted a study on the contribution of food gardens to household food security in 4 villages in the Eastern Cape. Similarly, Nontu and Taruvinga (2021) study was focusing on the variables that determine rural households' engagement in home gardening.

Food gardens can provide fruits and vegetables to enhance household food security (Galhena et al.,2013; Algert et al.,2014; Matsimbi,2020; Carstens et al.,2021). Food insecurity, related to poverty and low intakes of fruits and vegetables is widespread in South Africa (Jowell,2011; Govender et al.,2017; Du Toit et.,2022; Sithole et al.,2023). The problem is failure to access or produce enough fruits and vegetables which results to household food insecurity (Castillo et al.,2012; Gundersen and Ziliak,2015).

Income is the main means of accessing food and the main determinant of household food security (Hart, 2010; Drammeh et al.,2021). However, due to high unemployment rate in South Africa, the poor households do not have enough money or resources to purchase fruits and vegetables, which are high in price and easily perishable (Jacobs et al., 2016). As a result, households end up making poor food choices as they tend to focus on quantity than quality (Hendriks, 2014; Shelembe,2018). The rise in food prices further reduces people's income and forces poor households to allocate greater proportion of their expenditure to food, resulting in diets that are less diverse, lower in quality and energy intake (Altman et al., 2009; Chakona and Shackleton,2018; French et al.,2019).

While research activities have been carried out in urban areas, their focus was on urban agriculture in general (Khumalo and Sibanda, 2019; Philander and Karriem, 2016). This then suggest that research on the contribution of food gardens in urban areas is scanty and requires further attention (Modibedi et al., 2021). EThekwini municipality in KwaZulu-Natal, is no exception to this phenomenon.

The absence of literature in this regard makes it difficult to come up with strategies to support urban food garden initiatives. It is for this reason that scholars (Kingsley et al.,2019; Cerda et al.,2022) have called for in-depth research on the role that is played by urban agriculture (Khumalo and Sibanda, 2019; Philander and Karriem, 2016; Webb, 2000). Therefore, the aim of this study is to analyse the contribution of food gardens to household food security.

1.3. Aim of the study

The aim of this study is to investigate the contribution of food gardens to household food security at eThekwini Municipality in KwaZulu-Natal.

1.4. Objectives

- To assess the socio-demographic characteristics of households participating in food gardens.
- Investigate the contribution of food gardens to food availability of households.
- To assess the contribution of food gardens to food accessibility of these households.
- Investigate challenges and benefits which the food gardeners' faces in response to their food gardens.

1.5. Research questions

- What are the socio-demographic characteristics of participants in food gardens?
- What is the contribution of household gardens to food availability?
- How do the food gardens contribute to accessibility of food for these households?
- What are the benefits and challenges faced by food gardeners in the study area?

1.6. Significance of the study

The study will contribute to the body of literature where the results will assist the municipality and other stakeholders to understand better the importance of food gardens and their contribution to household food security. The literature reviewed indicated insufficient information on the contribution of food gardening towards household food security (Jacobs et al., 2016). The results of this study could be used to inform policy and assist in promoting food gardens to alleviate poverty and malnutrition. A holistic approach will be used to communicate the outcome of this study to the communities to promote food gardens, thus ensuring household food and nutrition security.

1.7. Operational definitions of key terms and concepts

Food gardens refer to the land that is utilised to grow a variety of crops. The crops are utilised for household consumption and income creation (Musotsi, Sigot and Onyango, 2008; FAO, 2011; Jowell, 2011; Galhena, Freed and Maredia, 2013).

Household food insecurity is induced by difficulty in meeting one's daily dietary needs and worries about one's ability to generate or obtain food (Shisanya and Hendricks, 2011; Labadarios et al., 2011).

Household food security occurs when there is sufficient food for each person to live a healthy and active life. It covers the accessibility of nutritious and safe food and the capability of obtaining high-quality food in a manner acceptable to society (Labadarios, Mchiza, Davids, and Weir-Smith, 2009; Labadarios et al., 2011).

There are 4 main concepts that form food security: availability, access, stability, and utilization (Hanson, 2013). **Food availability** is achieved when procurement of food is sufficient whether its national or household level (Department of Agriculture, 2002; Nkwana, 2016). Climate conditions such as high winds, hail, excessive precipitation can make food to be unavailable to household. For an example drought and flooding conditions can reduce food gardens yield.

Food accessibility refers to a country or household's capacity to obtain enough food on a sustainable basis (Department of Agriculture,2002; FAO, 2008; Hanson, 2013; FAO, 2014). Scarcity of products might increase prices. Increase prices may lead to unaffordable of food (Masekoameng, 2016). This will reduce access to food for poor communities.

Food stability occurs when food is available, accessible and utilised meet people nutrition requirement (FAO, 2008; FAO, 2014). At the national level, South Africa's food security is stable and sufficient. Nevertheless, food security is inconsistent at the household level (DAFF, 2011). Stability has three elements which are vulnerability, resilience, and temporal dimension. The food gardens should be able to provide equitable provision of food for all season.

Food utilization relates to how food is used up by people at the domestic level, this will include proper use of food, processing, preservation, storage and food preparation (DAFF, 2011). The preparation of vegetables must provide maximum nutrients. They can prepare food gardens products using resources such as electricity, fuel and cooking utensils so that they utilise food (Nkwana, 2016).

1.8. Outline of the dissertation

The dissertation will follow a book format consisting of six (6) chapters as follows:

Chapter 1 is the introduction to the study. This chapter provides a background and introduction, significance of the study, research problem and questions, aims and objectives, operational definitions, and study limitations. Chapter 2 is reviews literature on. This chapter first defines food gardens as a concept. This is followed by the benefits of food gardens as described in the literature and the prevalence of food gardening as a practice. Description of the concept food security is also provided in this chapter. Chapter 3 explains the research methodology that was employed to conduct the study. In Chapter 4, the results of the study are presented. Chapter 5 discusses the results of this study. Interpretation and linkages with previous literature are made. Chapter 6 includes a summary, conclusion, and recommendations of the study.

CHAPTER 2: LITERATURE REVIEW

2.1. Introduction

The chapter reviews the literature on food security as a concept by unpacking the different pillars that form part of this concept. It also discusses gardens as a worldwide practice, its origins and benefits. Lastly, statistics of where food insecure people are found and challenges to food security are explored.

2.2. Description of food security concept

Food security is characterised as a state in which every person regularly has access to an adequate supply of healthy and safe food (FAO,2008; Fahy,2021). Four pillars support the concept of food security: accessibility, utilisation, stability, and availability (FAO, 2006; 2014; Njunguna, 2013; Fraanje and Lee-Gammage, 2018). So, to consider food security accomplished, all four of these pillars must be met.

2.2.1. Availability of food

Food availability is accomplished through domestic food production, imports and the effectiveness of food distribution networks (FAO, 2006). The quantity of food at the national and household level is known as food availability. Food availability is dependent on farming and procuring ample food on continuum basis (Nkwana, 2016).

Wlokas (2008) and Masipa (2017) stipulate that food gardens productivity is influenced by climate change and thus have consequences on food availability. Friedlander and Chronicle (2021), findings revealed that climate change is having an adverse effect on agricultural yields and patterns of different food items which in turn hinders food availability. Climate conditions such as high winds, hail and excessive precipitation can make food to be unavailable to households. For an example drought and flooding conditions can reduce the yields of food gardens.

2.2.2. Accessibility of food

For a nation or household to achieve food accessibility, they should obtain enough food on sustainable basis (Department of Agriculture,2002; Ndobo, 2013). Accessibility of food includes economic and physical access to sufficient resources for acquiring appropriate food (Chihambakwe et al., 2019; FAO, 2014). Access to food for households is dependent on two factors: economic access and physical access (Nkwana, 2016). However, Napoli (2011) argues that there are three factors which influence food access: physical, economic/financial and socio-cultural.

Food access in this study refers to individuals' ability to get food through farming. Therefore, if households cannot produce enough food, they should have financial means to source it from the markets. This dependence on markets makes households to be vulnerable to price fluctuations. For example, scarcity of products might increase prices which then translates to unaffordability of food (Mkhawani et., 2016).

Economic access is dependent on availability of income, stability of food prices and accessibility of social supports systems while physical access is determined by quality and efficient ports, roads, railways, communication and food storage facilities, and other installations that facilitate the functioning of markets (Nkwana, 2016) and accessibility of shops and markets (Greenberg, 2010). Roos et al. (2013) and Selepe et al. (2015) emphasize that retail stores have a beneficial impact on household food security. Previously, heavy reliance on markets for food access, however in times of distress such as the outbreak of covid-19 has shown that market reliance is not always guaranteed which highlights the importance of localised, own food production (Chisamba et al., 2019, Carstens et al., 2021), as means to food accessibility. It is for this reason that previous research is advocating home gardens (Carstens et al., 2021), revitalization of urban and peri-urban agriculture (Chihambakwe et al., 2019) and resilience of local food systems.

2.2.3. Utilisation of food

Food utilization is attributed to the final food intake at household level by individual. Food utilization includes keeping food to extend shelf life, selection, preparation and final intake of food by household members (Hanson, 2013; FAO, 2014; Omotayo et al.,2017; Fraanje and Lee-Gammage, 2018). Ingesting food that is both safe and sufficient to meet everyone's physiological needs in the family is necessary for achieving food security. Food utilisation and consumption pattern is not the same for various groups of the population. The choice of food by households is influence by cultural categories and rational categories (Bonke, 1992; Gorton and Barjolle,2014).

Rationale categories are economic factors (such as cost, income, and availability) can change eating habits of households (Bonke, 1992; Gorton and Barjolle,2014). Food choice is determined by cost of food (France, 2006). Unbalanced diets are more likely to be consumed by low-income populations (Temple and Steyn, 2011). For example, compared to households with higher incomes, lower income households buy fewer fruits and vegetables (French et al., 2019). However, in order for nutritious diets to be realized, one needs to have access to wide range of foods (Pechey and Monsivais,2016).

Preparation and consumption of food differ due to cultural and religious belief also play a crucial role in determining food choices. Cultural and religion belief may influence people not to consume certain foods (Shipman and Durmus,2017). When a person move to another country may adopt food habits of that country due to unavailability of preferred food type (Mbombo-Dweba et al.,2017)

2.2.4. Stability of food

For households to achieve food stability, the afore-mentioned 3 food security pillars have to stable, and this leads to households being food secure (FAO, 2011; FAO, 2014; Hanson, 2013). This therefore means there is interdependence of the four pillars food security to be attained. Disruption in one pillar negatively affects food stability (Fraanje and Lee-Gammage, 2018). Taking steps to prevent food spoilage and/or significant losses during the storage and processing of readily available food is another aspect of ensuring food stability (Sayed, 2006; Nesamvumi, 2014). Food stability stipulates that households have to find ways to minimize spoilage of food, so that food will be availability for many months.

Political factors, economic crisis and natural disasters affect food stability (Davis-Reddy and Vincent, 2017), resulting into vulnerability. The greatest way to address food poverty issues may not be to rely too heavily on foods produced commercially (Chikoto, 2016). During economic depression, commercially produced food can be high in prices. Therefore, increasing reliance on food gardens can straighten resilience of household. In a review of studies by Galhena et al. (2013), it was revealed that food gardens were able to create resilience and ensure food security amongst vulnerable households in Cuba when the country was experiencing economic and political turmoil. Households with possession of assets are more resilient and capable of adapting to economic depression (Ansah et al., 2019).

2.3. Food garden as a concept

Depending on the setting, emphasis, or research goals, numerous definitions to food gardens, emphasising distinct elements (Galhena et al., 2013). Food gardening is the process whereby land is used to produce mostly fruits and vegetables by households (Musotsi et al., 2008; Galhena et al., 2013). Food gardens are categorized as mixed, homestead, backyard, kitchen or farmyard gardens (Galhena et al., 2013) and most of the manpower used for vegetables comes from household members.

With regard to origins of food gardens, it is worth mention that food gardening were previously associated with rural settings until subsistence agriculture in the form of vegetable gardens started in England in the early 1800s (French, 2008). Additionally, in the United States, community gardens were mostly used to cultivate food from the late 1800s until the 1940s (Lee, 2002). Mudzinganyama (2012) revealed that food gardens in urban settings were established before 20th century in response to food shortages. The food gardens served to feed the soldiers while easing the burden that the war had placed on the general food supply.

The Allotment Acts of 1887 and 1890, which mandated that allotment gardens be allotted to each gardener, were formed in Britain as a response of the public's interest in food (Mudzinganyama, 2012; Clarke et al., 2019). This was acerbated by the rapid immigration to cities which occurred towards the end of 19th century resulting to economic crisis (Kransy and Saldivar-Tanaka, 2004), that led to increased demand for affordable foods. The economic depression resulted into inaccessibility and unavailability of food, hence the allotment gardens to enable people to grow their own food. Literature indicated that these allotment gardens provided vegetables when incomes did not allow access from the markers (Mudzinganyama, 2012). As years passed, the support and research interest for food gardening increased.

In South Africa, an average of four million people partake in small-scale agriculture (Aguera et al.,2020). In KZN, approximately 24% of households are involved in cultivating fruits and vegetables on a small-scale basis (STAT SA,2019. Small-scale agriculture is perceived as the primary source of food for households. There is evidence that both urban and rural areas have food gardens which are classified as subsistence farming (Galhena et al., 2013). Baiphethi and Jacobs (2009) suggest that that expanding subsistence farming can increase the food supply and enhance household food security in both rural and urban regions. Moreover, subsistence farming can reduce dependence on purchasing and, subsequently vulnerability to price inflation.

2.4. Benefits of food gardens

History has shown us that food gardening is vital to improve accessibility and availability of food at household level. Over the years communities have continued to practice food gardens because food gardens are more effective in enhancing household food security (Hart, 2010). Food gardens are believed to provide several benefits to households. These include higher nutrition advantages and increased food accessibility, economic, social, and environmental benefits (Mitchell and Hanstad, 2004; Galhena et al.,2013). Society and households benefit from the potential environmental advantages of food gardens.

2.4.1. Increase availability, accessibility of food and better nutrition benefits.

Food gardens are crucial in the cultivation of food, provision of fresh and safe foods (Modibedi et al.,2020; Oguttu et al.,2021). Household production provides the best, fresh ingredients possible. Food gardens can enhance food and nutritional security (Musotsi, et.al, 2008), by improving overall food supply and consumption (Tesfamarian, Owusu-Sekyere, Emmanuel and Elizabeth,2018). Food gardens give the households daily access to a variety of fresh and healthy meals. This results in more food being available and greater nutrition due to dietary diversity.

In a study that was conducted by Kubheka (2015) at Amathole District (Eastern Cape Province) majority of respondents reported that access to vegetables and their subsequent vegetable intake had increased. In addition to this, some respondents reported eating more vegetables overall, eat a wider range of vegetables or try different vegetables as a result of having food gardens. In their research, which was carried out in Lesotho, Walsh et al. (2020) also reported an increase in vegetable consumption, where they trained respondents in food gardening, food preparation and preservation. A study done by Modibedi (2018) in Emfuleni Local Municipality arrived at a similar conclusion, stating that the majority of respondents (86.1%) being capable to grow their own food in their homes, supplying fresh vegetables to their families. Increased intake and variety of vegetables translates to disease prevention and maintaining optimal health (Okop et al.,2019).

Food gardens are a key source that contribute to food and nutritional security, as well as livelihoods (Galhena et al., 2013). Njuguna (2013) confirms the importance of food gardens by pointing out how they might increase the food security of resource-constrained rural residents in emerging economies. Furthermore, it was revealed by Tesfamariam et al. (2018) in their study that was conducted in Gauteng amongst Homestead Food Garden Programme beneficiaries that the extent of current food insecurity in this study area was reduced by 41.5%.

Research done by Chauke (2016) on food gardens at Mudavula village revealed that food gardens have positive impact on people`s livelihoods (access to food).

2.4.2. Social benefit

The literature (Oguttu et al., 2021; Audate et al., 2019) has also noted a connection between food gardens, social capital, and food gardening. Social benefits of food gardens include uplifting the status of women, building relationship with food garden members, empowerment of the community, preserving indigenous knowledge and building integrated societies (Rankoana,2017; Olivier,2015; Galhena, 2013). Based on a study by Beavers et al. (2022) in Detroit, participation in communal food gardens was linked to higher levels of social capital relationships, networking, cooperation, and bonding.

Lippman et al. (2013), Tibesigwa et al. (2014) and Olivier (2015) concluded that that strong social links allowed for the flow of money or resources in the type of loans or donations, which helps impoverished households cope with shocks or difficulties. For an example, the community indicated that they depended on relatives, friends and neighbours to ask maize meal or sugar which will be returned when they have access to such food items (Masekoameng and Malotja,2016). A strong connection also enables farmer to farmer extension (Deressa et al., 2009). A review of literature (Armstrong,2000; Rosol,2010; Litt et al.,2015; Martin et al.,2016; McMillen et al.,2016) that was published between 2000 and 2016, arrived at a similar conclusion regarding food gardens' social advantages (Christensen, 2017). Olivier and Heinecken (2016) believed that food gardens create bonds and allows for formation of linkages between members. Through this they develop trust as they help one another in their gardening activities (Kanosvamhira and Tevera, 2019). This then translates into genuine friendships outside the gardening space. The social capital is generated; relationships remain bolstered and were undoubtedly essential to the gardens' long-term viability (Dzanja at el., 2013; Christensen, 2017).

2.4.3. Economic benefit

According to Tesfamariam et al. (2018) and Beavers at el. (2019) food gardens can provide economic well-being to households. This is when the surplus is sold to earn income. Money generated from these sales and money saved by not depending on markets for food can be used for other household needs (Audate et al., 2019; Beavers et al., 2019). In addition to this, at times small cottage industries are developed from gardens offering more income generating activities (Galhena et al., 2013; Taboka ,2016).

Qange and Mdoda (2020) further support that food gardens are rapidly being used to earn income, even if they are primarily intended for household sustenance. For example, according to Galhena et al. (2013), food gardening practices in Vietnam created over 22% of their cash income. In south-eastern Nigeria, participants generated up to 60 % of their income from food gardens (Galhena et al., 2013). Vegetable gardening is a useful technique as earnings during unemployment (Uzokwe, 2016).

2.4.4. Environmental benefit

Food gardens utilize available space of land and contributing to environmental care (Noss,2022; Musotsi, et al., 2008). Food gardens provide multiple environmental and ecological benefits (Galhena et al., 2013) such as nutrient cycling, soil conservation and reduction of soil erosion (Pulido at el., 2008; Torres et al.,2017). The ultimate nutrient in the soil is recycled by plants and animal waste, and a highly effective nutrient cycling system is made possible by continual reuse of organic soil materials. The prevention of soil degradation and soil conservation are additional possible advantages of food gardens.

2.5. Statistics of food insecure people and where they are found

Food insecurity continues to be a persistent challenge globally (Ndobo,2013). Numerous individuals worldwide continue to experience food insecurity (McDonald, 2010). Strengthening food availability, accessibility, stability, and utilization throughout international populations is essential to tackle the world's food security issues.

According to Global Status Report (World Health Organization,2011 and Hawkes,2013) revealed that 57 million deaths in 2008 were linked to food insecurity while 36 million or 63% deaths around the world were caused by consuming unhealthy food. This is validated in prior research by Galhena et al. (2013) in which approximately 35% deaths worldwide were associated with consuming nutritional inadequate food. More than 500 million people worldwide experience chronic food shortages (Galhena et.al. 2013). According to Food and Agriculture Organization, International Fund for Agriculture Development and World Food Programme (2015), one in every nine people in the world are currently unable to consume enough food and this results to food insecurity.

As a result, there are roughly 2 billion people around the globe who suffer from moderate to severe food insecurity, this issue has become a worldwide crisis (FAO, IFAD, UNICEF, WFP and WHO, 2019; FAO, 2020). There are 815 million undernourished individuals in the globe, and the majority of them do not eat enough fruits and vegetables (FAO, WHO, WFP, IFAD and UNICEF, 2017; Gundersen at al., 2018). As a result, the globe is unlikely to have

eliminated hunger by 2030. Hunger will indeed affect 840 million population by 2030 (FAO, 2020).

According to literature, developing countries are where the majority of individuals who are hungry and malnourished are situated (Galhena et.al. 2013). In war-distressed countries in Sub-Saharan Africa for an example, between 2015 to 2018 the statistics for people prone to malnutrition increased by 23.4 million. Statistics indicates that Sub-Saharan Africa account for 56% of the globe extreme impoverished in 2015 and headcount ratio was 41% (FAO, IFAD, UNICEF, WFP and WHO,2019). Food insecurity may lead to undernourishment.

Costly food prices and unemployment causes hardships for most people to be capable of affording nutritious food. This in turn result in adverse health effects due to inadequate intake of basic macronutrients micronutrient deficiencies. The World Health Organization advises that five servings of fruit and vegetables (400g total) must be eaten on a daily basis in order to maintain a healthy diet that contains adequate critical micronutrients (Jowell, 2011). A large percentage of South African households consume fewer fruit and vegetables than this daily suggested intake (Mudzinganyama,2012).

South Africa is ranked number 20 on countries with concern regarding under nutrition. (Hart, 2010). STATS SA (2019) reported that have households' adequate access to food were 12, 7 million. Despite the fact that South Africa has a stable food supply nationwide. In contrast, 20% of households in 2017 had insufficient or extremely insufficient access to food (STATS SA, 2019).

Regarding variations between the provinces, the three (3) provinces with the highest incidences of food inaccessibility in 2015 were Free State, KwaZulu Natal and Eastern Cape, while Western Cape and Limpopo had the lowest numbers at 5% and 4.4%, respectively (Masipa, 2017). Notable, from these statistics, only Free State province had food inaccessibility numbers equal to the national level of 20%. However, according to the 2019 statistics, there were 3 provinces with food inaccessibility numbers above the national level of 24%. While Mpumalanga was below this food insecurity national level, the number of food insecure people in this province was still above 20% (Stats SA, 2019).

2.6. Challenges of food gardening

Small-scale farming is still confronted with many challenges to achieve acceptable level of food security. In-order to decrease food insecurity, malnutrition, poverty, and hunger, the South African government has put in place food garden programs (Tesfamarian et al., 2018). According to Qange and Mdoda (2020) agricultural activities have ability to supply nutrition, economic, social status and reduce household food insecurity. However, farming has faced tremendous obstacles over recent times due to pest and diseases, limited extension services, scarcity of water, natural disasters and climate change and access to land.

2.6.1 Pests and diseases

Humans are in competition with pests for available natural resources and most essentially food and food crops (Eze and Echezona,2012). Crop pests have negative effect on food security (Ristaino et al.,2021; Modibedi,2018). Plants contribute about 80 percent of the food utilized by people and are essential for livestock food (Rizzo et al.,2021). Savary et al. (2017) and Kena (2017) mentioned in their studies that plant diseases and pests negatively affect crop yield and overall quality, thus having detrimental effects on household food insecurity. Within food gardens, the pest problem is exacerbated by the inability of sector the household to deal with invasive species that have been introduced through global trade and international travel (Isman,2019).

2.6.2 Poor access to extension services

According to Shabangu (2016) access to extension services is one of the biggest challenges for small-scale farmers. This is despite the high demand of this service in the smallholder sector. Small-scale farmers often lack skills and knowledge to enhance their operations and extension services are seen as means to develop and improve farmers capabilities through education and training (Shabangu,2016). The study by Khapayi and Cilliers (2021) revealed that farmers need training in marketing strategies, business management skills, labour management, financial management and farming skill.

A study by Maake and Antwi, (2022) in Gauteng province found that, government agricultural advisory services are of not effective. In the later study, of the 16 measured variables that were derived from South Africa Norms and Standard for Extension and Advisory Services, public extension and advisory services were found to be ineffective in 11 variables.

The study by Kipkurga and Tuigong (2015) indicated similar findings that smallholder farmers in Wareng District have been receiving extension services however, it is not sufficient, and provision of extension services is not satisfactory as most of the farmers' needs are not met. In addition to this, a study by Myeni et al. (2019) in Eastern Free State province indicated that majority of farmers (99 %) did not receive advisory services. According to Raidimi and Kabiti (2017), the public sector is constrained with limited resources which makes it difficult to meet the demands of farmers, and this affects accessibility. As a result, sufficient access to food gardens knowledge is not easily available. Communities have inadequate access to information and resources to make best decision for suitable diet (DAFF, 2014). It is against this background that other researchers call for public-private sector partner regarding extension services (Raidimi and Kabiti, 2017).

Several interventions and recommendations have been put in place to deal with the ineffectiveness of public extension and advisory services in South Africa, however based on the literature this sector is yet to reap the benefits from these initiatives. These include development of National Policy on Extension and Advisory Services, Norms and Standards for Agricultural extension, Extension Recovery Plan and the National Development Plan to revive agricultural advisory services (Khwidzhili and Worth,2019). Regular trainings to keep abreast of technical advancements may help those participating in food gardens (Raidimi and Kabiti, 2019).

2.6.3 Scarcity of water

Water is an essential resource in agriculture, and among the most significant barriers to food gardening (Nkambule and Dlamini,2012; Galhena et al.,2013; Gashu et al.,2019; Oguttu at al.,2021). Total average annual rainfall for South Africa is 464 millimetres. KwaZulu Natal receives about 106,56 millimetres of precipitation per year (KwaZulu Natal Weather,2020).

This is because rainfall is distributed unevenly across regions due to extreme weather fluctuations. This causes problems owing to climate change, which make weather forecasting difficult and unreliable (Shabangu,2016). According to Swedish International Development Cooperation Agency (2019), when water source is distant from the farm, it needs manpower and duplicates workload.

Vegetables and fruits productivity is affected by water scarcity and can result in crop failures. When there is drought, the participants should irrigate. However, due to a lack of water and equipment, the participants cannot irrigate. Inaccessibility of irrigation resources restricts households' ability to increase yields, thus causing households to be more vulnerable (Muzawazi, Terblanché and Madakadze, 2017).

2.6.4 Impact of climate change and natural disaster on household food security

Climate change is a serious threat to household food security. Despite the function of agricultural sector in food security is vital, like any other sector, agriculture is susceptible to negative effects of climate change and natural disasters **(**Matlakala et al.,2021).

Climate change is attributed mainly to man-made influence such as greenhouse gas, aerosol emissions and ecological destruction (Porter et al., 2014; Ruane and Rosenzweig,2018). This, combined with global food demand estimated to increase by at least 60 % in 2050, there is an urgent need to develop effective adaptation strategies to climate change for food security to be reached (FAO,2016).

The consequences of climate change, such as higher temperatures and less rainfall have also been observed in South Africa (De Lange,2015). These lead to poor yields especially amongst small-scale farmers. Food gardeners are particularly vulnerable to the climate change as most of their production is rainfed and therefore highly dependent on predictable climate patterns. The unreliability of these patterns has devastating implications on food gardeners, who often lack resources to handle the changes in climate.

Climate change's influence on seasonality have a detrimental effect on crops, making them sparse at particular periods of the year and endangering the availability of food (Ziervogel & Frayne, 2011; De Lange, 2015). Therefore, this leads to food instability and results to high demand of food and price fluctuations. Furthermore, seasonal changes and natural disasters lead to food gardens to be unable to supply enough vegetables (Toit et al.,2022). Chapagain and Raizada (2017) reported that natural disasters (such as drought) in Ethiopia had caused food price crisis for over 50 years. Furthermore, Ramakrishna et al. (2014) and Riptanti et al. (2016), revealed that floods undermine farm yields and income.

2.6.5 Land tenure rights

Acquiring productive land for food gardens is challenging, as most of the land is allocated for housing. As a result, food gardens take place on unproductive land (Wong,2020; Wills, Chinemana and Rudolph, 2009). It is difficult to grow crops on marginal land (Shahid and Al-Ashankiti,2013).

Majority of land reform projects are located at rural areas. Households in rural areas are likely to benefit from food gardens since urban areas land allocated for housing or building factories or warehouses (Mcata,2019). This was confirmed in a study that was conducted by Landesa (2012), who argued that small-holder farmers in developing countries are at risk of food insecurity due to absence of agricultural land tenure.

In addition to this, due to scarcity of land most small-scale farmers end up operating in small farm sizes. Unfortunately, small farm sizes are associated with inadequate agricultural productivity among small-scale farmers and food insecurity (Nkomoki et al.,2019; Nnaji et al.,2022). Mutero (2015) in his study that was conducted in eThekwini Municipality revealed that majoring (66%) of small-scale farmers had less than half of an acre (< 0.5 acres). Khapayi and Cilliers (2021) further confirmed that small size of land limits and prevents emerging farmers to progress to commercial farming. A study done by Nkomoki et al. (2019) in Zambia revealed that households with a smaller farm size had higher odds of experiencing food insecurity than those households who had 3.5 hectares.

2.7 Chapter summary

This chapter gave an overview, definition by identifying and discussing the four pillars of this concept. Food gardening as a concept was also discussed where it was concluded that food gardening is no longer just a rural activity but can also be used as food accessibility strategy for urban dwellers as well. The chapter further discussed the statistics of food insecurity and pillars of food security. This chapter concluded unpacking the challenges confronted by food garden participants, suggesting that even though food gardening is seen as a food accessibility strategy, it is still faced with many challenges. However, with adequate support and resources, food gardens can contribute to household food security.

CHAPTER 3: METHODOLOGY OF THE STUDY

3.1 Introduction

This section discusses the study's methodology that was used to answer the objectives of this study. A research methodology provides guidelines for designing and conducting evidence-based research (Sahu,2013; Acharyya and Bhattacharya,2019). The research methodology was informed by the literature that was reviewed and objectives of this study. The review of similar studies allowed the researcher to select the most appropriate research design and methods. The chapter outline includes the study area to demarcate geographical scope of the research, research design, target population, sampling method, questionnaire development, data collection procedure and data analysis. The chapter concludes with ethical aspects of the study.

3.2 Study setting

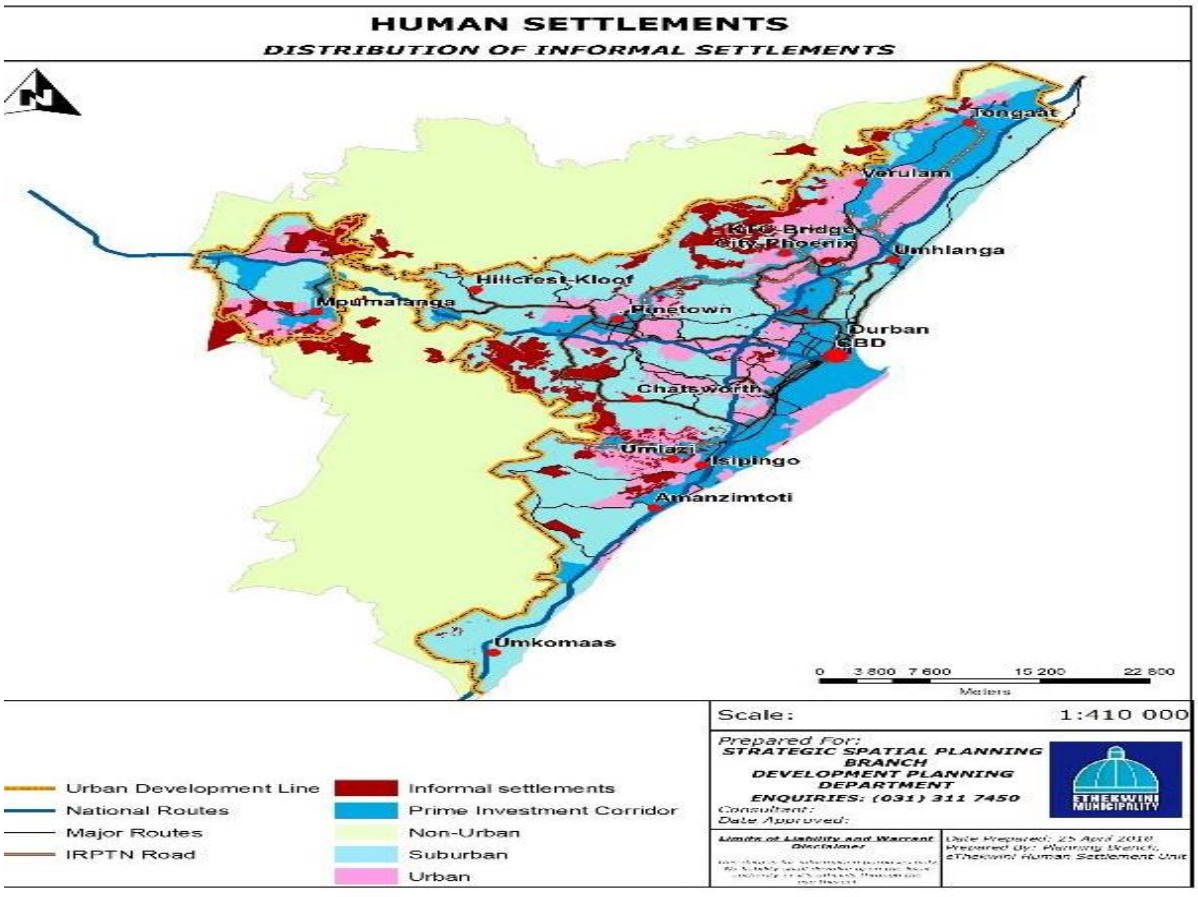


Figure 3. 1. Map showing names under each spatial region of eThekwini municipality

Source: eThekwini Municipality (2023)

The study was conducted at eThekwini municipality which is located in KwaZulu Natal (KZN) province. EThekwini Municipality covers approximately 2 556 km² in geographical area (Municipalities of South Africa, 2017). The population residing in this municipality is 3 723 435 people (eThekwini Municipality IDP, 2017). Females account for 51% and men make up for 49% (eThekwini Municipality IDP, 2017). This municipality consists of four regions: North, South, Outer West and Central (EThekwini municipality, 2018).

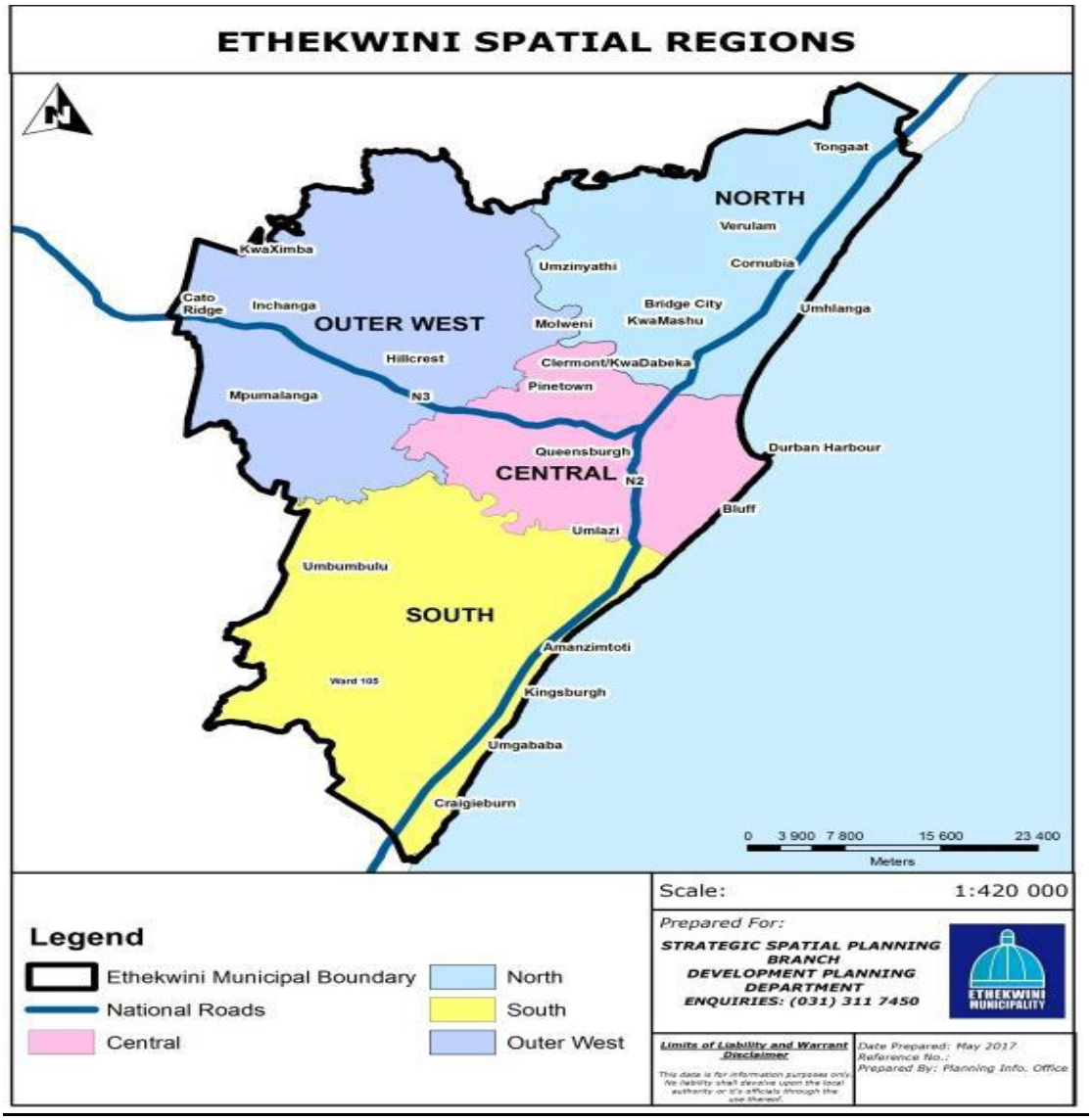


Figure 3. 2: Map shows that the EThekwini municipality consists of four regions: North, South, Outer West and Central.

Source: eThekwini Municipality (2023)

The KwaZulu-Natal province is suitable for food gardens since it has favourable climate, soils and accessible to water (KZNDAEA,2005). This drive KZN to have excessive agriculture potential when compared with other provinces. The KZN consists of 6.5 million ha of land available for farming purposes. While 18% is favourable for arable farming and eighty two

percent for extensive livestock production (South African National Treasury 2015; Ngema at el., 2018).

The study was set to target household members within the eThekwini municipality living in peri- urban areas. Little research has been done in these peri-urban areas to assess food gardens and their impact on household food security. The eThekwini municipality was targeted based for this reason.

3.3 Research approach and design

A research design is a strategy for connecting research methodologies and procedures to gather trustworthy and valid data for empirically supported analysis, conclusions, and theory development (Creswell,2014; Vosloo ,2014). The research design enables researchers to attain their goals and to concentrate on employing methods of inquiry that are appropriate for the subject matter (Creswell and Clark 2007; Boru ,2018; Jansen and Warren ,2020).

In this study, mixed methodology approach was adopted. Mixed methods research involves gathering, interpreting, and combining quantitative and qualitative information in a single study. It is both a technique and a method for conducting research (Johnson and Onwegbuzie, 2004; Creswell, 2008; Creswell,2015). Both qualitative and quantitative data methods as standalone have strengths and weaknesses. Therefore, collecting mixed data enabled the researcher to balance the drawbacks intrinsic in one method with the strengths of the other.

Creswell and Clark (2011) and McGregor (2018) indicated six mixed methods, namely:

(1) sequential explanatory model,

(2) sequential exploratory model,

(3) sequential transformative model,

(4) concurrent triangulation strategy,

(5) concurrent nested strategy, and

(6) concurrent transformative strategy.

The concurrent nested technique was adopted for this study. When using the concurrent nested strategy, both qualitative and quantitative data are gathered, evaluated, and summarized simultaneously (Creswell & Clark, 2011).

One approach predominates in concurrent nested investigations while the other is integrated. For this study, quantitative methods dominates (primary method) whereas qualitative method act as secondary method. In this study the secondary method (qualitative method) is needed to address different questions. The collected data from two methods are not compared against each other during analysis. The data from quantitative and qualitative are mixed through analysis, to acquire large and comprehensive responses to the research objectives of the study.

3.4 Sampling technique

A study population is the entire group that a researcher wants to draw conclusions about. Furthermore, population includes all individuals or objects which have common and binding characteristics (Kumar,2011). In the current study, participants of the food gardens were identified as the ideal population. One person per household was chosen for the study. The target population were residents from eThekwini municipality in KwaZulu-Natal province who participate in food gardens.

A list of food gardens was obtained from KwaZulu-Natal Department of Agriculture and Rural Development. From this list, it was revealed that the total number of households participating in food gardens in the eThekwini Municipality is 1520. These households were from the four regions: North, South, Outer West and Central. The households were randomly selected from the list given by the key informants.

3.4.1. Sampling method and size

A sample is a determined category that the researcher will gather information from. The population size of the sample is lower than the total size of the population (Korb,2012; McCombes,2021).

(i)Sampling of key informants

The sample criterion for inclusion in the study group were Agricultural Advisors employed by Department of Agriculture and currently working in the study area. Given that they are knowledgeable with the food gardens, key informants were chosen. Purposive sampling was used in the research to choose one key informant per region. One key informant was selected from each area, resulting into a total of four (4) key informants. The purpose of this exercise was to elicit in-depth knowledge about food gardens and develop a list of food items that are likely to be consumed in the study area.

(ii) Sampling of the households

Purposive sampling and stratified random sampling method were used to select participants for this study. Stratified random sampling includes segmenting the population into groups and randomly choosing individuals from each category (Frey,2018). Its purpose is to ensure that all strata are represented fairly (Kapur,2018).

Purposive sampling is chosen for this study because participants are specialist in food gardening of eThekwini municipality (Taherdoost,2016). Researcher utilised stratified random sampling to select the different strata (regions). Then once the strata had been selected, the researcher selected participants randomly.

Number of participants to take part from each region was determined by stratified sampling. Respondents were sampled according to their region: North, South, Outer West and Central. The reason for using stratification was to capture differences that exist between regions. The stratified sampling divides target population into four strata.

This study used Krejcie and Morgan (1970) and Research advisors (2006) formula to determine the sample size. The researcher used the formula to determine sample size:

$$\boldsymbol{s = \frac{X^2 NP(1-P)}{d^2(N-1) + X^2 P(1-P)}}$$

$$s = \frac{(3.841)(1520)(0.5)(1-0.5)}{(0.0025)(1520-1) + (3.841)(0.5)(1-0.5)}$$

$$s = \frac{1459.58}{4.75775}$$

s=307 respondents

The four strata include the following:

Region	**Participants of food gardens**	**Krejcie and Morgan**
North	383 (25, 2%)	77
South	401(26, 4%)	81
Outer west	388(25.5%)	78
Central	348(22,9)	71
Total	**1520**	**307**

(iii) Sampling of the focus groups

Ten participants were invited and randomly selected to join the focus group discussion from those who took part during structured survey questionnaire. According to Gundumogula (2021), Principe (2022) and Graham and Bryan (2022) ideal sample size of a focus group is between 3-12 respondents per discussion. For each strata or region, the researcher conducted one focus group discussion resulting to a total of 4 focus groups.

3.5 Data collection instruments

Various data collection instruments were adopted and used to gather data to answer the four objectives of this study. These included key informant interviews, semi-structured survey questionnaire and focus groups. Key informant interview was helpful to develop HFI and create a list of vegetables and clarify questions. Interviews were conducted with the key informants as described under section 3.4.1 (i). The semi-structured questionnaire was administered on the household to document data on socio-demographic characteristics of households, food availability and food accessibility. Survey questionnaire was administered to enable the accuracy of data collection and better chance of response rate (Crow, 2013; Oltmann, 2016). Focus groups discussion were then held to identify strengths and opportunities of participating in food gardens.

3.6 Development of measuring of instruments

The three data collection instruments mentioned under section 3.5 were developed as follows:

3.6.1 Development of the interview guide (for Agricultural advisors and focus group discussion)

Four interviews were held with Agricultural Advisors who work in the study area. The interview guide included of open-ended questions to enable respondents to express themselves freely. The interview schedule was developed in English (Appendix 1). A consent form (Appendix 5) was used to obtain permission to interview and record the proceedings.

3.6.2 Development of the survey questionnaire

The questionnaire had four sections, namely, (i) general information, (ii) socio-demographic characteristics, (iii) questions on the contribution of food garden to household food security in terms of availability and access to fruits and vegetables, and lastly (iv) questions on factors that food gardeners' faces in response to their food gardens.

(i) Section A: General information

This section consisted of house number and each questionnaire was allocated a number to enable accuracy during capturing stage.

(ii) Section B: Socio-demographic details

The demographic variables that were included in section B were: gender, race, age group, home language, marital status, education level) while socioeconomic information that was collected included: size of the family, years involved in farming, income details and garden characteristics (Appendix 2). Closed ended questionnaires were used to determine socio-demographic characteristics (Siniscalco and Auriet, 2005).

(iii) Section C: The contribution of food garden to household food security in terms of availability and access to fruits and vegetables.

This section comprised of two sub-sections: assessing the contribution of food gardens to food availability and contribution of food garden to food accessibility:

- The first sub-section on food availability utilised close-ended questions to probe food availability. The Household Food Inventory (HFI) (Appendix 2) was used to assess the contribution of food gardens to vegetables availability as explained by Gichunge, Somerset and Harris (2016). Household food inventory record sheet consisted of a list of food items that are likely to be consumed in the study area (Sisk, Sharkey, McIntosh, and Anding, 2010; Nesamvumi, 2016). The HFI list of vegetables and fruits was developed by the researcher and key informants. During data collection, participants were asked if the vegetables on the lists are available or unavailable in their homes. Reponses to these questions was “yes or no”. Respondents were then requested to rate the contribution of food gardens to vegetables and fruits availability. The respondents had an option to rate the frequency on a scale from 1 – 5. Respondents were asked whether they (1) totally dissatisfied, (2) little dissatisfied, (3), moderately satisfied, (4) satisfied and (5) highly satisfied with the statement in the questionnaire. Lastly, the respondents were asked to determine which month’s vegetables and fruits are available and have options to answer “yes” or “no”.

The second sub-section focused on the contribution of food gardens to food accessibility using the Dietary Diversity Scale (HDDS) in conjunction with Household Food Insecurity Access Scale (HFIAS) developed by FANTA (Coates et al., 2006).

- Household Dietary Diversity Scale (HDDS) measured the household food access (Hodditt & Yohannes, 2002; Ndobo, 2013) (Appendix 2). Data for the HDDS indicator was collected by asking the participants a series of yes or no questions (Swindale and Bilinsky, 2006). Each household's HDDS was determined using a variable with the labels A through L and a range of 0 to 15. The total number of food groups consumed

by household members was calculated using HDDS (0–15). A through L will have values of "0" or "1," denoting no or yes, respectively.

- HFIAS consists of nine occurrence questions and nine frequency-of-occurrence questions related to food insecurity incidents that occurred in the previous month (Ndobo, 2013). Participants then scored as follows: 'never',' sometimes' and 'often' received a score of 1, 2, and 3 respectively (Appendix 2). The HFIAS score of 0–27, with 27 denoting the most severe food insecurity is obtained. As a result, when the scores for each sampled household were added together, the lowest score was 0 and the highest was 27, indicating that the higher the score, the greater the likelihood of a household becoming vulnerable to food insecurity (Ndobo, 2013; Coates et al., 2007). The Household Insecurity Access Prevalence (HFIAP) was then developed from the information of HFIAS. The researcher was able to classy household using HFIAS information into four categories: food secure, mildly, moderate and severely food insecure (Jones, Ngure, Pelto and Young, 2013).

(iv) Section D: To investigate challenges and benefits which the food gardeners' faces in response to their food gardens.

The focus group discussions were held using a checklist (Dilshad and Latif, 2013) (Appendix 3). The checklist consisted of open-ended questions that were used to probe respondents about factors which gardeners face. This method allowed participants, to discuss about challenges and benefits they experience and gain from gardening.

3.7 Piloting of the data collection instruments

Before the main data gathering, data collection instruments were piloted in September 2020.To take part in the pilot study, ten members were chosen at random in Tshongweni and KwaNdengezi (eThekwini municipality). This enabled the researcher to identify flaws and refine research approach and instruments (Coe, Waring, Hedges and Arthur, 2017;Frey ,2018). In the course of the pilot study, the researcher found that questionnaire such as the HDDS did not have examples and therefore participants had difficult to answer questions. Such questions were revised accordingly and simplified.

Participants who participated in the pilot study, did not form part of main survey to reduce bias caused by foreknowledge of research instruments as advised in the literature (Lead and Ormrod, 2010; Modibedi, 2018).

The researcher piloted both the structured survey questionnaire and the focus group check list. The pilot study sample sizes were as follows:

Structured survey questionnaire	Focus group discussion
10 participants	**10 participants**

3.8 Main data collection

Main data collection took place from November 2020 to February 2021. First activity was key informant's interview, followed by surveys, and lastly was focused group discussions.

3.8.1. Key informants

The interview with the four Agricultural Advisors as described under section 3.6.1 was conducted by the researcher. The interviews were conducted in English and took place at the Department of Agriculture (Durban offices). Each interview took approximately 30 minutes.

3.8.2. Questionnaire

The survey questionnaire was administered and completed by the researcher in the presence of respondents. This improved response rate and participation of all persons including those were illiterate. The questionnaire was administered at the homes of the respondents. IsiZulu was used to conduct surveys. Each questionnaire took approximately 45 minutes to complete.

3.8.3. Focus group discussions

Lastly, focus group discussions took place at the local community hall with the participants as the last data collection activity. The topics covered relevant information regarding to food gardens as indicated in Appendix 3. Key informants and the researcher conducted focus group discussion. During discussion, the researcher recorded information.

3.10 Data Capturing and Analysis

Quantitative and qualitative data analysis was utilized. Both techniques are discussed below:

3.10.1. Quantitative data

The quantitative research demands that the data, which is made up of numbers be assessed fairly with the attempt to eliminate any bias from the perspective (Denzin and Lincoln, 2007; Vosloo, 2014).

Quantitative data was coded, entered, and stored in Microsoft Excel spreadsheet by the researcher. Data was then exported into Statistical Package for the Social Sciences (SPSS) version 26.0 for labelling and descriptive analysis. Data was presented in tables, pie and bar charts using percentages, means, and frequencies. This included data obtained from socio-*demographic characteristics,* HFI, HDDS and HFIAS*.*

The HFI results were analysed using descriptive statistics. With regards to HFI results, for 'yes' response was given one and 'no' response was given zero. In the analysis, the total sum of vegetable availability was used, with higher scores representing greater availability. The HFI score was classified into two groups: low and high. As suggested by Gichunge et al., (2016) and Koui and Jago (2008), vegetable scores were summed up and means were calculated. Those that obtained less than the mean were categorised as low while those that obtain equal or greater than the mean were considered as having high availability.

Household Dietary Diversity Scale (HDDS) measured the household food access (Hodditt & Yohannes, 2002; Ndobo, 2013).

$$\textbf{Average HDDS} = \frac{\textbf{Sum (HDDS)}}{\textbf{Total number of households}}$$

The average (mean) HDDS indicator was calculated using the above formula for the sample population (Malahlela, 2014; Swindale *et al.,* 2005) to help classify household into either food secure or food insecure. Food secure households had high accessibility of food whereas food insecure has low accessibility of food. Similar studies done by Mekuria et al. (2017) and Ngema et al. (2018) utilised HDDS to determine household access to food. Households were categorized into low, medium and high dietary diversity scores.

Households were classified as shown below:

 1 - food secure/high accessibility, if HDDS = AHDDS (if the household dietary diversity score is above or equal-to the average household dietary diversity score).

 0 - food insecure/low accessibility, if HDDS<AHDDS (if the household dietary diversity score is less than the average household dietary diversity score). The different scored were then entered into SPSS for descriptive analysis.

The HFIAS score was derived by summing the scores from each sampled household; the lowest score was 0 and the highest was 27, indicating that the higher the score, the greater the likelihood that a household will experience food insecurity. (Diallo and Toah,2019; Ndobo, 2013; Coates *et al*., 2007).

The households were classified into following scores:

- Food secure: 0-1
- Mildly food secure: 2-7
- Moderate food secure:8-14
- Severely food insecure: 15-27

For each household, the score was captured into SPSS software for descriptive analyses and thereafter developed frequencies, bar chart and percentages.

3.10.2. Qualitative data

For this study qualitative data analysis was used to analyse data collected from focus group discussion. Information obtained from focus group discussion was analysed using content analysis. This is the process by which the analyst looks for trends and similarities with the goal of identifying relevant keywords and/or aspects in the content of data collected and writing the data findings (Elo and Kyngas, 2007 Vosloo, 2014; Maxwell ,2013). Focus group data was recorded in Microsoft word.

For data analysis, researcher adopted the six-step process which was identified by Creswell (2014). This six-step included: organizing and preparing for data analysis, read or look all the data, start to code all data, create a description and theme, interrelate theme and interpretations. Emerging themes, concepts, patterns and quotes were identified and summarized.

3.11. Limitations of the study

The focus of the study is on contribution of food gardens to household food security. The study was limited to two pillars of food security. The two pillars are accessibility and availability. Food utilization and stability were not assessed. Geographically, the study is limited to eThekwini municipality, in KwaZulu Natal. The focal point for this study was on limited number of households. Furthermore, the researcher was limited by resources and can only collected data on 307 household members. The study targeted participants of food gardens. The study was only limited to 307 (quantitative research) sampled households within the study area.

3.12. Ethical considerations

The study was ethically cleared by UNISA's College of Agriculture and Environmental Sciences Ethics Review Committee (Reference number**:2020/CAES_HREC/107**) (Appendix 4). Consent to conduct this study in eThekwini Municipality was granted by the KwaZulu Natal Department of Agriculture and Rural Development (Appendix 6).

The importance of the study and its objectives were given to the participants prior data collection. The respondents were advised that they could withdraw from the study at any stage. The participants were asked to fill in consent forms (Appendix 5).

Participants of the research study had to sign consent form. Signing the consent form indicates that the individual agrees to engage in the study. Data gathered from the participants was kept completely confidential. The questionnaire was coded to maintain the anonymity of the participants.

3.13. Chapter summary

This chapter covered the research method, which included the research approach. In this study, mixed methodology approach that was adopted to answer the objectives of this study was unpacked. The chapter also described the sampling method, sampling size, research instruments that were used to collect and data analysis tools.

CHAPTER 4: RESULTS OF THE STUDY

4.1. Introduction

This chapter's presents the results of the study. The results and discussions are presented under the following subheadings: demographic information, socio-economic characteristics, availability and access to fruits and vegetables and household food security status of the respondents. Strengths and weaknesses of participants of food gardens are also presented.

4.2. Demographic characteristics of the respondents

Findings on demographic characteristic are divided into two categories: socio-demographic details and socio-economic profile of the respondents. These findings are presented from section 4.2.1 to 4.2.2.

4.2.1. Socio-demographic details

Table 4. 1**:** Demographic characteristics of the respondents (n=307)

Variable	**Level**	**Frequency**	**Percent**
Gender	Female	174	56.7
	Male	133	43.3
Total		**307**	**100**
Race	Black African	307	100
Total		**307**	**100**
Age	18-35 years	57	18.6
	36-45 years	75	24.4
	46-55 years	86	28
	Above 55 years	89	29
Total		**307**	**100**
Marital status	Single	101	32.9
	Married	85	27.7
	Divorced	61	19.9
	Widowed	42	13.7
	Cohabitation	12	3.9
	Other	6	1.9

Total		**307**	**100**
Head of household (Gender)	Female	165	53.7
	Male	142	46.3
Total		**307**	**100**
Education level	No formal education	78	25.4
	Primary education	85	27.7
	Secondary education	134	43.6
	Tertiary	10	3.3
Total		**307**	**100**

Table 4.1 shows that 56.7% of the participants were females and 43.3%; were males. All 100% respondents in the study area were Africans. In terms of age, 29.0% respondents were between 46-55 years; followed by 24.4% respondents who were between 36-45 years; and only 18.6% were between 18-35 years of age. This demonstrates unequivocally how little young people participated in food gardens. Most respondents (32.9%) were not married (single) while 27.7% were married. With regards to head of the households, most households (53.7%) in this study were headed by females. In terms of educational level, the study revealed that 25.4% respondents had no formal education, while 27.7% had primary education. Most respondents 43.6% had attended secondary school, but only 3.3% had tertiary education.

4.2.2 Socio-economic profile of the respondents

In this section socio-economic profile is discussed under the following headings: sources of income, number of household members employed, employment status and land size.

4.2.2.1 Income sources

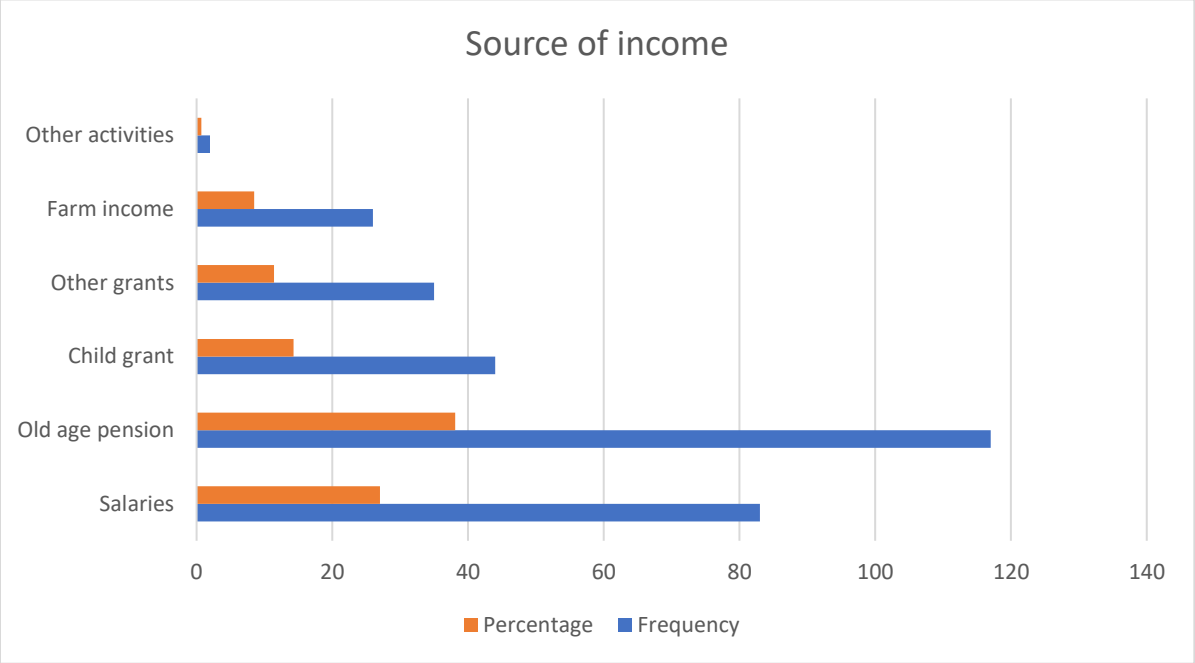


Figure 4. 1: Main Sources of income of the participants (n=307)

Source: Field survey (2021)

Sources of income for respondents in this study are presented in **Figure 4.1.** The study revealed that some respondents had more than one source of income hence the proportion is exceeding 100%. Old-age grant constituted 38.1% of income sources for most respondents in this study. This was followed by salaries 27%; child grant 14.3%, other government grants accounting for 11.4%. Few respondents (8.5%) in this study earned income from farm activities and other activities 0.7%.

4.2.2.2 Number of household members employed

Table 4. 2: Number of households Employed (n=307)

Variable	Level	Frequency	Percentage
Employment status	Unemployed	97	31.6
	Employed	84	27.4
	Self employed	58	18.9
	Retired/Pensioner	68	22.1
Total		**307**	**100**

Source: Field survey (2021)

As shown in **Table 4.2,** a total of 31.6% respondents were unemployed, 27.4% employed, 22.1% while18.9% were self-employed.

4.2.2.3 Size of land

Table 4. 3: Size of land of the participants (n=307)

Variable	Level	Frequency	Percent
Size of land	0.1 ha - 0.5 ha	191	62.2
	0.5 - 1 ha	82	26.7
	1 ha -2 ha	30	9.8
	3ha-5 ha	4	1.3
Total		**307**	**100.0**

Source: Field survey (2021)

With regards to land size, results in **Table 4.3** revealed that that most respondents (62.2%) had between 0.1 to 0.5 hectare. This was followed by 26.7% respondents who had 0.5 to 1 hectare and 9.8% had between 1- 2 hectares of land. Few 1.3% respondents had between 3 ha to 5 ha of land.

4.2.2.4 Food grown by participants

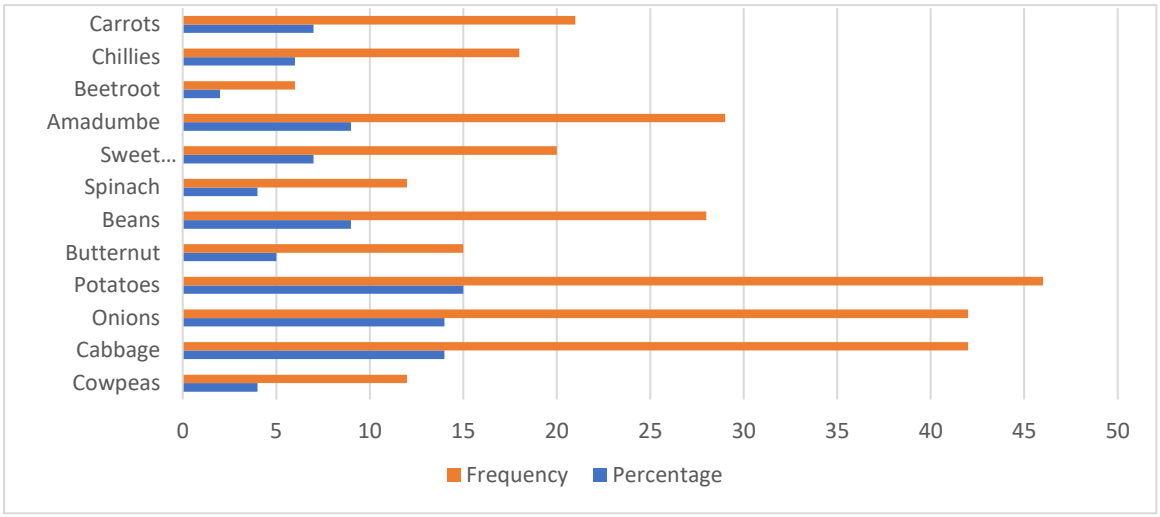


Figure 4. 2: Vegetables grown by participants (n=307)

Source: Field survey (2021)

The results in **Figure 4.2** revealed that about 16 food crops were grown by respondents. However, the number of respondents growing each crop varied. Food crops planted by the respondents' included potatoes, cabbage, onion, beans, *amadumbe*, sweet potatoes, maize, carrots, chillies, butternut, cowpeas, oranges, spinach, banana, apples, and beetroot. The most grown food crops were potatoes (15.3%) and cabbage (14.3%). While the least planted food crops were beetroot and apples; grown by only 2.0% and 2.3% respondents respectively.

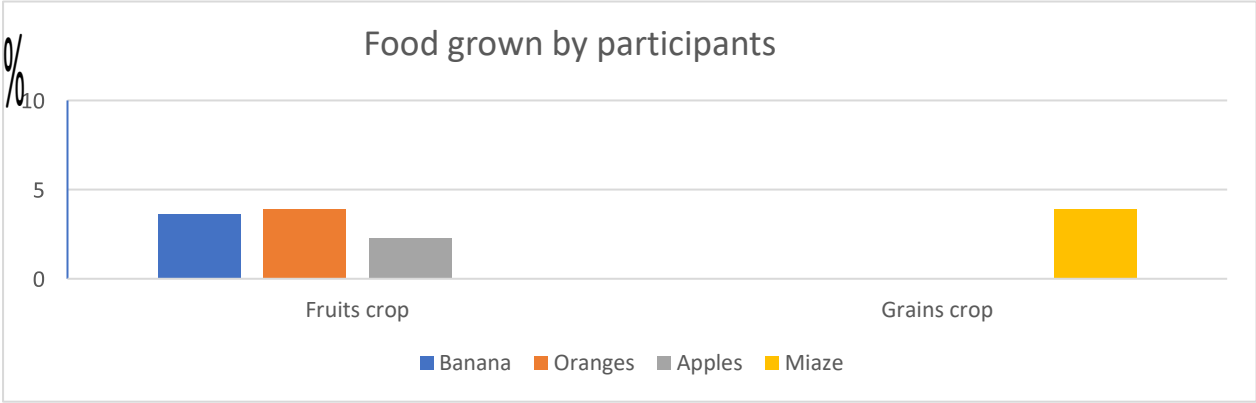


Figure 4. 3: Other crops grown by participants (n=307)

Source: Field survey (2021)

Figure 4.3 revealed that other crops grown by participants were banana (3.6%), oranges (3.9%), apples (2.3) and maize (3.9).

4.3. Contribution of food gardens to availability of vegetables

To determine the contribution of food gardens to food availability, several variables were assessed. These included completing a household food inventory list, indicating whether food gardens produced vegetables throughout the year, indicate the months in which vegetables are available in the year, and reasons thereof. In addition to this, respondents were also requested to rate contribution of food gardens to vegetable availability and indicate reason for low production.

4.3.1 Determination of vegetable availability using Household Food Inventory (HFI)

Table 4. 4: Distribution of HFI (n=307)

Variable	Level	Frequency	Percentage
HFI			
	High score	29	9.4
	Low score	278	90.6
Total		**307**	**100**

Source: Field survey (2021)

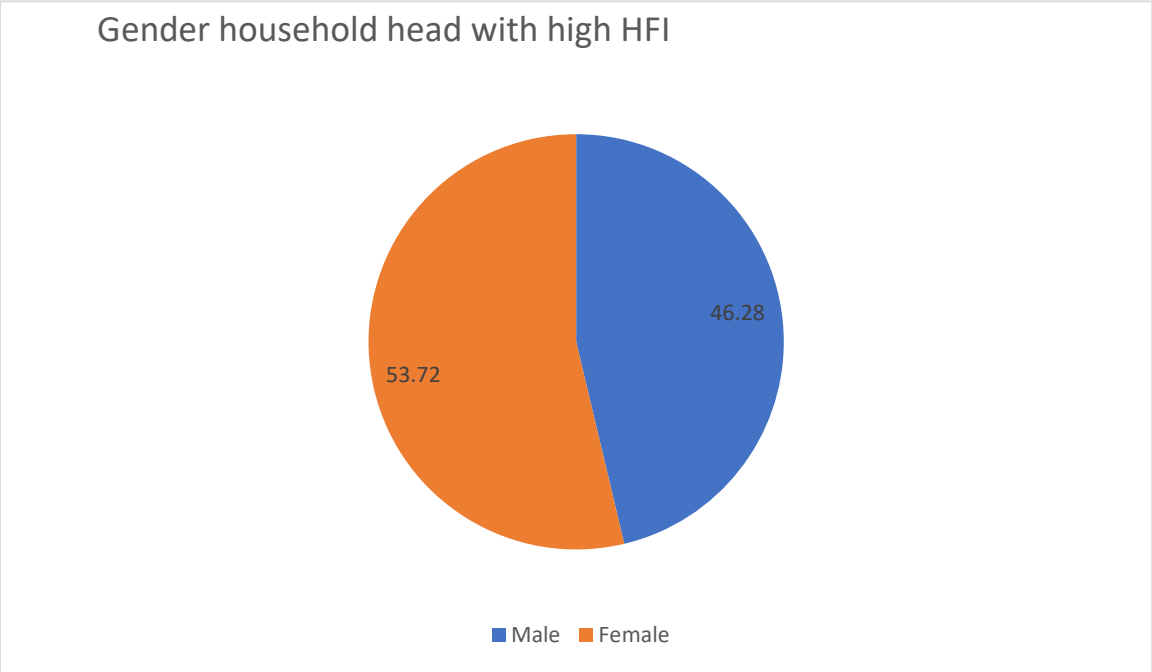


Figure 4. 4: Gender household head with high HFI scores (n=307)

Source: Field survey (2021)

The HFI score was group into two: low and high as explained under section 3.10.1. The results in **Table 4.4** revealed that only 9. 4% participants had high scores of (HFI) available vegetables and fruits.

The HFI scores were further analysed in terms of gender and results are presented in **Figure 4.4**. The results revealed that female headed households (53,7%) had high scores of HFI when compared with males. High scores are associated with food security.

4.3.2 The contribution of food gardens to vegetables and fruits availability

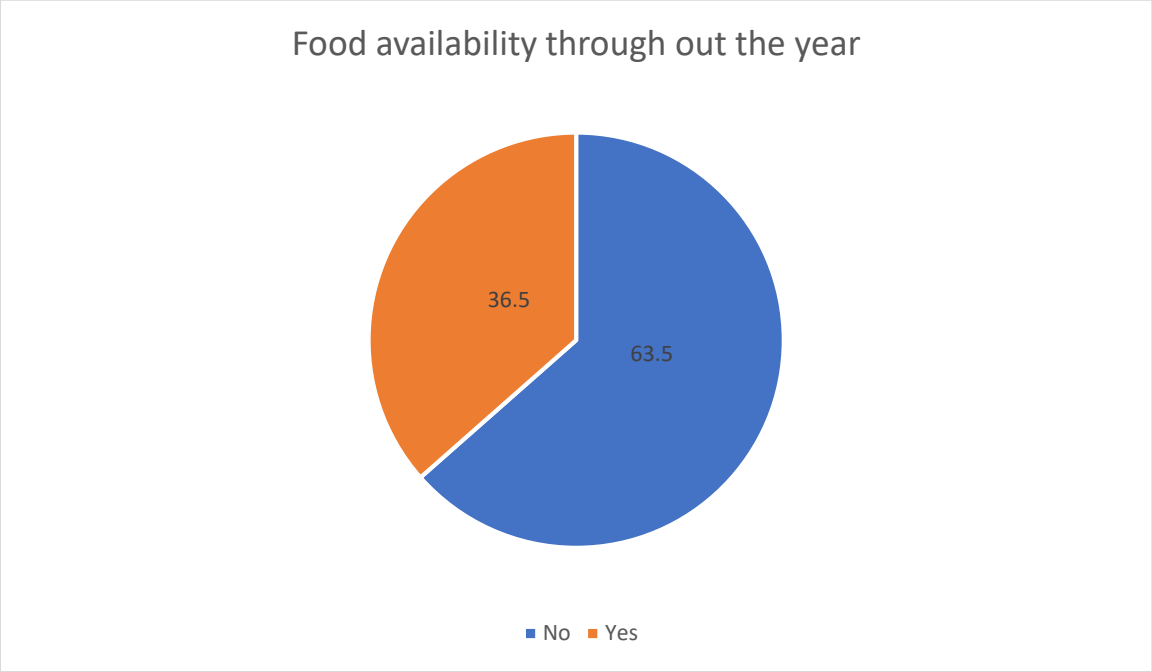


Figure 4. 5: The contribution of food gardens to vegetables and fruits availability (n=307)

Source: Field survey (2021)

Majority (63.5%) of the respondents indicated that vegetables and fruits were not available throughout the year (**Figure 4.5**). Participants attributed this unreliable availability to unreliable production patterns due to the seasonality. Only 36.5% indicated had vegetables availability throughout the year.

4.3.3 Months in which vegetables are produced

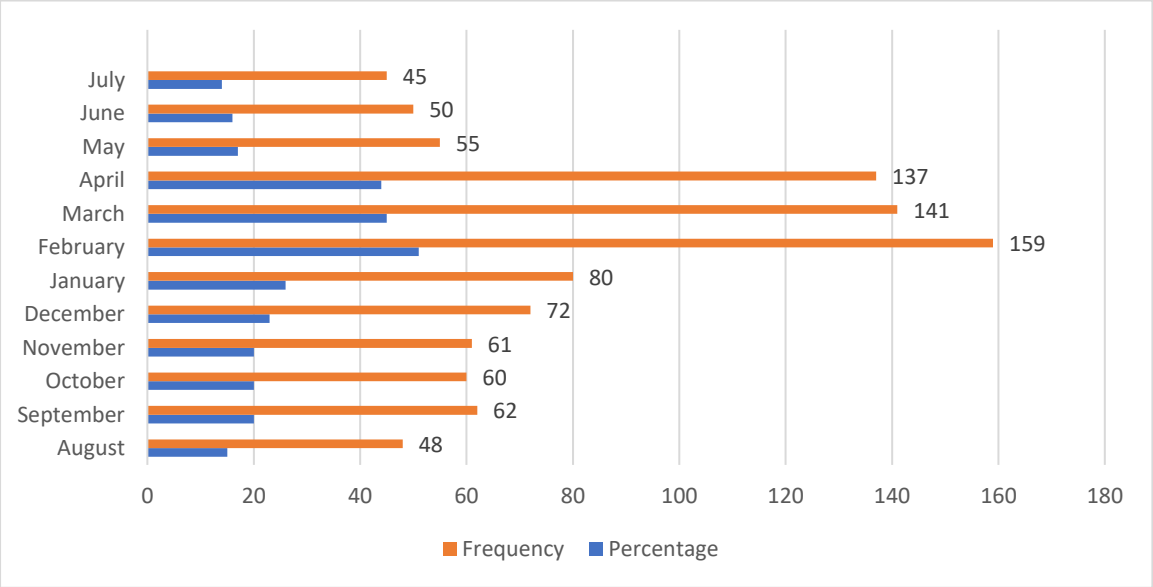


Figure 4. 6: Harvesting of food during different months (n=307)

Source: Field survey (2021)

Participant who indicated that vegetables were not available throughout the year were then asked the exact months in which vegetables are most available (Question 15; Appendix 2). The results in **Figure 4.6** depict that participant received most vegetables in February (51,8%), March (45.9%), April (44.6%), January (26%) and December (23.5%). Very few respondents indicated that food crops were available in July (14.7%), August (15.6%) and June (16.3%).

4.3.4 Reasons why vegetables and fruits are unavailable at household level

Table 4. 5: Reasons of unavailable of food (n=307)

Variables	Level	Frequency	Percentage
Reasons for unavailable of food			
	Low production	71	23.1
	Theft of vegetables	60	19.5
	Low disposable income	37	12.1
	Lack of support for extension services	79	25.7
	Planting limited varieties	60	19.5
Total		**307**	**100**

Source: Field survey (2021)

When respondents were asked to indicated reasons for unavailability of vegetables at household level, most responds (25,7%) attributed this to the lack of support from the extension services **(Table 4.5)**. This was followed by 23,1% respondents who cited low productivity of food gardens as the main reason. Planting limited varieties and theft of vegetables was mentioned 19.5% respondents. Few respondents (12.1%) indicated lack of disposable income as the reason for unavailability of vegetables at household level.

4.3.5 Rating contribution of food gardens to household vegetables availability

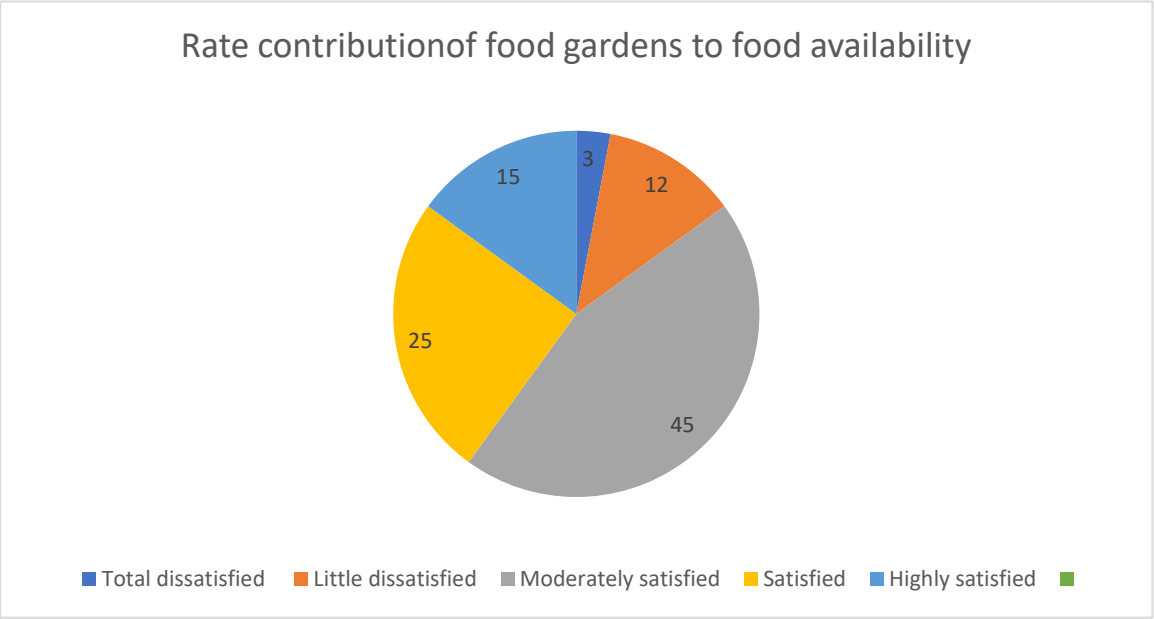


Figure 4. 7: Rating the contribution of food gardens to food availability (n=307)

Source: Field survey (2021)

With regards to respondent's satisfaction to contribution of food gardens to availability of vegetables at household level, majority of respondents 85.0% were satisfied at varying degrees, with 45.0% moderately satisfied, 25.0% satisfied and 15.0% highly satisfied **(Figure 4.7)**. Only 3% of respondents were dissatisfied with the contribution of their food gardens to vegetable availability.

4.3.6 Reasons for low production of food gardens

Table 4. 6: Reasons for low contribution (n=307)

Variables	Level	Frequency	Percentage
Reasons for low contribution			
	Pest and disease	67	21.8
	Shortage of land	71	23.1
	Climate change and natural disaster	80	26.1
	Lack of resources/water	74	24.1
	Other	15	4.9
Total		**307**	**100**

Source: Field survey (2021)

The results (**Table 4.6)** indicated the reasons for low production. Most respondents 26.1% revealed that climate change and natural disasters are the main reasons for low productivity of food garden, followed by lack of water at 24.1%. Shortage of land was mentioned 23.1%; while 21.8% respondents attributed low productivity to pests and diseases **(Table 4.6).**

4.4. Contribution of food gardens to food accessibility

As mentioned in chapter 3 (under section 3.8.1), food accessibility was measured using Household Dietary Diversity (HDD) and Household Food Insecurity Access Scale (HFIAS). The results obtained from Household Dietary Diversity (HDD) are presented under 4.4.1 while results from Household Food Insecurity Access Scale (HFIAS) under 4.4.2.

4.4.1. Household Dietary Diversity (HDD)

Table 4. 7: Shows the number of households who consumed specific food groups the previous day using the 24-hour recall approach (n=307)

Food group	Frequency	Percentage
A: Cereals	149	48.5
B: Tubers	113	36.8
C: Vegetables	212	69.0
D: Fruits	89	29.0
E: Meat	142	46.3
F: Eggs	87	28.3
G: Fish	50	16.3
H: Beans	41	13.4
I: Dairy products	77	25.1
J: Fats/oil	96	31.3
K: Sugar and honey	106	34.5
L: Condiments	102	33.2

Source: Field survey (2021)

Using a 24-hour recall, the food groups that were consumed by households were compiled and are presented in **Table 4.7**. Vegetables were the most 69% consumed food group in this study area followed by cereals which were consumed by less than half of the respondents (48.5%) while meat was consumed by 46.3%. Tubers were consumed by 36.8%; sugar by 34.5%; condiments by 33.2% and fats and oils by 31.3.

Furthermore, the results (**Table 4.7)** indicate that foods such as fruits (29%); eggs (28.3%); dairy products (25.1%); fish (16.3%) and beans (13.4%) were less consumed by the respondents of this study.

As indicated under section 3.8.1 using the scores obtained, households were classified into 3 categories: low, medium and high dietary diversity scores (**Table 4.8**). Most household had 42.3% low HDDS, (33.2%) had medium HDDS, and only 24.5% had high HDDS.

Table 4. 8: Indicates dietary level of participants (n=307)

HDDS level	**Range**	**Frequency**	**Percentage %**	**Mean**	**Standard deviation**
Low	1-3	130	42.3	2.06	0.75
Medium	4-5	102	33.2	4.54	0.50
High	6-12	75	24.5	7.09	1.45
Total	**1-12**	**307**	**100**	**4.1**	**2.20**

Source: Field survey (2021)

The **Table 4.8** shows that the HDD scores ranged from 1 to 12. The mean HDDS was 4.1. The standard deviation was 2.20. The individuals consuming less than four food groups were considered to have low dietary diversity and can lead to food insecurity.

4.4.2 Household Food Insecurity Access Scale (HFIAS)

As indicated under section 3.8.1, nine item Household Food Insecurity Access Scale (HFIAS) was administered for 307 households. The HFIAS is used to measure the four indicators of food accessibility in households, namely: 'Household Food Insecurity Access-related Conditions', 'Household Food Insecurity Access-related Domains', 'Household Food Insecurity Access Scale Score' and 'Household Food Insecurity Access Prevalence'.

4.4.2.1. Household Food Insecurity Access-related Conditions

Table 4. 9: Distribution of respondents based on the replies to the nine standardised HFIAS questions (N=307)

HFIAS Questions	No		Yes	
	F	(%)	F	(%)
Worry about not having enough food	155	(50,5)	152	(49,5)
Unable to eat preferred food	152	(49,5)	155	(50,5)
Eat just a limited kind of food	188	(61,2)	119	(38,8)
Eat food really do not want	150	(48,9)	157	(51,1)
Eat a smaller meal than you felt you needed	146	(47,6)	161	(52,4)
Eat fewer meals in a day	151	(49,2)	156	(50,8)
No food of any kind to eat in the household	187	(60,9)	120	(39,1)
Go to sleep hungry at night	180	(58,6)	127	(41,4)
Go a whole day and night without food	158	(51,5)	149	(48.5)

Source: Field survey (2021)

This section (**Table 4.9**) indicates the number of households that had experienced any of the nine-food insecurity access-related conditions indicated by HFIAS in the past 30 days irrespective of the number of times it occurred.

The findings of this study revealed that 49.5% of the households worried about not having enough food. With regards to the perceptions of the food quality, 50.5% were unable to eat preferred food, 38.8% ate limited food and 51.1% reported that that they ate food they did not want to eat. In terms of the quantity of food, 52.4% indicated that they consumed smaller quantity of food, while 52.4% had fewer meals in a day.

Furthermore, the percentage of homes without access to any form of food means that people go to bed hungry, go through the full day and night without eating were 39.1%; 41.1% and 48.5% respectively.

4.4.2.2. Household food insecurity access-related domains

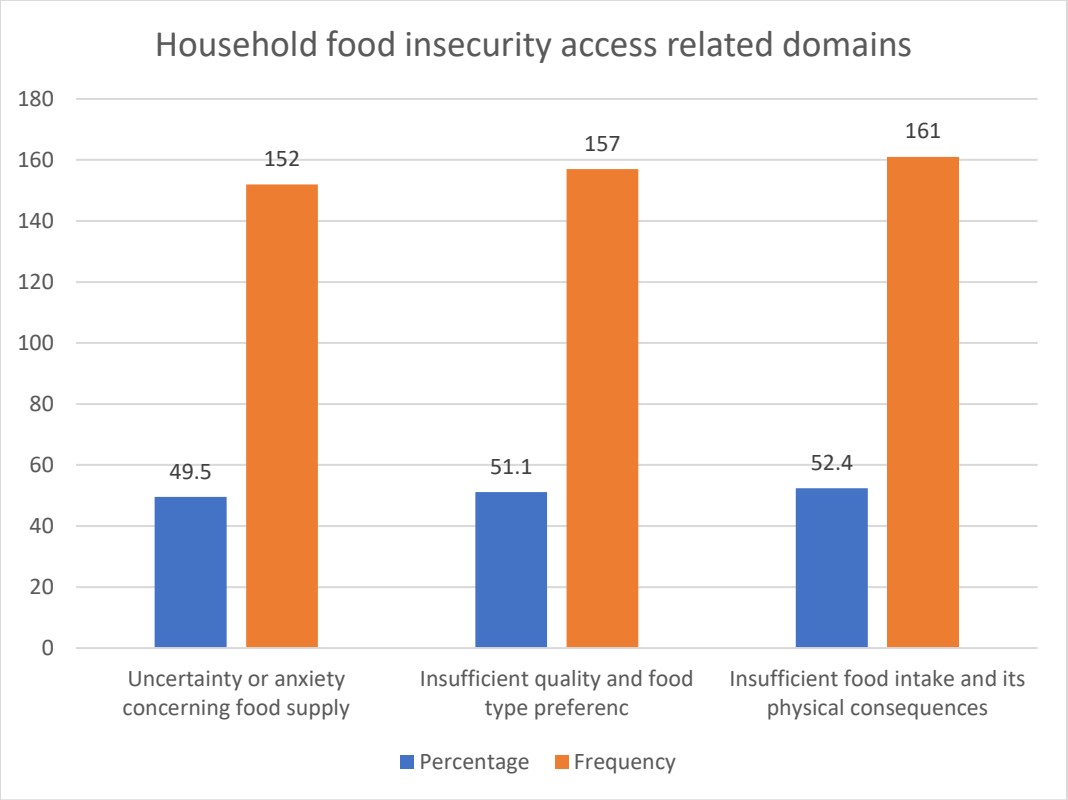


Figure 4. 8: Distribution of households by their Experience Food Insecurity Access-related Domains (N=307)

Source: Field survey (2021).

The nine-food insecurity access-related conditions were then categorised into three (3) major domains based on their characteristic similarities: (i) feelings of uncertainty or anxiety concerning the household food supplies (described by item 1); (ii) perceptions that household food is of insufficient quality and food type preference (described by any of items 2–4); and (iii) insufficient food intake and its physical consequences (described by any of items 5–9).

Based on these categories **(Figure 4.8)**, most households 52.4% experienced insufficient food intake and physical consequences. This was followed by those that had insufficient quality and food type preference (51.1%). Less than half (49.5%) had anxiety concerning food supply.

4.4.2.3. Household Food Insecurity Access Scale Score

Codes for every frequency of occurrence question were added to determine the HFIAS score. The score represents the level of food insecurity of the household in the past 30 days. This was computed by allocating code 0 in case a household did not experience food insecurity, code 1 if the household has rarely experienced food insecurity, 2 if the household has sometimes experienced food insecurity and a 3 if food insecurity was experienced often. The

score varied from 0-27, with high score suggesting that that particular household experienced high food insecurity.

These scores were then computed to determine the mean score for the households in this study as indicated under chapter 3 (3.6.2). The mean HFIAS score was 7.1.

4.4.2.4. Household food insecurity access prevalence (categories)

Table 4. 10: Distribution of households by food insecurity prevalence (N=307)

HFIAS level	Range	Frequency	Percentage
Food secure	0-1	35	11.4
Mildly food insecure	2-7	165	53.7
Moderately food insecure	8-14	70	22.8
Severely food insecure	15-27	37	12.1
Total	**27**	**307**	**100**

Source: Field survey (2021)

Lastly, the data from nine-food insecurity access-related conditions was analysed to classify the households into 4 categories namely food secure, mildly food insecure, moderately food insecure, and severely food insecure and the results are presented in **Table 4.10**. The results showed that most 53,7% respondents were mildly food insecure, 22.8% moderately food insecure and 12.1% were severely food insecure. Few respondents (11.4%) in this study were food secure.

4.5. Perceived challenges and benefits of the food gardens

As indicated in chapter 3 (3.6), information on challenges and benefits of food gardens was collected through focus group discussion.

In this study, focus groups participants mostly were speaking isiZulu, isiXhosa, Sesotho or English as a preference. However, the discussion way conducted using isiZulu. The researcher conducted four focus groups of between five (5) to ten (10) participants as indicated in chapter 3 (3.6.2). Under section 4.5.1 results on challenges are presented while benefits of food gardens are found under 4.5.2.

4.5.1. Challenges experienced by participants in pursuing home food gardens

During the data analysis of the challenges that food gardeners experience, five themes emerged: lack of equipment, land, water, fencing and extension services.

4.5.1.1 Equipment

The participants of this study revealed that lack of equipment is one of the major challenges they face in pursuing gardening. One respondent stated that:

> "*Angisebenzi futhi anginalo irekhodi elihle lasebhange lokuthola imali engingayisebenzisa ukuthenga izinto zokusebenza*" which is translated to "*I am not working* and *I cannot even access credit from the bank to buy tools due to bad credit record*".

Another respondent agreed with above statement:

> *"sidinga ukusekelwa ngezimali kukhona sizothenga noma siqashe imishini yokulima ukuze umsebenzi uhambe ngokushesha"*
>
> which means
>
> *"We need financial support so that we can buy or hire gardening tools so that we can work faster"*.

As a result, most respondents found gardening to be labour intensive:

> "*iningi lethu lisebenzisa igeja lesandla, ifosholo neraki ukuthi sitshale, sisuse ukhula kanye nokuvuna*"
>
> which means
>
> *"Most of us use hand tools such as hand hoe and shovel for ploughing, weeding and harvesting"*.

4.5.1.2 Land

In this study, participants saw lack of land as one of the impeding issues with regards to gardening. One respondent indicated that:

"*Umhlaba esinayo muncane"* which is interpreted as *"we don't have enough land".*

Therefore, participants are unable to grow enough food and variety of vegetables. In addition, participants stated that:

"omunye umhlaba awukhiqizi" which means *"some of the land is infertile".*

Respondents further indicated that infertile land requires lot of attention and resources to improve it so that it can be productive. Participants utilizing infertile land are unable to produce enough food.

One of the respondents added that:

"esikudingayo umhlaba omkhulu kukhona soba abalimi abakhulu futhi bazimele" meaning "we need more land so that we can produce more and be independent".

4.5.1.3 Fencing

All participants shared the same sentiments that lack of and insufficient fencing around the gardens negatively affects food production activities. In support of this fact one respondent mentioned that

"izitshalo zethu zidliwa izimfuyo (iziNkomo, iziMbuzi)" which is interpreted as "*Our produce gets vandalised by animals (cattle and goats)*".

One respondent added that:

"*sazama ukulungisa ucingo oludala ngoba asinayo imali yokuthenga olusha, kodwa lwaphinde lawa*" meaning

"*We don't have money to buy new fencing, so we tried to repair the old one, but it fell off again*".

The members of the focus groups also reported that theft of produce is increasing, and this was attributed to high unemployment. The participants further revealed that the loss of produce due to damage by animals and to theft lead to the reduction in yields and subsequent availability of food at household level.

4.5.1.4 Water

Participants revealed that lack of water is another challenge that prevent their gardening activities in reaching the desired potential. One respondent commented that:

> "*Asinayo imishini yokuchelela futhi sithembele emanzini emvula".* This means:
>
> "*We do not have irrigation systems, so we only rely on rainwater harvesting*".

Respondents also indicated that relying on rainwater poses other challenges because rain is unreliable. Another respondent revealed that when there is scarcity of rain, water accessibility is an issue, stating that:

> *"Uma kungani ngisebenzisa ibhala ukuletha amanzi bese ngiwayise engadini,ngisebenzisa isigubhu ezi-25L".* This translates to:
>
> *"When there is no rain, I end up fetching water from the nearby source using a wheelbarrow and 25L containers".*

All participants agreed that this scarcity of water makes it difficult to grow crops. It also became clear during the discussions that water scarcity restricts their gardening activities of some respondents. This fact was supported by the following extract:

> *"sitshala kakhulu eHlobo ngoba imvula iningi ehlobo",* meaning:

" *We do most of our gardening in summer because there is lots of rain*"

4.5.1.5 Extension services

During the focus group discussions, participants raised concerns about lack/ limited of access to extension services in this study area as it impacts negatively on the development of farmers. To collaborate this view one participant indicated that:

> "*Angiyanga esikoleni futhi ngintula amakhono okukhiqiza nokuphatha ezolimo".* This means: "*am uneducated, so I lack necessary agricultural skills to produce food and manage my farm*".

Another participant shared the same sentiments and reported that:

> "*kunzima ukukhulisa amakhono ngoba uMeluleki wezoLimo simubone uma sikuphele izinyanga eziyisithupha".* This translated to "*Developing sufficient gardening skills and knowledge is a challenge as we sometimes go for 6 months without seeing an agricultural advisor*".

During the discussion, without exception it was pointed out that the participants had to resort to other kinds of knowledge to sustain their gardening activities. These include indigenous and local knowledge:

> *"Mina ngiyakwazi ukutshala,ukukhulisa izitshalo nokuvuna.Ngafundiswa abazali bami ukulima. Lolulwazi lozolimo liyangisiza ukuthi ngilale ngidlile"* meaning: *"I can plant and harvest as I learned these skills from my parents. These skills help me to put food on the table"*

4.5.2 Benefits of participating in food gardens

During the focus group discussion, participants revealed a number of benefits they reap from food gardens. During the analysis, three themes emerged: improved availability and accessibility of food, social connection, and economic benefit.

4.5.2.1 Improved availability and accessibility of food

All respondents revealed that participating in food gardens have improved availability and accessibility of food. In support of this, one participant mentioned that:

> "*Selokhu ngaqala ukubamba iqhaza ekulimeni, angisashodi ngokudla ekhaya lami. Ngitshala u-anyanisi, iklabishi, isipinashi, utamatisi namazambane ukuze ngizidle"*. This means:
>
> "*Ever since I started gardening, I don't run out of food. I plant onions, cabbage, spinach, tomatoes and potatoes for household consumption*."

The finding implies that food gardens are able to improve household food security by reducing vulnerability against food shortages.

In agreement another participant added:

> "*manje sesiyakwazi ukondla imindeni yethu ngokudla okulinywa emasimini noma ezingadin*i" this translate to "*we are now able to feed our families with the food that we produce*".

In addition to improved food availability and accessibility, the results also showed that respondents believed that gardening has a positive contribution towards their diets. To collaborate this one respondent said

> *"ukuzilimela kuyangisiza ukuba ngidle ukudla okunempilo"* meaning *"producing my own food help me to eat healthy.*

4.5.2.2 Improved social connection and sharing of knowledge

During the discussion it also transpired that gardening improved social connection and sharing of agricultural knowledge amongst participants. Few participants mentioned that:

"ngezingxoxo siyakwazi ukwelulekana. Uma utshela umuntu ngezinkinga zakho, kulula ukuthola iziluleko eziningi futhi wenze isinqumo esingcono". This can be translated as:

"Through interaction, we able to advise one another. When we share our problems, consequently this helps us to make sound decisions".

Individuals that engage with one another are able to discuss their ideas, knowledge, and difficulties, resulting in individual and community growth. Based on the findings, food gardens give a platform for cultivators and other inhabitants to socialize.

Few participants mentioned that: "*siphinde sihlukaniselane izithombo no umkhiqizo".* This can be translated as:

"*we also share the seedlings and produce"* Sharing produce is essential and different people cultivate different types of vegetable.

Participants added that:

> *'asigcini ngokuhlanganyela umkhiqizo kodwa siphinde sabelane nezinye izinto zasendlini ezifana noshukela, kanye nempuphu".* This means:

"We do not only share garden produce we also share household items such as sugar and maize-meal".

4.5.2.3 Economic benefit

It was also reported during discussions that participants also exchange produce amongst one another or sell it to generate income. One respondent indicated that:

> *"sidayisela umphakathi umkhiqizo ngoba yonakala ngokushesha"* simple translated to:
>
> *"We also sell the surplus as you know that fresh produce get rotten easily"*

This means local community can access fresh food and people don't need to travel to cities for vegetables. Apart from increasing accessibility to the non-participants this also saves transport costs. The money saved from transport is then used to buy other essential food stuff.

Most of respondents indicated that:

"*imali engenayo ifaka isandla emalini yesikole yezingane kanye nezinye izidingo eziyisisekelo zasendlini" meaning "we also use the money generated from selling garden produce to pay for school fees and other household items"*

Respondents answered that money derived from the sale of garden produce. Sales supplement social grant income which is primary source of earnings for the majority of respondents in this survey. The participants also mentioned that:

"*siphinde songe imali etholakala ngokudayisa umkhiqizo ngezitokofela futhi sithenge nezinye izinsiza zokulima"*. This means "we *also use the money to contribute towards social savings groups and buy agricultural inputs*"

4.6 Chapter summary

The majority of the participants were females. The most of the participants were old and had attended secondary school and had limited access to arable land. The participants were cultivating potatoes, onions, beans, cabbage etc. The crops were highly available in February and March.

The level of food insecurity amongst agricultural households in the study area were mildly food insecure. The households had a low HDDS. Challenges of food gardening were lack of equipment, land, water, fencing and extension services. Benefits of food gardening are improved availability and accessibility of food, social connection, and economic benefit.

CHAPTER 5: DISCUSSION OF THE RESULTS

5.1 Introduction

This section discusses the quantitative and qualitative results that were presented in preceding chapter, and the literature that has already been published serves as support for the findings. The discussion of these results will follow the same format that was adopted when presenting the results chapter by discussing them in terms of the objectives of the study.

5.2 Demographic characteristics of the respondents

In terms of gender, most respondents (56.7%) in this study were females. This is contrary to the results that were reported by Oduniyi and Tekana (2020), in their study that was conducted at Ngaka Modiri Municipality amongst small and emerging maize farmers who found more males in their study than females. The discrepancies in these two studies might be linked to the differences in farming attributes. In literature, maize farming has been associated with males (Utonga, 2022) while food gardens are always a female domain (Darries,2019). Similar findings were also reported the previous studies (Modibedi et al., 2020; Phezisa, 2016). For example, in a study that had been carried out in Emfuleni Local Municipality, Gauteng there were (71.3%) females participating in gardening activities while male participants accounted for (28.7%). The study found females were dominating food gardens (Njobe and Kaaria, 2015).

In terms of age, most respondents (29%) were above the age of 55 years. These results confirm that there is low participation of youth in food gardens as indicated in the previous studies. For example, several studies in this subject revealed that that young people are not interested in agriculture (Masuku et al., 2017; Kheswa et al., 2021). Masuku et al., (2017) in their study that was conducted uThungulu District, KwaZulu; reported that there are fewer young people who participate in agriculture. Kheswa et al., (2021) arrived at a similar conclusion in their study that was conducted at UMkhanyakude District, noting that younger generation is not keen in participating in agriculture.

In this study most respondents (32.9%) were not married, while a bigger proportion (32%) were either divorced or widowed. These results are in line with Statistics South Africa (2016) report which revealed that 68,3% people in KwaZulu-Natal have never been married. However, these findings contrast those of Mkhize (2015) in a study that was conducted in Tsholotsho (Zimbabwe), who found that 69.7% of respondents were married.

The results also revealed that 53.7% households were headed by women. This is inconsistent with the findings of the study by Odunyi and Tekana (2020), who reported that majority (84.1%) of households were headed by male. According to previous research (Oppenheimer ,1994; Danziger,2009; Fedha et al.,2015; Nyathi,2018; Choithani, 2019; Yoosefi et al.,2020) conducted in many developing nations, the number of households headed by women is dramatically rising in rural regions as rural males relocate as a result of a lack of job and shifting cultural standards that have caused a decline in marriage rates (Mlambo,2018).

In terms of education, the findings revealed that nearly a quarter (25.4%) of the respondents had no formal education while the 27.7% had only primary school education. Based on these results, it is evident that extent of education for participants in this study were typically low. This is a reason for concern because literature (Bashir et al., 2012; Malahlela, 2014), has discovered a correlation between higher levels of education amongst household heads and food security. Maluleke (2018) further affirmed that education is a crucial factor that enhancing employability, as well as knowledge to make better dietary and health decisions.

5.3 Socio-economic profile of the respondents

In relation to sources of incomes, it was observed that majority of respondents (63.8%) in this study were depended on social assistance (children, old age, and disability grant) as their primary source of income. Even though social grants money may increase disposable income of households, the money is barely enough to accommodate households needs. Households are forced to make difficult decisions of using their little money for basic necessities -food, shelter, clothing or using that money for health issues (Devereux,2017; Chakona and Shackleton,2019; Nhlangulela,2021).

The results were similar to those of past study by Makwangudze (2012) who had seen similar results in his study that was conducted in Mpophomeni, KwaZulu Natal, where 64% of food gardening households relied on social grants. The high numbers of respondents relying on social grants could be explained by the fact that South African government pays R7.9 million on social grants to households and this is due high levels of unemployment (Kamer, 2021). These results are however contrary to what was observed by Modibedi et al. (2020), where respondents derived most of their income from home gardens. But it should be noted that the

respondents in latter study were beneficiaries of a food security programme. Therefore, the support these respondents were receiving from the programme could have assisted them in this regard.

Unemployment rate in the study area was 31.6%. This is in line with the South Africa unemployment rate of 35% (Patel ,2022). These results coupled with high dependency of this community on social grants and high unemployment rates further emphasize the importance of home gardens as a livelihood strategy for this community. Literature indicates that food gardens play a crucial role in improving food availability and protecting vulnerable households from fluctuating food prices (Modibedi et al.,2021).

Majority of respondents (98.7%) of respondents in this study had less than 3 ha of land. Sambo et al. (2022) in a study that was conducted at Nkomazi Local Municipality reported similar findings, with majority of respondents (60.3%) in his study operating with less than 3 ha of land. Small landholdings (land size) negatively affect agricultural development (Sikk and Maasikamäe,2015). This has negative impact on household food security of small-scale farmers and their ability to graduate from subsistence farming to commercial farming (Khapayi and Celliers, 2016).

In terms of the type of the food grown by respondents, potatoes were the most 15.3% grown food item. This consistent with Ngobese (2015) research in KwaZulu Natal, and 80% of participants were growing potatoes. Previous literature confirmed this indicating that potatoes are the most important crops in KZN (Govender et al., 2016; Hlatshwayo, 2018). Cabbage was the second most grown crop at 14.3%. This is inconsistent with Modibedi (2018) because spinach, carrots and beetroot were the most cultivated vegetables in Emfuleni Local Municipality. Choice of crop grown is influenced by climate conditions, soil, farm size and availability of resources (Machete, 2020).

5.4. Contribution of food gardens to availability of vegetables

This part comprises a discussion of the findings of the vegetable and fruit availability. The discussion is presented from 5.3.1 to 5.3.5.

5.4.1. Determination of vegetable availability using Household Food Inventory (HFI)

The HFI results indicated that majority of respondents in this study had low availability of fruits and vegetables. These results were inconsistent with the findings of Gichunge et al. (2016) in a study that was conducted at Queensland, Australia among African refugees. However, it should be noted that study by Gichunge at al. (2016) was conducted on indigenous vegetables. Previous literature has shown that indigenous vegetables are readily available

and easy to grow than their exotic counterparts (Ndhlovu,2019; Gerrano,2021). The low HFI scores in this study could be linked to low land size and lack of input resources.

5.4.2 Contribution of food gardens to vegetables and fruit availability

Most respondents (63.5%) indicated that vegetables and fruits were not available throughout the year. These findings are contrary to what has been reported in the literature (Modibedi et al., 2020; Ngobese, 2015; Mudzinganyama, 2012), that gardens lead to accessibility of vegetables throughout the year. The unavailability of vegetables and fruits can be influenced by constrains such as natural disasters, crop diseases and resources (Mpandeli and Maponya, 2014). This unavailability of vegetables and fruit on certain months could predispose the respondents to food insecurity as they have to depend on markets.

5.4.3 Reasons why vegetables and fruits are unavailable at household level

When asked the reasons why vegetables and fruits are unavailable at household level, lack of support from extension services and low productivity of food gardens were mentioned by most respondents in this study. According to Fan et al., (2018) and Myeni et al., (2019), crop production becomes challenging without the lack of government support. It is for this reason that several studies (Raidimi and Kabiti, 2017; Mcata, 2019) in South Africa are postulating that accessibility to extension services as key in providing much needed scientific knowledge to advance food gardening.

5.4.4 Rating contribution of food gardens to household vegetables availability

Majority 85.0% of respondents in this study were satisfied with the contribution of food gardens to household vegetable availability. These results affirm the belief in the literature that home gardens improve accessibility of fruit and vegetables (Phulkerd et al., 2020; Modibedi et al., 2020).

5.4.5 Reasons for low production of food gardens

Climate change, lack of water, shortage of land, and pests and diseases were mentioned by over 20% respondents in this study as the reasons for low production of food gardens. Similar results were observed by Shabangu (2016) in a study that was conducted in Swaziland on challenges faced by small-scale farmers. Literature reveals that threats of weather such as drought will cause crops to die because of water stress (Lubisi et al., 2021).

Similarly, to other studies conducted on food gardens around the world, in which lack of water was mentioned as the main challenge (Nkambule and Dlamini,2012; Galhena et al.,2013; Gashu et al.,2019; Oguttu at al.,2021), in this study water was mentioned as one of the main

limitations. This could explain why the respondents of this study did not have access to vegetables throughout the year as most crops require water to grow. According to previous research, this has dire implications on yields and food security.

Accordingly, access to arable land has been identified as a big problem (Wong,2020; Wills et al., 2009) especially in urban and peri-urban areas. In a study that was conducted in the Eastern Cape, lack of land was found to be a constraint and discouraging home gardening (Nontu and Taruvinga, 2021).

Likewise, pests and diseases pose major challenges in farming, especially to small-scale farmers as they have to spend thousands of rands on pesticides. Controlling pests is even more challenging as they resistant to most pesticides (Gustafson,2017). In addition, crop diseases and pests are the leading cause of food uncertainty, likely to result in reduction in yield of more than 20% on average (Shah, 2021).

5.5 Contribution of food gardens to food accessibility

The results on the contribution of fruits and vegetables to food accessibility are discussed in this section. The discussion is presented from 5.4.1 to 5.4.2.

5.5.1 Household Dietary Diversity

According to literature (Deitchler et al.,2010; Swanepoel,2017) higher score indicates a more diverse diet and suggest that the household is food secure (Swanepoel et al.,2018). Generally, vegetables, cereals, meat were the most consumed foods in this study. The results of this study revealed that vegetables were consumed by most (69%) households in this study over the 24-hour reference period. The fact that consumption of vegetables had exceeded that of cereals was surprising and contrary to the previous studies (Sambo et al., 2022; Minja et al., 2021; Jebessa et al., 2019), where cereals were found to be dominant. However, these discrepancies could be explained by the elevated consumption of tubers in the current study, which has not been the case in the afore-mentioned studies. Studies reveal that tubers are used to replace cereals in Sub-Saharan because they are able to survive harsh climatic

conditions therefore cheaper to produce and are considered more nutritious (Nuani et al., 2022).

Although meat was amongst the most consumed items in this study, the proportions of respondents that had consumed it was low. However, it should be noted that the low consumption of meat observed in this study is consistent with the previous studies (Minja et al., 2021; Ngema et al., 2018). Meat is a good source of protein and micronutrients such as iron, zinc, and vitamin B12 (Godfray et al.,2018) hence it is recommended by the South African Dietary Guidelines to be eaten daily (Vorster et al., 2013). The low consumption of meat is attributed to high prices. Apart from meat, fish, eggs, dairy, beans, and lentils are also good sources of protein, but they were also on the least consumed foods. This finding suggests low intake of proteins in the study area, which is a cause for concern.

Sugar and honey, condiments, fats and oils and fruits also fell under the least consumed food items in the current study. These findings were consistent with those of Sambo et al. (2022), in their study that was conducted among farming households in Nkomanzi Local Municipality, Mpumalanga. Although the low consumption of the other items is not worrying, it is the low consumption of fruits that is of interest. This is because fruits are good sources of vitamins and antioxidants and their inadequate intake is associated with certain cancers and cardiovascular diseases (Vorster et al., 2013).

In terms of the HDDS, the results revealed that most respondents of this study had low HDDS, with the mean of 4.1. However, these results are dissimilar with those of Ngema et al. (2018) and Sambo et al. (2022), both of which found medium HDDS. This might have been influenced by the fact that respondents of both studies were beneficiaries of various agricultural programmes while in the current study respondents had no form of agricultural support. However, it is worth mentioning that the mean HDDS obtained in this study is slightly higher than the provincial DDS level of 3.7 (Shisana et al., 2014). According to Swindale and Bilinsky (2006) this slight increase means an improved dietary diversity and household's diet thereof. Research done by Hendriks et al. (2020) in Jozini, Maruleng and Ratlou revealed that households who participate in food gardens had high HDDS.

5.5.2 Household Food Insecurity Access Scale

This section presents the discussion of the results for Household Food Insecurity access-related Conditions, Household Food Insecurity Access-related Domains, Household Food Insecurity Access-related Score and Household Food Insecurity Access-related Prevalence. The discussion is presented from 5.4.2.1 to 5.4.2.4.

5.5.2.1 Household Food Insecurity access-related Conditions

The findings of this study revealed that 49.5% of the households were worried about not having enough food. The households had uncertainty or anxiety concerning the household food supplies. The findings of this study were congruent with previous study by Nabuuma et al. (2021) in Uganda, where less than 50% of the households were worried about not having enough food. Low-income earners and high food prices may cause households to not have enough food (Mohamadpour et al.,2012; Mei et al.,2020). Low-income earners have difficulty accessing fresh and nutritious food (Nettles, 2012). Income insecurity can lead to poor nutrition (Robbins ,2021). Furthermore, poor nutrition leads to chronic disease and emotional distress.

5.5.2.2 Household food insecurity access-related domains

Food insufficiency is a segment of food insecurity that relates to the inability to have access to ample food in terms of quantity, quality, and anxiety (Frac,2022). Households with a very low level of food security are probably and deemed to have food insufficiency. Just over half (52.4%) of the respondents in this study experienced insufficient food intake. In Omotayo et al. (2019) study, highest level of food insufficiency among children and adults was observed in a study that was conducted in Gauteng and KwaZulu-Natal.

However, these findings were different from a study conducted by Ndobo (2013) in Kwakwatsi Township, Free State Province who found few (26.7%) respondents who experienced insufficient food intake. According to Singh et al. (2015) research in a study that was conducted Kenya, household food insecurity access-related *domains* are associated with income. Consuming insufficient quantities of food has adverse impacts on family lifestyles, wellness, and nutrition security (Shisanya and Hendriks,2011).

The results of the current study (Table 4.9) also revealed that 51.1% of households are prone to insufficient quality of food. These results correlate with those of Knueppel et al. (2009), who reported that 55,3% households had consumed lower-quality food and 36,3% of participants worry about food supply. Currently, the food quality problem is found in the developing world where the highest number of countries is in Africa (Mupindu,2015). This is a big concern as individuals' health depends on quality and sufficiency nutrition (Moafi et al.,2018).

5.5.2.3 Household Food Insecurity Access Scale Score

The mean HFIAS score for this study was 7.1. These findings suggest that the household in this study area had food access challenges. This could be attributed be attributed to high unemployment levels, heavy reliance on social grants and lack of government support

programmes alluded to above. These findings are inconsistent with the findings of the study by Sambo (2021), who reported that participants in their study had mean score of 4.1.

5.5.2.4 Household food insecurity access prevalence (categories)

The results of this study also showed that most 53,7% respondents were mildly food insecure. These statistics are slightly higher than those observed by Diallo and Toah (2019) in their research that was done in Mali amongst 215 participants. In the latter study, 41% respondents were mildly food insecure. The high numbers of food insecure households observed in this study could be attributed to household size, land plot size, crop production yield and access to extension services. However, the proportion of severely food insecure respondents (12,1%) in the current study are lower when compared to those of Makwangudze (2013), a research study in Mpophomeni Township, KwaZulu-Natal where 34.8% of the households with food gardens were severely food insecure. A national study conducted in South Africa by Shisana et al. (2014) on health and nutrition, revealed that number of individuals experiencing food insecurity was highest in urban informal (32.4%) and rural formal (37.0%) settings.

5.6. Perceived challenges and benefits of the food gardens

The qualitative analysis revealed challenges and benefits experienced by participants. The challenges included equipment, land, fence, water and extension services. Lastly, benefits include improve accessibility and availability of vegetables, social capital and economic benefit.

5.6.1 Challenges experienced by participants in pursuing home food gardens

This section will discuss results for challenges experience by participants. The challenges include equipment, land, fence, water and extension services.

5.6.1.1 Lack of equipment

The study participants indicated that they lacked gardening equipment. Njeri (2020) reported similar findings respondents in his study spent most of their time on manual labour. Minimum or no use of machinery result to labour intensive. While the use of machinery can free up

labour to participate in other profitable sectors of the economy. Hendriks (2014) has seen the same phenomenon in her study, revealing that small scale farmers in Grabouw, South Africa lacked agricultural tools, and this caused them to cultivate only small plots just for the household consumption.

5.6.1.2 Small plots of land

Food availability is determined by amount of land set aside for growing crops. Nkomoki et al. (2019) a bigger land allocated for production is found to be related with food security. Respondents in the current study mentioned that they have small plots of land, unable to grow enough food and variety of vegetables. The finding was in line with Masekoameng and Molotja (2019) research, who reported that majority of food produced in home gardens which are small plots and as such the vegetables are often insufficient.

5.6.1.3 Lack of fencing

In a study by Shisanya and Hendriks (2011) it was revealed that lack of fencing can lead to animals invading gardens and destroy vegetables. This also applied to the current investigation, which involved insufficient fencing around the gardens negatively affects food production activities and decrease yields. Modibedi (2018) reflected this phenomenon yet in another way, noting that stealing of the produce become an issue when plots are not properly fenced.

5.6.1.3 Water

Water is essential for ensuring the household's food security and is a basic human function that must be met in order to prepare, process, and produce food (Selepe et al,.2015). The findings of the current study revealed that respondent do not have enough water for their gardening, as a result these gardens are rainfed or have to go collect water for irrigation. The finding is line with Chauke (2016) research, that fewer than 30 percent of crops are produced with irrigation, and more than 70 percent of crops are rain-fed. Relying mainly on rain is problematic for small-scale farmers, as rain has patterns has become unpredictable due to climate change (Kabanda and Nenwiini,2016; Rankoana,2020). This cause small-scale farmers to be unable to irrigate their crops. The demand for water is during germination, transplanting, flowering and fruit development of vegetables is critical (Nebraska extension in Lancaster County,2013). Dry conditions during bulb enlargement affects size development (Nebraska extension in Lancaster County,2013).

5.6.1.4 Access to Agricultural extension

Agricultural extension helps to dissemination of information and building capacity of farmers (Danso-Abbeam et al.,2018). During the discussion participants shared that they have limited access to agricultural extension. This limited access might adversely affect the development of skills and productivity of food gardens. The government support to smallholder farming is essential to reduce failure and to improve sustainability of agricultural project (Maponya et al.,2020).

5.6.2 Benefits of participating in food gardens

As mentioned under section 4.5.2, improved accessibility and availability of vegetables, social capital and economic benefit were mentioned as the main benefits of participating in food gardening by respondents of this study.

5.6.2.1 Improved availability and accessibility of food

Respondents for the current study revealed that food garden activities have improved availability and accessibility to food. The results are similar with those of Algert at el. (2014), who reported increased intake of vegetables by respondents in their study due to gardening. Similarly, participants of food gardens in Emfuleni Local Municipality indicated that they are less reliant on spaza shops as they obtain most of their vegetables from the food gardens (Modibedi et al,2020).

5.6.2.2 Improved social capital

Respondents in this study mentioned improved social connection and knowledge sharing as one of the benefits of gardening. Nosratabadi et al (2020) found similar results in a study that reviewed 39 articles, postulating that the food availability and accessibility for community members are facilitated through the sharing of food goods and knowledge.

5.6.2.3 Economic benefit

A study by Icheria (2019) in Kenya, revealed that smallholder farming is a generator of income for households. Likewise, in the present study respondents indicated that they sell surplus to local community. This was also found in the study by Ngobese (2015) in KZN, that respondents in his study regularly sold vegetables to generate income. Nkosi et al. (2014) argued that community gardens also contribute to savings as gardeners don't have to spend a lot of money at formal vegetable vendors.

5.7 Chapter Summary

This chapter gives a full discussion of the results reported in chapter 4, with sufficient academic references that support up the research findings. The discussion section presented socio-demographic details, socio-economic profile of the respondents, HFI, HDDS and HFIAS.

CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

This chapter presents the summary of major findings, conclusion and recommendations for future research. The study was intended to contribute to the body of knowledge about food gardens. The study was conducted in the eThekwini Municipality focusing on the food gardens projects.

6.2 Summary of the aim and objectives of the study

The main objective of the study was to investigate the contribution food gardens to household food security in the KwaZulu Natal province. The specific objectives of this research on the recipients of food gardens in the KwaZulu Natal province of South Africa were:

- To assess the socio-demographic characteristics of households participating in food gardens.
- Investigate the contribution of food gardens to food availability of households.
- To assess the contribution of food gardens to food accessibility of these households.
- Investigate challenges and benefits which the food gardeners' faces in response to their food gardens.

6.3 Summary of the measuring instruments

The study was mixed method in nature. Data was gathered utilizing a questionnaire, focus group discussions and through interviews with key informant. The study sample consisted of 307 gardeners, 4 key informants and 4 focus groups. Ten participants for each focus group and all participants were food gardeners. Quantitative data was analysed using SPPS version 26, while qualitative data was analysed using thematic analyses.

6.4. Conclusions of the study

This section outlines the conclusion of this study**.** The conclusions are discussed relative to specific objectives of this study.

The demographic and socio-economic factors impacting household food security were identified. The study results reported that the respondents were predominantly middle-aged, females and single. In addition to this, most respondents in this study had low formal educational levels and households were mainly headed by females. The participants were

also highly reliant on government social assistance and operating on small pieces of land. These are not positive results as literature indicates that people with these characteristics are most vulnerable to food insecurity.

The most grown vegetables in the study area were potatoes and cabbage. However, despite the fact that they were the most grown crops, the number of respondents that had grown these crops were relatively low (less than quarter of the sample).

The HFI results showed only few respondents (9.4%) had high scores with less than half of them (36.5%) indicating to have available vegetables and fruits availability all year round. Although the contribution of food gardens to vegetable availability had been studied before, this is the first study to present an evaluation of vegetable availability using the HFI tool. The study also found that vegetables are mostly available in February, March, April, January, and December. Considering outcome of the result, it can be said that food gardens did not have a beneficial effect on vegetable availability of the respondents of this study. Limited exposure to extension service and low production were the major reasons why the respondents were not producing enough food.

With regards to Household Dietary Diversity, vegetables were the most consumed food group in this study. Based on the DDS results, the study demonstrated that food accessibility amongst the households studied is still a big challenge, with most households classified as having low dietary score. However, based on the mean HDDS of 4.1 which is higher than the provincial score, it can be concluded that food security status of these households is much better than that of the general population in the province. Furthermore, the other notable result from this study was the high consumption of vegetables, suggesting that gardening has had a positive impact on some respondents.

Likewise, the HFIAS results revealed that most respondents in this study were mildly food insecure with a mean score of 7.1. These results indicate that food inaccessibility in this study area is higher than the national and provincial levels, with numbers of those that are severely food insecure (12.1%) more than double than the provincial numbers of 4%. These results showed severe inadequate food access and that in this study area participating in food gardens alone is not enough reduce their food insecurity levels.

The challenges mentioned by participants were lack of equipment, small plots of land, lack of fencing, water and agricultural extension. Lastly, benefits of food gardening were identified. This includes improved accessibility and availability of vegetables, social capital and economic benefit.

6.4 Recommendations

Based on the findings and limitations of the study, the following recommendations are made:

6.4.1 Recommendations to address the limitations of the study

- It is recommended that further studies should include the assessment of the other pillars of food security such as utilisation and stability. Knowing the contribution of food gardening on other pillars will give researchers and policy makers a holistic picture and enable them to recommend and design appropriate intervention strategies.
- Given the fact that the study was cross-sectional in nature, longitudinal studies are recommended to assess food security status over different seasons. This will enable stakeholders to establish if there are certain periods when respondents are most vulnerable and thus requiring intervention.

6.4.2 Recommendations aimed at improving vegetable availability and food access in the study area

- Considering the high unemployment numbers and low representation of youth in this study sample, the study recommends that the government should design tailored programmes that are aimed at encouraging the youth to participate in food gardens.
- Supporting these respondents with production inputs such seeds, fertilizers, land, insecticides, and machinery would go a long away in improving yields. Availing extension services would also play a crucial part in imparting agricultural knowledge and subsequent improvement of food access.
- The results also revealed that most respondents in this study area were operating in small land sizes which could have exacerbated the inadequate food access that was observed in this study area, therefore there is a need to increase access to land for yields to be increased. For example, the South Africa government has initiative such as One Household One Hectare, which could be used to encourage agricultural reform and give individuals rights to land. By fostering smallholder agriculture, the project aims to help rural businesses by fostering the growth of rural industry and the effective transportation of agricultural products to markets. This will also help to increase access of land by African and which is currently at 4%. Such programmes would be beneficial in this community.
- Food production was also highly seasonal, and this could be attributed to the water challenges that were raised as the hindrance by the respondents. Therefore, water

harvesting techniques should be explored to enhance food production throughout the year.

- Low nutritious food intake by households. Based on the HFI, HDDS and HFIAS results of the studied sample it is evident that there is an urgent need to address this issue. In addition to increasing yields, educational programmes in the form of nutrition sensitive gardens as recommended by Hendriks et al., (2020) in their research are perfect examples of intervention strategies that can be introduced at eThekwini Municipality to ensure that the land is used optimally for positive nutritional outcomes.

- Government support service and food programmes should focus on high nutritious crops. Crops such as legumes. cucurbit, leafy vegetables, roots and tubers are dense in nutrients. According to Wang et al. (2022) the government can incentivize smallholders to grow crops that will improve nutrition.

6.4.3 Recommendations for future research

Future research should focus on the following:

- Further research is needed to find the constraints inhibiting small scale farmers to produce enough food and sell surplus. The research can investigate issues such as market opportunities, financial support, provide resources and extension services.

- Investigating how to better track the project of food gardens in respect of who benefits, what is cultivated, and where the food is sent. The finding for this research can used to make informed decisions about beneficiaries of the food gardens and which crops are preferred to be grown by communities.

- Investigate implications of low intake of fruits and vegetables on household food security.

- A research study is needed to investigate consequences of imbalance of four pillars of food security. The study setting should be on a national level.

6.0 References

Abdu-Raheem, K.A. and Worth, S.H. (2011). Household food security in South Africa: evaluating extension's paradigms relative to the current food security and development goals. *South African journal of agricultural extension*, *39*(2).

Acharyya, R., and Bhattacharya, N. (2019). *Research methodology for social science*. New York: Routledge.

Aguera, P., Berglund, N., Chinembiri, T., Comninos, A., Gillwald, A. and Govan-Vassen, N. (2020). Paving the way towards digitalising agriculture in South Africa. *no. June*, pp.1-42.

Alexander, M. (2020). *What languages are spoken in South Africa's nine provinces.*

Algert, S.J., Baameur, A. and Renvall, M.J. (2014). Vegetable output and cost savings of community gardens in San Jose, California. *Journal of the Academy of Nutrition and Dietetics*, *114*(7), pp.1072-1076.

Altman, M., Hart, T., and Jacobs, P. (2009). *Food security in South Africa*. Pretoria. Human Sciences Research Council. Pretoria.

Armstrong, D. (2000). A survey of community gardens in upstate New York: implications for health promotion and community development. *Health & place*, *6*(4), 319–327. https://doi.org/10.1016/s1353-8292(00)00013-7

Ansah, I.G.K., Gardebroek, C. and Ihle, R. (2019). Resilience and household food security: a review of concepts, methodological approaches and empirical evidence. *Food Security*, *11*(6), pp.1187-1203.

Antwi, M., and Nxumalo, K. K.S. (2014). Impact of Proactive Land Acquisition Strategy (PLAS) Projects on Human Capital Livelihood of Beneficiaries in the Dr. Kenneth Kaunda district in South Africa. *J. Agric. Sci., 6(12)*, pp .1–13.

Agrotex Global.(2021).Crop diversification:definition,benefits, challenges and Strategies.Available at :Crop Diversification:Definition,Benefits, Challenges and Strategies (agrotexglobal.com) (Accessed on:2022/07/23).

Atuoye, K.N., Antabe, R., Sano, Y., Luginaah, I. and Bayne, J. (2019). Household income diversification and food insecurity in the upper west region of Ghana. *Social Indicators Research*, *144*(2), pp.899-920.

Audate, P.P., Fernandez, M.A., Cloutier, G. and Lebel, A. (2019). Scoping review of the impacts of urban agriculture on the determinants of health. *BMC Public Health*, *19*(1), pp.1-14.

Baiphethi, M.N. and Jacobs, P.T. (2009). The contribution of subsistence farming to food security in South Africa. *Agrekon*, *48*(4), pp.459-482.

Bashir, M.K. and Schilizzi, S. (2013). Determinants of rural household food security: a comparative analysis of African and Asian studies. *Journal of the Science of Food and Agriculture*, *93*(6), pp.1251-1258.

Bashir, M.K., Schilizzi, S. and Pandit, R. (2012). *The determinants of rural household food security in the Punjab, Pakistan: an econometric analysis* (No. 1784-2016-141882).

Beavers, A.W., Atkinson, A. and Alaimo, K. (2020). How gardening and a gardener support program in Detroit influence participants' diet, food security, and food values. *Journal of Hunger & Environmental Nutrition*, *15*(2), pp.149-169.

Beavers, A.W., Atkinson, A., Varvatos, L.M., Connolly, M. and Alaimo, K*. (2022).* How Gardening in Detroit Influences Physical and Mental Health*. International journal of environmental research and public health, 19(13), p.7899.*

Bikombo, B.G. (2015). Understanding household food insecurity and coping strategies of street traders in Durban. Doctoral dissertation, University of South Africa.

Bonke, J. (1992). *Choice of Foods Allocation of Time and Money, Household Production and Market Services: Part II*. MAPP.

Boru, T. (2018). Chapter five research design and methodology. *TB Lelissa. Research Methodology.* University of South Africa, PHD Thesis. http://www://doi, 10.

Business Tech. (2021). *The areas in South Africa where more people are unemployed than working.*

Carstens, G., Hay, R. and Laan, M.V.D. (2021). Can home gardening significantly reduce food insecurity in South Africa during times of economic distress?. *South African Journal of Science*, *117*(9-10), pp.1-7.

Castillo, D. C., Ramsey, N. L., Yu, S. S., Ricks, M., Courville, A. B., and Sumner, A. E. (2012). Inconsistent Access to Food and Cardiometabolic Disease: The Effect of Food Insecurity. *Current cardiovascular risk reports*, *6*(3), 245–250. https://doi.org/10.1007/s12170-012-0236-2

Cerda C., Guenat S., Egerer, M and Fischer L.K. (2022). Home Food Gardening: Benefits and Barriers During the COVID-19 Pandemic in Santiago, Chile. *Front Sustain Food Syst.* 6:841386. doi: 10.3389/fsufs.2022.841386

Chauke, T.M. (2016). *The contribution of community gardens to livelihood of participants: a case of Mudavula Village, Vhembe District, Limpopo Province.* Doctoral dissertation, South Africa.

Chakona, G., and Shackleton, C. M. (2018). Household Food Insecurity along an Agro-Ecological Gradient Influences Children's Nutritional Status in South Africa*. Frontiers in nutrition, 4, 72.* https://doi.org/10.3389/fnut.2017.00072

Chakona, G., and Shackleton, C. M. (2019). Food insecurity in South Africa: To what extent can social grants and consumption of wild foods eradicate hunger? *World Development Perspectives 13 ,87–9.*

Chandia, M. (2012*). Gardens in the Johannesburg Inner-city: An analysis of the Multifunctionality of Urban Agriculture.* Masters' dissertation, Johannesburg, University of Johannesburg.

Chapagain, T. and Raizada, M.N. (2017). Impacts of natural disasters on smallholder farmers: gaps and recommendations. *Agriculture & Food Security*, *6*(1), pp.1-16.

Chikoto, L. (2016). *The relationship between household food gardens and household food security in an urban area in Harare, Zimbabwe: a right to food perspective*. Doctoral dissertation, Stellenbosch, Stellenbosch University.

Christensen, S. (2017). Seeding social capital? Urban community gardening and social capital. *Civil Engineering and Architecture*, *5*(3), pp.104-123.

Chihambakwe, M., Mafongoya, P. and Jiri, O. (2019). Urban and peri-urban agriculture as a pathway to food security: A review mapping the use of food sovereignty. *Challenges*, *10*(1), p.6.

Choithani, C. (2019). *Gendered livelihoods: migrating men, left-behind women and household food security in India, Gender, Place & Culture.*

Coghlan, D and Miller, M., B. (2014). *The Sage Encyclopedia of Action Research: Data Analysis.*

Coates, J., Swindale, A. and Bilinsky, P. (2007). *Household Food Insecurity Access Scale (HFIAS) for measurement of food access: indicator guide: version 3*.

Coates, J, Swindale, A and Bilinsky, P. (2006). *Household Food Insecurity. Access Scale (HFIAS) for measurement of food access: Indicator guide*.

Coe, R., Waring, M., Hedges, L and Arthur, J. (2017). *Research methods and methodologies in education*. Second edition. London: Sage publications Inc.

Creswell, J. W., and Plano-Clark, V. L. (2007). *Designing and conducting mixed methods research*. Thousand Oaks, Calif: SAGE Publications.

Creswell, J. (2015). *A concise introduction to mixed methods*. London: Sage Publications Inc.

Creswell, J.W. (2007). Qualitative *inquiry and research design: Choosing among five approaches*. Second edition. London: Sage Publications Inc.

Creswell, J.W. (2008). Mixed methods: design and procedures. *Journal of Mixed Method Research.*

Creswell, J.W. (2014). Research *design: qualitative, quantitative and mixed methods approach*. California: Sage publications.

Creswell, J., W., and Clark, V.L.P. (2011). *Design and conducting mixed methods research*. Second edition. University of Nesbrasaka-Lincoln.London: Sage Publications.

Clarke, M., Davidson, M., Egerer, M., Anderson, E., Fouch, N. (2019). *The underutilized role of community gardens in improving cities' adaptation to climate change: A review.* Villanova University.

Crow, G. (2013). *What is qualitative interviewing*. Available from: http://eprints.ncrm.ac.uk/3276/1/complete_proofs.pdf (Accessed on: 2019/04/18).

Danziger, N. (2009). *Rural women and migration rural women and migration.*

Darries, G.S. (2019). Impact *assessment of community and household food gardens and the influence of livelihoods and food security: A case study in the Overberg District Suurbraak village in the Western cape, South Africa*. Masters' dissertation, Bloemfontein, University of Free State.

Danso-Abbeam, G., Ehiakpor, D.S., and Aidoo, R. (2018). Agricultural extension and its effects on farm productivity and income: insight from Northern Ghana*. Agric & Food Secur 7*, pp.74.

DAFF. (2011). The *national policy on food and nutrition security for the Republic of South Africa*.

DAFF. (2014). *The National Policy on food and nutrition Security for The Republic of South Africa.*

Davis-Reddy, C and Vincent, K. (2017). *Climate risk and vulnerability: a handbook for southern Africa*. CSIR, Pretoria, 202.

Department of Agriculture. (2002). *The Integrated Food Security Strategy for South Africa*.

De Lange, D. (2015). *The relationship between food security and disaster risk reduction at the urban household level in the South African context*. Doctoral dissertation, North-West University (South Africa), Potchefstroom Campus.

Devereux, S. (2017). Why South Africa's social grants aren't eradicating malnutrition.

Deressa, T., Hassan, R., Ringler, C., Alemu, T., Yesuf, M. (2009). Determinants of farmers' choice of adaptation methods to climate change in the Nile Basin of Ethiopia. *Global environmental change*, *19*(2), pp.248-255.

Delport, C. (2019). *Food and Nutrition Policy in South Africa: The National Vision, Policy Space and Policy Alignment. Stellenbosch University, South Africa.*

Denzin, N. and Lincoln, Y. (2007). *The land scape of qualitative research (Introduction): The discipline and practice of qualitative reach*.

Diallo, A and Toah, A., M. (2019). Determinants of food insecurity among maize farming households in the Southern Region of Mali. *Food Secur*, *7*, pp.151-158.

Dilshad, R.M. and Latif, M.I. (2013). Focus group interview as a tool for qualitative research: An analysis. *Pakistan Journal of Social Sciences (PJSS)*, *33*(1).

Deitchler, M., Ballard, T., Swindale, A., and Coates, J. (2010). *Validation of a measure household hunger for cross cultural use.*

Dladla, N. (1997). *Food security policy for South Africa: A discussion document for the Department of Agriculture and land affairs. Food security working group*. South Africa.

Dodd, N and Nyabvudzi T. (2014). Unemployment, living wages and food security in Alice, Eastern Cape, South Africa. *Journal of Human Ecology*, *47*(2), pp.117-123.

Drammeh, W., Hamid, N. A and Rohana, A.J. (2021). *Determinants of household food insecurity and its association with child malnutrition in Sub-Saharan Africa: A review of the literature*.

Durai. (2022). Crop *diversification: Need, advantages and challenges-explained, pointwise*.

Dzanja, J., Christie, M., Fazey, L., and Hyde, A. (2013). The role of social capital on rural food security: the case study of Dowa and Lilongwe Districts in Central Malawi. *Journal of Agricultural Science,*7. 10.5539/jas.v7n12p165.

E News Channel Africa (ENCA). (2021).SA *unemployment rate rises to 32.6%*.

eThekwini Municipality. (2023).*Integrated Development Plan, 5 year plan: 2023/24 to 2027/28*.Integrated Development Plan 2023-24 to 2027-28.pdf (durban.gov.za).

Eze, S.C. and Echezona, B.C. (2012). Agricultural pest control programmes, food security and safety. *African Journal of Food, Agriculture, Nutrition and Development*, *12*(5), pp.6582-6592.

Fan, M., Shen, J., Yuan, L., Jiang, R., Chen, X., Davies, W.J. and Zhang, F. (2012). Improving crop productivity and resource use efficiency to ensure food security and environmental quality in China. *Journal of experimental botany*, *63*(1), pp.13-24.

Faber, M. and Wenhold, F. (2008). *Nutritional status of South Africans: Links to water and agriculture*. Pretoria, Report to the Water Research Commission.

Faber, M., Schwabe, C. and Drimie, S. (2009). Dietary diversity in relation to other household food security indicators. *International Journal of Food Safety, Nutrition and Public Health*, *2*(1), pp.1-15.

Faber, M., Wenhold, F.A. and Laurie, S.M. (2017). Dietary diversity and vegetable and fruit consumption of households in a resource-poor peri-urban South Africa community differ by food security status. *Ecology of food and nutrition*, *56*(1), pp.62-80.

Fedha, L.M., Gutwa, P.O and Gatobu, C. (2016). The implication of men's rural-urban migration on household decision making in Soy Sub-County, Kenya*. INTERNATIONAL JOURNAL OF SCIENTIFIC & TECHNOLOGY RESEARCH, Vol 4, Issue 06.*

Frey, B., B. (2018). *The Sage Encyclopedia of Educational Research: measurement, and evaluation*. Available from: https://0-methods-sagepub-com.oasis.unisa.ac.za/Reference/the-sage-encyclopedia-of-educational-research-measurement-and-evaluation. (Accessed on 2019/04/15).

French, S.A., Tangney, C.C., and Crane, M.M. (2019). Nutrition quality of food purchases varies by household income: The shopper study. *BMC Public Health* 19, 231. https://doi.org/10.1186/s12889-019-6546-2

Food research and action centre (Frac). (2022). *Food insufficiency during COVID-19*. Available at: https://frac.org/ (Accessed on :2022/09/29).

Food and Agriculture Organization. (2006). *Changing policy concepts of food security.*

Food and Agriculture Organization. (2008). *An introduction of the Basic Concepts of Food Security: Four dimensions of food security.*

Food and Agriculture Organization. (2010). *The State of Food Insecurity in the World. Addressing food insecurity in protracted crises.* Food and Agricultural Organization of the United Nations, Rome.

Food and Agriculture Organization. (2014). Food security and why it matters. Food and Agriculture Organization of the United Nations. Available from: http// www.fao.org/docrep/014/i2330e00.htm (Accessed on: 2018/07/03).

Food and Agriculture Organization. (2015). *Challenges and opportunities to improve the livelihoods of smallholder farmers in the Pacific Island Countries*.

Food and Agriculture Organization. (2016). *The state of food and agriculture: climate change, agriculture and security.*

Food and Agriculture Organization, World Health Organisation, World Food Programme, International Fund for Agriculture Development and United States Children's Fund. (2017). *The State of Food Security and Nutrition in the World 2017. Building Resilience for Peace and Food Security.*

Food and Agriculture Organization, World Health Organisation, World Food Programme, International Fund for Agriculture Development and United States Children's Fund. (2019). *The State of Food Security and Nutrition in the World.*

Food and Agriculture Organization. *(2020). The state of food security and nutrition in the world: Transforming food systems for affordable healthy diets.*

Fhy, A. (2021). *What is food security?*

Fraanje, W and Lee-Gammage, S. (2018). *What is food security*?

Frey, B.B. (2018). *The SAGE Encyclopedia of educational research, measurement, and evaluation*. (Vols. 1-4). SAGE Publications, Inc., https://doi.org/10.4135/9781506326139

Friedlander, B and Chronicle, C. (2021). *Climate change has hurt farm productivity.*

French, C.A. (2008). *The social production of community garden space: Case studies of Boston, Massachusetts and Havana, Cuba*. University of New Hampshire.

French, S.A., Tangney, C.C., Crane, M.M., Wang, L., and Appelhans, B.M. Nutrition quality of food purchases varies by household income: the shopper study. (2019*). BMC Public Health,19*,231.

Galhena, D.H., Freed, R. and Maredia, K.M. (2013). Home gardens: a promising approach to enhance household food security and wellbeing. *Agriculture & food security*, *2*(1), pp.1-13.

Game, I and Primus, R. (2015). *Urban Agriculture.*

Gashu, D., Mantague, W. D and Stoecker, B. (2019). Challenges and opportunities to the African agriculture and food systems. *African Journal of Food, Agriculture, Nutrition and Development*, *19*(1), pp.14190-14217.

Gerrano, A., S. (2021). Indigenous African vegetables can contribute to food security. Available at: https://agriabout.com/indigenous-african-vegetables-can-contribute-to-food-security/ (Accessed on 20/09/2022).

Gichunge, C., Somerset, S and Harris, N. (2016). Using a Household Food Inventory to Assess the Availability of Traditional Vegetables among Resettled African Refugees*. International journal of Environmental Research and Public Health, 13*, pp.137.

Godfray, H.C.J., Aveyard, P., Garnett, T., Hall, J.W., Key, T.J., Lorimer, J., Pierrehumbert, R., T., Scarborough, P., Springmann, M., and Jebb, S., A. (2018). Meat consumption, health, and the environment. *Science*, *361*(6399).

Gorton, M. and Barjolle, D. (2014). Theories of food choice. *Food consumer science* (pp. 15-26). Springer, Dordrecht.

Govender, L., Pillay, K., Siwela, M., Modi, A and Mabhaudi, T. (2017). Food and nutrition insecurity in selected rural communities of KwaZulu-Natal, South Africa—Linking human nutrition and agriculture. *International Journal of Environmental Research and Public Health*, *14*(1), p.17.

Graham, D and Bryan, J. (2022). *How many focus groups are enough: focus groups for dissertation research*.

Greenberg, S. (2010). *Contesting the food system in South Africa: issues and opportunities. Institute for poverty, land and Agrarian Studies*. Belville.

Guest, G., Namey, E and McKenna, K. (2017). How many focus groups are enough? building an evidence base for non-probability sample sizes. *Field Methods, Vol. 29(1). pp.* 3-22

Gundersen, C., Tarasuk, V., Cheng, J., De Oliveira, C. and Kurdyak, P. (2018). Food insecurity status and mortality among adults in Ontario, Canada. *PloS one*, *13*(8), p.e0202642.

Gundumogula, M. (2021). Importance of focus groups in qualitative research. *International Journal of Humanities and Social studies*, Vol 8, Issue 11.

Gustafson, S. (2017). *Pests threatening food security*.

Harris, J., De Bart de Steenhuijsen, P., McMulin, S., Bajwa, B., De Jager, L. and Brouwer, I.D. (2023). *Fruits and vegetables for healthy diets: Priorities for food system research and action*

Hanson, C. (2013). Food security, inclusive growth, sustainability and the post 2015 development Agenda. *Background Research Paper.*

Hallegatte, S., Vogt-Schilb, A. and Rozenberg, J. (2020). From Poverty to Disaster and Back: A Review of the Literature. *EconDisCliCha, 4*, pp.223–247.

Hart, T. (2010). Food and nutrition security: household food plots or gardens. Enter for poverty, employment and growth. *Agririan development and Agririan reform workshop.* Human Sciences research council.

Hawkes, C. (2013). Promoting healthy diets through nutrition education and changes in the food environment: an international review of actions and their effectiveness. *Nutrition Education and Consumer Awareness Group, Rome: FAO. Available at: www. fao. org/ag/humannutrition/nutritioneducation/69725/en*.

Hendriks, M. (2014). *Connecting small-scale farmers in Grabouw, South Africa to formal markets: an assessment of the key constraints*. Doctoral dissertation, MSc. Thesis (unpublished), Wageningen University, Nertherlands.

Hendriks, S.L., Viljoen, A., Marais, D., Wenhold, F.A., McIntyre, A.M., Ngidi, M.S., Annandale, J.G., Kalaba, M. and Stewart, D. (2020). Considerations for the design of nutrition-sensitive production programmes in rural South Africa. *BMC Public Health*, *20*(1), pp.1-16.

Hendriks, S. (2013). Food security in South Africa: Status quo and policy imperatives. *Agrikon,52 (2),* pp.1-24.

HLPE (High Level Panel of Experts). (2016). *Sustainable agricultural development for food security and nutrition: A report by The High-Level Panel of Experts on Food Security and Nutrition HLPE High Level Panel of Experts what roles for livestock?* Committee on World Food Security: Rome.

Hoddinott, J. and Yohannes, Y. (2002). *Dietary diversity as a food security indicator.* Washington, DC: International Food Policy Research Institute.

Howell, C.R., Su, W., and Nassel, A.F. (2020). Area based stratified random sampling using geospatial technology in a community-based survey. *BMC Public Health 20, 1678*. https://doi.org/10.1186/s12889-020-09793-0

Hlatshwayo, S. (2018). *Local economic sustainability under small holder subsistence farming.* Doctoral dissertation.

International Hellenic University. (2015). Introduction to sustainable development. Available at: https://www.ihu.edu.gr/icsd/docs/introduction-to (Accessed on :2022/04/13).

Isman, M.B. (2019). Challenges of pest management in the twenty first century: new tools and strategies to combat old and new foes alike. *Frontiers in Agronomy*, *1*, p.2.

Icheria, B.K. (2019). *An investigation into food security among female-headed households in Kenya: A case of VOI division in Taita-Taveta County*. Doctoral dissertation, University of Pretoria.

Issahaku, G., Kornher, L., and Saiful Islam, A.H.M. (2023). Heterogeneous impacts of home-gardening on household food and nutrition security in Rwanda. *Food Sec.*https://doi.org/10.1007/s12571-023-01344-

Jacobs, B.M., Aliber, M and Oyelana, A.A. (2016). Investigating the contribution of home gardening to household food security with regard to dietary diversity. *Journal of Human Ecology*, *55*(1-2), pp.80-91.

Jansen and Warren. (2020). *What (Exactly) Is Research Methodology*?

Jebessa, G.M., Sima, A.D. and Wondimagegnhu, B.M. (2019). Determinants of household dietary diversity in Yayu biosphere reserve, Southwest Ethiopia. *Ethiopian Journal of Science and Technology*, *12*(1), pp.45-68.

Johnson and Onwegbuzie. (2004). Mixed methods research: A research paradigm whose time has come. *Educational Researcher, 33*, pp. 7. American Educational Research association.

Jones, A., D., Ngure, F., M., Pelto, G., and Young, S., L. (2013). What are we assessing when we measure food security? A compendium and review of current metrics. *Advances in nutrition*, *4*(5), pp.481-505.

Jowell, J. (2011). *The role of food gardens in addressing malnutrition in children (0-5 years).* DG Murray trust.

Kanosvamhira, T.P. and Tevera, D. (2020). Urban agriculture as a source of social capital in the Cape Flats of Cape Town. *African Geographical Review*, *39*(2), pp.175-187.

Kamer, L. (2021). *Sources of income for households in South Africa 2019.*

Kabanda, T., and Nenwiini, S. (2016). *Impacts of climate variation on the length of the rainfall season: an analysis of spatial patterns in North-East South Africa*.

Kassie, M., Ndiritu, S. W., and Stage, J. (2014). *Food security as a gender issue: Why are female-headed households worse off compared to similar male-headed counterparts.*

Khapayi, M. and Celliers, P., R. (2016). *Factors limiting and preventing emerging farmers to progress to commercial agricultural farming in the King Williams area of the Eastern Cape Province, South Africa.*

Kheswa, T., Kolanisi, U and Siwela, M. (2021). Contextualized interpretation of food (in) security by rural youth in KwaZulu-Natal*. Journal of Consumer Sciences,* Vol 49.

Knueppel, D., Demment, M and Kaiser, L. (2009). *Validation of the Household Food Insecurity Access Scale in rural Tanzania.*

Kena, M. (2017). *Developing plant disease management strategies for smallholder vegetable farmers in the Limpopo province, South Africa*.

Khwidzhili, R.H and Worth, S. (2019). Evaluation of South Africa' public agricultural extension in the context of sustainable agriculture. South African.*Journal of Agriculture Extension; 47(1),* pp. 20-35.

Kirsch, T. D., Wadhwani, C., Sauer, L., Doocy, S and Catlett, C. (2012). Impact of the 2010 Pakistan floods on rural and urban populations at six months. *PLoS currents*, *4*, e4fdfb212d2432. https://doi.org/10.1371/4fdfb212d2432.

Kipkurgat, T and Tuigong, D. (2015). Impact of agricultural extension on food security among small scale farmers in Wareng District, Kenya. European *Journal of Agriculture and Forestry Research,3(4)*, pp.25-28.

Kingsley, J., Bailey, A., Torabi, N., Zardo, P., Mavoa, S.; Gray, T., Tracey, D., Pettitt, P., Zajac, N. and Foenander, E. (2019). A Systematic Review Protocol Investigating Community Gardening Impact Measures. *Int. J. Environ. Res. Public Health*, *16*, 3430. https://doi.org/10.3390/ijerph16183430

Kransy, M., and Saldivar-Tanaka, L. (2004). Culturing community development, neighbourhood open space, and civic agriculture: The case of Latino community gardens in New York. *Agriculture and Human Values, 21(4),* pp. 399-412.

Kubheka, B.P. (2015). *Impact assessment of the Siyazondla Homestead food production programme in improving household food security of selected households in the Amathole District, Eastern Cape*. Masters' dissertation, Pietermaritzburg, University of Kwa-Zulu Natal.

Khumalo, N., Z., and Sibanda, M. (2019). Does Urban and Peri-Urban Agriculture Contribute to Household Food Security? An Assessment of the Food Security Status of Households in Tongaat, eThekwini Municipality. *Sustainability*, 11(4), 1082.

Korb, K. (2012). *Conducting Educational Research: Step 5*: Identify the Population.

Krejcie, R.V., & Morgan, D.W. (1970). *Determining sample size for research activities*. Educational and Psychological Measurement. Small sample techniques (1960). The NEA *Research Bulletin,* Vol. 38.

KwaZulu-Natal Department of Agriculture and Environmental Affairs (KZNDAEA). (2005). Final Formulation Report. KZNDAEA: Pretoria, South Africa.

Kumar, J. (2011). *Research methodology: A step-by-step guide for beginners*. Third edition. London: Sage Publications Inc.

Lal, R. (2020). Home gardening and urban agriculture for advancing food and nutritional security in response to the security to the Covid-19 pandemic. *Food security 12*, pp.871-876.

Landesa. (2012). *Land Rights and Food Security: the linkages Between Secure Land Rights, Women and Improved Household Security and Nutrition*. Rural Development Institute.

Labadarios, D., Davids, D., Mciza, Z and Weir-Smith, G. (2009). *The assessment of food security in South Africa*.HRSC. Pretoria.

Labadarios, D., Mchiza, Z.J.R., Steyn, N.P., Gericke, G., Maunder, E.M.W., Davids, Y.D., and Parker, W. (2011). Food security in South Africa: a review of national surveys. *Bulletin of the World Health Organization,* 89(12), 891–899.

Lee, S., H. (2002). *Community gardening benefits as perceived among American-born and immigrant gardeners in San Jose, California*.

Yoosefi, L.J., Mohammadi G., M and Soofizad, G. (2020). Challenges and opportunities confronting female-headed households in Iran: A qualitative study.*BMC Women's Health,183.*

Leedy, P.D. and Ormrod, J.E. (2010). *Practical research, planning and design*. (8th ed.). New Jersey: Pearson Merrill Prentice Hall.

Liere, H., Egerer, M., Sanchez, C., Beachier., and Philpott, S., M. (2020). *Social context influence on urban gardener perceptions of pests and management practices.*

Lippman S., Maman S., MacPhail C., Twine R., Peacock D., Kahn K., and Pettifor A. (2013). *Conceptualising community mobilisation for HIV prevention: Implication for HIV prevention programming in the African context*.

Litt, J. S., Schmiege, S. J., Hale, J. W., Buchenau, M.and Sancar, F. (2015). Exploring ecological, emotional and social levers of self-rated health for urban gardeners and non-gardeners: A path analysis. *Social science & medicine (1982)*, *144*, 1–8. https://doi.org/10.1016/j.socscimed.2015.09.004

Lubisi, P.B., Agholor, A. I and Kanayo, O. (2021). *Climate threat and alternatives for farming in Driekoppies, Mpumalanga, South Africa.*

Luna, K.L.G., Ostonal, J.M., and Orillo, A.T. (2020*). Dietary Diversity as a Component of Food Security among Households with Preschool Children in a Coastal Municipality in Batangas, Philippines.*

Maake, M.M.S., and Antwi, M.A. (2022). Farmer's perceptions of effectiveness of public agricultural extension services in South Africa: an exploratory analysis of associated factors*. Agriculture and Food Security,11,* pp.34. Available at: https://doi.org/10.1186/s40066-022-00372-7(Accessed on:2022/07/11).

Machete, M. (2020). *The Contribution of Subsistence Farming to Rural Household Food Systems: A Case Study of Mamokgadi Village*. Doctoral dissertation.

Makwangudze, K., E. (2013). *Home gardening as a mitigation measure for food security of HIV/AIDS affected households in Mpophomeni Township, KwaZulu-Natal.* Masters' dissertation, Pietermaritzburg, University of KwaZulu-Natal.

Malehlela, N. (2014). *Socio-economic contribution of community food gardens to the livelihoods of rural household Lepelle-Nkumpi Local municipality of Limpopo Province, South Africa*. Masters' dissertation, Bloemfontein, University of Fort Hare.

Maluleke, M.N. (2018). *Assessing the access to nutritious food by households participating in the household food security short learning programme* (Doctoral dissertation).

Mango, N., Makate, C., and Mapemba, L. (2018). The role of crop diversification in improving household food security in central Malawi. *Agriculture & Food Security*, *7*(1), pp.1-10.

Maponya, P., Venter, S., L., Du Plooy, C., P., Oelofse, D, D, D., Van Den Heever, E., Manyaga, C., Nyirenda, O., Masuku and Mahlangu, M. (2020). *Mechanism for Improving the Sustainability of Homestead Food Gardens in the Gauteng Province, South Africa*.

Masuku, M.M., Selepe, M. M., and Ngcobo, N. (2017). Status of household food security in rural areas at uThungulu District, Kwa-Zulu Natal, South Africa. *African Journal of Hospitality, Tourism and Leisure, 6(2),* pp.19-38.

Masipa, S. (2017). The impact of climate change on food security in South Africa: Current realities and challenges ahead. *Jàmbá: Journal of Disaster Risk Studies*, *9*(1), pp.1-7.

Masekoameng, M and Molotja, C. (2016). The impacts of climate change on household food security. The case of Mogaladi village in Sekhukhune District, South Africa*.Indilinga-African Journal of Indigenous Knowledge Systems,15,* pp.49-70.

Masekoameng, M.R and M. C. Molotja. (2019). The role of indigenous foods and indigenous knowledge systems for rural households' Food Security in Sekhukhune District, Limpopo Province, South Africa. *Journal of Consumer Sciences*.

Martin, G., Clift, R.and Christie, I. (2016). Urban Cultivation and Its Contributions to Sustainability: Nibbles of Food but Oodles of Social Capital. *Sustainability 8, 409*. https://doi.org/10.3390/su8050409

Matlakala ,F.K.,Nyahunda,L., and Makhubele,J.C.(2021).Challenges faced by small-scale farmers in the face of natural disasters in rural areas: an Afrocentric perspective. *African Journal of Development Studies*, *11*(4), p.177.

Matsimbi, F. (2020). *The effects of food gardens on food security amongst urban households in Gauteng and western cape provinces of South Africa*. Master of Philosophy in Urban and Regional Science, Stellenbosch University.

Maxwel, J.A. (2013). *Qualitative research design: Interactive approach*. George Mason University, California: Sage Publications.

Maxwell, D., Coates, J. And Vailta, B. (2013). How do different indicators of household food security compare? Empirical evidence from Tigray. *Feinstein International Center*, pp.1-19.

Mazenda, A., Molepo, N., Mushayanyama, T. and Ngarava, S. (2022). The invisible crisis: the determinants of local food insecurity in Gauteng municipalities, South Africa. *British Food Journal*.

Mbombo-Dweba, T.P., Mbajiorgu, C.A., Agyepong, A.O and Oguttu, J.W. (2017). Food consumption patterns of sub-Saharan African immigrants residing in Gauteng province, South Africa. *Applied Ecology and Environmental Research*, *15*(4), pp.1023-38.

Mbombo-Dweba, T.P. (2017). *Food consumption patterns of Sub-Saharan Africa immigrants residing in Gauteng province, South Africa.* Doctor of Philosophy thesis, UNISA.

McCombes, S. (2021). *An introduction to sampling methods*.

McGregor, S., L., T. (2018). *Understanding and Evaluating Research: A Critical Guide*. USA: Sage Publications Inc.

Mcata, B. (2019). Garden ownership as a solution to food insecurity in urban areas of South Africa: A case of food gardens in Alice Town, Eastern Province. *Journal of Agribusiness and Rural Development,3(53)*, pp. 215–224.Available at: https://doi.org/10.17306/J.JARD.2019.01157.(Accessed on: 2022/07/18).

Mcata B., and Ajuruchukwu, O. (2015). Home gardening as a strategy for food security and poverty alleviation in low-income households in South Africa.University of Fort Hare.

McDonald, B. (2010). *Food security*. Malden: Polity Press.

McMillen, H., Campbell, L.K., Svendsen, E.S. and Reynolds, R. (2016). Recognizing Stewardship Practices as Indicators of Social Resilience: In Living Memorials and in a Community Garden. *Sustainability, 8, 775*. https://doi.org/10.3390/su8080775

Mdiya, L and Mdoda, L. (2021). Mdiya, L. and Mdoda, L. (2021). Socio-economic factors affecting home gardens as a livelihood strategy in rural areas of the Eastern Cape province, South Africa. *South African Journal of Agricultural Extension*, *49*(3), pp.1-15.

Mekuria, G., Wubneh, Y and Tewabe, T. (2017). Household dietary diversity and associated factors among residents of Finote Selam Town, north west Ethiopia: a cross sectional study. *BMC nutrition*, *3*(1), pp.1-6.

Mei, C. F., Faller, E., M., Chuan, L.X and Gabriel J.S. (2020). Household Income, Food Insecurity and Nutritional Status of Migrant Workers in Klang Valley, Malaysia. *Annals of Global Health*, *86*(1).

Mfitumukiza, D.D., Barasa, B and Catherine, A.B. (2017). *Influence of Literacy on the Smallholder Farmer's Ability to Adapt to Drought in Pallisa District, Eastern Uganda*.

Miller, K. (2015). Could *waiting too long to get married increase your odds of Divorce ?*

Minja, E.G., Swai, J.K., Mponzi, W., Ngowo, H., Okumu, F., Gerber., M., Puhse., U., Long, K.Z., Utzinger, J., Lang, C., Bechmann, J and Finda, M. (2021). Dietary diversity among households living in Kilombero district, in Morogoro region, South-Eastern Tanzania. *Journal of Agriculture and Food Research*, *5*, p.100171.

Mitiku, A., Fufa, B. and Tadese, B. (2012). Empirical analysis of the determinants of rural households' food security in Southern Ethiopia: The case of Shashemene District. *Basic Research Journal of Agricultural Science and Review, 1 (6),* pp.132–138.

Mitchell, R. and Hanstad, T. (2004). Small Homegarden plots and sustainable livelihoods for the poor. *FAO LSP WP*, *11*.

Mkhawani, K, Motadi S. A, Mabapa N. S, Mbhenyane, X. G and Blaauw, R. (2016). Effects of rising food prices on household food security on female headed households in Runnymede Village, Mopani District, South Africa. *South African Journal of Clinical Nutrition, 29(2)*, 69-74.

Mkhize, C.J. (2015). *Tick control practices in communal Tsholotsho* (Doctoral dissertation).

Mlambo, V., H. (2018). An overview of rural-urban migration in South Africa: its causes and implications. *Archives of Business Research*, *6*(4).

Moafi, F.,Kazemi,F., Siboni,F.S and Alimoradi,Z.(2018). The relationship between food security and quality of life among pregnant women. *BMC Pregnancy and Childbirth*, *18*(1), pp.1-9.

Modibedi, T. P., Masekoameng, M. R., and Maake, M. (2021). The contribution of urban community gardens to food availability in Emfuleni Local Municipality, Gauteng Province. *Urban Ecosystems, 24(4),* pp.847-847.

Modibedi, T.P. (2018). *The contribution of urban agriculture to food security in Emfuleni local municipality, Gauteng Province*. Masters' dissertation, Pretoria, University of South Africa.

Modibedi, T., P., Masekoameng, M., R and Maake, M., M., S. (2020). *The contribution of urban community gardens to food availability in Emfuleni Local Municipality, Gauteng* Province.

Mohamadpour M., Sharif M., Z and Keysami, M.A. (2012). Food insecurity, health, and nutritional status among sample of palm-plantation households in Malaysia. *Journal of Health Population Nutrition, Issue30(3)*, pp.291–302.Available at: https://pubmed.ncbi.nlm.nih.gov/23082631.(Accessed on:2022/04/26).

Mpyana, J., M. (2017). *Home gardening and livelihoods of households in Manamani and Itsane, Thulamela local municipality, South Africa.*

Mpandeli S., and Maponya P. (2014). Constraints and challenges facing the small-scale farmers in Limpopo Province, *South Africa. J Agric Sci ,6(4),* pp.135–143.

Mtolo, A. (2016). *Food security and coping strategies of an urban community in Durban*. Doctoral dissertation, Durban University of Technology.

Mthethwa, S and Wale, E. (2021). Household vulnerability to food insecurity in rural south Africa: Evidence from a nationally representative survey data*. International Journal of Environmental Research and Public Health, 18(4), p.1917.*

Mudzinganyama, T., C. (2012)*. A livelihood-based analysis of the contribution of community gardens to food security in Msunduzi and Umngeni municipalities in KwaZulu Natal, South Africa.* Masters' dissertation. University of KwaZulu-Natal, South Africa.

Mupindu, W. (2015). *The challenges of food security policy and food quality in Zimbabwe: A case study of Operation Maguta in Buhera District*.

Mutisya, M., Ngware, M., W., Kabiru, C., W. and Kandala, N., B. (2016). The effect of education on household food security in two informal urban settlements in Kenya: A longitudinal analysis. *Food Security, 8 (4),* pp.743–756.

Mutero, J. (2015). Operational *challenges faced by smallholder farmers: A case study of eThekwini District.* Doctoral dissertation.

Musotsi, A.A., Sigot, A.J. and Onyango, M.O.A. (2008). The role of home gardens in household food security in Butere division of Western Kenya*. African Journal of Food, Agriculture, Nutrition and Development,8(4),* pp.375-390.

Muzawazi, H.D., Terblanché, S.E., and Madakadze, C. (2017). Community gardens as a strategy for coping with climate shocks in Bikita District, Masvingo, Zimbabwe. *South African Journal of Agricultural Extension, 45(1)*, pp.102- 117.

Myeni, L., Moeletsi, M., Thuvhana, M., Randela, M and Mokoena, L. (2019). Barriers affecting sustainable agricultural productivity of smallholder farmers in the Eastern Free State of South Africa. *Sustainability*, *11*(11), p.3003.

National Treasury, South Africa. (2015). *Provincial Budgets and Expenditure Review: 2010/11-2016/17.*

Nabuuma, D., Ekesa, B., Faber, M and Mbhenyane, X. (2021). *Food security and food sources linked to dietary diversity in rural smallholder farming households in central Uganda.*

Napoli, M. (2011). *Towards a Food Insecurity Multidimensional Index (FIMI).*

Ndobo, F. (2013). Determining *the food security of households in South Africa Township.*Doctoral dissertation, North-west University.

Ndhlovu, B. (2019). *The contribution of indigenous vegetables to food access and income generation of households in the rural and informal settlements in West Coast district Municipality, Western Cape Province, South Africa*. Doctoral dissertation.

Nettles, B. (2012). *Transportation and food: The importance of access*.

Nesbraska Extension in Lancaster County. (2013). *Critical periods of water need in the vegetable garden*.

Nesamvumi*. (2016). Food safety indicators in household food security in the rural Vhembe district, Limpopo province, South Africa.* University of Free State.

Ngatane, N. (2019). *Social grants second most important source of income in: STATS SA.*

Ngobese, N. (2015)*. Investigating the potential of Thuthukani as a viable community garden: a situation analysis.* Master's dissertation. University of KwaZulu-Natal, Pietermaritzburg.

Ngema, P.Z., Sibanda, M and Musemwa, L. (2018). Household food security status and its determinants in Maphumulo local municipality, South Africa. *Sustainability*, *10*(9), p.3307.

Njeri, T., L. (2020). *Role of kitchen gardens in diversifying diets among Semie-Arid inhabitants of IGamba Ngombe in Tharaka Nithi County, Kenya: A comparative study of kitchen garden practicing and non-practicing households in IGamba Ngombe.*

Njobe, B and Kaaria, S. (2015). Women and agriculture: the untapped opportunity in the wave of transformation. *Background Paper*.

Njuguna, J. (2013). *The role of kitchen gardens in food security and nutritional diversity: a case study of workers at James Finlay Kenya-Kericho*. Doctoral dissertation, University of Nairobi.

Nhlangulela, S. (2021). *Examining the use of social grants as a means to reduce income poverty: A case study of Ubuhlebezwe Local Municipality in KZN*. Master's dissertation. University of KwaZulu-Natal, Durban.

Nkambule, B. L and Dlamini, C.S. (2012). The concept of sustainable agriculture: Global and perceptions with emerging issues from Swazi land. *African Journal of Agricultural Research, Vol 7(28),* pp. 4003 - 4009.

Nkosi S., Gumbo T., Kroll F., and Rudolph, M. (2014). Community gardens as a form of urban household food and income supplements in African cities: Experiences in Hammanskraal, Pretoria. Briefing No. 112. *Africa Institute of South Africa*, South Africa.

Nkomoki, W., Bavorová, M and Banout, J. (2019). Factors associated with household food security in Zambia*. Sustainability, 11(9),* p.2715.

Nkwana, H.M. (2016). A multisectoral *public policy frame food security in South Africa.*

Nnaji, A., Ratna, N., and Renwick, A. (2022). Gendered access to land and household food insecurity: Evidence from Nigeria. *Agricultural and Resource Economics Review, 51*(1), pp. 45-67.

Nyathi, A.N. (2018). Exploring socio-economic challenges faced by female headed households in rural districts: The case of Manama village, Matebeland South Province in Zimbabwe. Masters Genders Studies, University of Venda.

Nontu, Y and Taruvinga, A. (2021). Determinants of home gardening participation among rural households: evidence from Ingquza hill local municipality, South Africa. *Journal of Agribusiness and Rural Development*, *60*(2), pp.213-220.

Noss.H.L.(2022). *Why community gardens are good for the environment?*

Nosratabadi, S., Khazami, N., Abdallah, M., B, Lackner, Z., S., Band, S., Mosavi, A., and Mako, C. (2020). *Social capital contributions to food security: A comprehensive literature review.*

Nuani, F., O., Gido, E., O., Ayuya, O., I and Musyoka, M., P. (2022)*. Demand analysis for selected roots and tubers among urban households of Nakuru County, Kenya.*

Oduniyi, O.S. and Tekana, S.S. (2020). Status and Socioeconomic Determinants of Farming Households' Food Security in Ngaka Modiri Molema District, South Africa. *Soc Indic Res 149*, pp. 719–732. Available at: https://www.doi.org/10.1007/s11205-020-02266-2 (Accessed on :2022/08/2022).

Oguttu, J. W., Mbombo-Dweba, T. P., and Ncayiyana, J. R. (2021). Factors correlated with home gardening in Gauteng Province, South Africa. *International journal of environmental research and public health, 18(5)*, pp. 2737.

Okop, K.J., Ndayi, K., Tsolekile, L., Sanders, D and Puoane, T. (2019). *Low intake of commonly available fruits and vegetables in socio-economically disadvantaged communities of South Africa: Influence of affordability and sugary drinks intake*.

Olivier, D.W. (2015). The *physical and social benefits of urban agriculture projects run by non-government organisation in Cape town*. Masters' dissertation, Stellenbosch, University of Stellenbosch.

Olivier, D. W and Heinecken, L. (2016). The personal and social benefits of urban agriculture experience by cultivators on the Cape Flats. *Development Southern Africa 34(2*), pp.1-14,

Omotayo, A.O., Amero, B.R and Alamu, O.P. (2017). Food utilization, nutrition, health and farming households' income: A critical review of literature. *Journal of Human Ecology,56.*

Omotayo A.O., Ogunniyi, A. I and Aremu A.O. (2019). Data on food insufficiency status in South Africa: Insight from the South Africa general household survey. *Data in brief*, *23*, pp.103730.

O'Neill, A. (2021). South Africa: Total population from 2009 to 2019, by gender *(in millions).*

Oppenheimer, V.K. (1994). Women's Rising employment and the future of the family in industrial societies. *Population and Development Review,20, No. 2,* pp. 293-342.

Oyegbami, A. (2018). Location and distance of farmers to agricultural extension service: implication for agricultural development in Oyo State, Nigeria. *South African Journal of Agricultural Extension*, *46*(2), pp.14-23.

Patel, F. (2022). *SA has worst unemployment rate among world's economic data-tracking countries.*

Phezisa, B. (2016). *A situational survey of Siyazondla homesteam food production programme and food safety, poverty alleviation in selected communities of Nkonobe Local Municipality of the Eastern Cape.*

Phulkerd, S., Thapsuwan, S., Soottipong Gray, R., and Chamratrithirong, A. (2020). Characterizing Urban Home Gardening and Associated Factors to Shape Fruit and Vegetable Consumption among Non-Farmers in Thailand. *International Journal of Environmental Research and Public Health, 17.*

Pem, D., and Jeewon, R. Fruit and vegetable intake: Benefits and progress of nutrition education interventions- Narrative Review Article. (2015). *Iran J Public Health,44(10)*,1309-21.

Philander, F., R and Karriem, A. (2016). Assessment of Urban Agriculture as a Livelihood Strategy for Household Food Security: An Appraisal of Urban Gardens in Langa, Cape Town. *International Journal of Arts and Sciences, 9(1)*, 327–338.

Pechey, R and Monsivais, P. (2016). *Social-economic inequalities in the healthiness of food choices: Exploring the contributions of food expenditures.*

Porter, J. R., Xie, L., Challinor, A. J., Cochrane, K., Howden, S. M., Iqbal, M. M., Lobell, D. B., and Travasso, M. I. (2014). Food security and food production systems. Available at: https://www.ipcc.ch/site/assets/uploads/2018/02/WGIIAR5-Chap7_FINAL.pdf.(Accessed on:2022/08/05).

Principe, L. (2022). *What is the optimum focus group size*.

Pulido, M.T., Pagaza-Calderón, E.M., Martínez-Ballesté, A., Maldonado-Almanza, B., Saynes, A and Pacheco, R, M. (2008). *Home gardens as an alternative for sustainability: Challenges and perspectives in Latin America.*

Qange, S and Mdoda, L. (2020). Factors affecting subsistence farming in rural areas of Nyandeni Local Municipality in the Eastern Cape Province. *South African Journal of Agricultural extension,48,* pp. 2. Pretoria, South Africa.

Rahman, S.U. (2014). *Impacts of flood on the lives and livelyhoods of people in Bangladesh: a case study of a village in Manikganj district*. Doctoral dissertation, Brac University.

Raidimi, E., N and Kabiti, H.M. (2019). A review of the role of agricultural extension and training in achieving sustainable food security: A case of South Africa*. Journal of Agriculture Extension;47, No 3,* pp. 120-130.

Raidimi, E.N. and Kabiti, H.M. (2017). Agricultural extension, research, and development for increased food security: the need for public-private sector partnerships in South Africa. *South African Journal of Agricultural Extension*, *45*(1), pp.49-63.

Ramakrishna, G., Gaddam, S and Diasy, I. (2014). Impact of floods on food security and livelihoods of IDP tribal households: The case of Khammam region of India*. International Journal of Development and Economics Sustainability,2(1),* pp.11-24.

Rankoana, S.A. (2017). The use of indigenous knowledge in subsistence farming: Implications for sustainable agricultural production in Dikgale community in Limpopo Province, South Africa. *Towar. Sustain. Agric. Farming Pract. Water Use*, *63*, pp.63-72.

Rankoana, S.A. (2020). Food security under unreliable rainfall: the case study of a rural community in Limpopo Province, South Africa. *Journal of Water and Climate Change*, *11*(3), pp.677-684.

Rebek, E. and Hillock, D. (2015). *Home vegetable garden insect pest control*. Oklahoma Cooperative Extension Service.

Research advisors. (2006). *Sample size table*. Available from: https://www.research-advisors.com/tools/SampleSize.htm.(Accessed on 2019/11/19).

Riptanti, E.W., Supardi, S. and Qonita, R.A. (2016). Sustainable food security on farmer households in flood prone areas. *International Journal of Applied Environmental Sciences*, *11*(6), pp.1435-1450.

Ristaino, J.B., Anderson, P.K., Bebber, D.P., Brauman, K.A., Cunniffe, N.J., Fedoroff, N.V., Finegold, C., Garrett, K.A., Gilligan, C.A., Jones, C.M. and Martin, M.D. (2021). The persistent threat of emerging plant disease pandemics to global food security. *Proceedings of the National Academy of Sciences*, *118*(23), p.e2022239118.

Rizzo, D.M., Lichtveld, M., Mazet, J.A., Togami, E. and Miller, S.A. (2021). Plant health and its effects on food safety and security in a One Health framework: Four case studies. *One Health Outlook*, *3*(1), pp.1-9.

Robbins. (2021). *Food Inequality: How poor nutrition affects health, wealth, and opportunity (and what we can do about it!).*

Roos, J.A., Ruthven, G.A. and McLachlan, M.H. (2013). Food availability and accessibility in the local food distribution system of a low-income, urban community in Worcester, in the Western Cape province. *South African Journal of Clinical Nutrition*, *26*(4), pp.194-200.

Rosol, M. (2010). Public participation in post-Fordist urban green space governance: the case of community gardens in Berlin. *International journal of urban and regional research*, *34*(3), 548–563. https://doi.org/10.1111/j.1468-2427.2010.00968.x

Ruane, A.C and Rosenzweig, C. (2018). *Climate Change Impacts on Agriculture*. Available at:https://www.worldscientific.com/doi/pdf/10.1142/9789813278356_0005 (Accessed on:2022/08/05).

SAnews. (2015). *South Africans flock to urban areas*.

Sahu, P.K. (2013). *Research methodology: A guide for researchers in agricultural science, social science and other related fields* (Vol. 432). New Delhi: Springer.

Sasson, A. (2012). Food security for Africa: an urgent global challenge. *Agriculture & Food Security*, *1*(1), pp.1-16.

Sambo, T. A. (2021). *Analysis of food security status among agricultural households in the Nkomazi Local Municipality, South Africa*. Doctor of Philosophy thesis, UNISA, Pretoria.

Sambo, T.A., Oguttu, J. W and Mbombo-Dweba, T., P. (2022). Analysis of food security status among agricultural households in the Nkomazi Local Municipality, South Africa*. Journal of Agribusiness and Rural development,3(61)*, pp. 323-336.

Sayed N. (2006). Household nutrition security in rural communities, In Fundamentals of nutrition security in rural development. *Ed. By Schonfeldt H. Graduate readings, 3:1-12*.

Selepe, B. M., Mtyingizane, S. S., and Masuku, M. M. (2015). Factors contributing to household food insecurity in Mhlontlo area, Eastern Cape, South Africa. *J. Hosp. Manage. Tourism*, *4*(1), 2223-814X.

Shah, S. (2021). *Crop diseases and pests: round table report on interventions.*

Savary S., Bregaglio S., Willocquet L., and Gustafson D. (2017). *Crop health and its global impacts on the components of food security.*

Savary, S., Bregaglio, S., Willocquet, L., Gustafson, D., Mason D'Croz, D., Sparks, A., Castilla, N., Djurle, A., Allinne, C., Sharma, M. and Rossi, V. (2017). Crop health and its global impacts on the components of food security. *Food Security*, *9*(2), pp.311-327.

Shabangu, P. (2016). *Challenges faced by small farmers in Swaziland: A case of Hhono Region.*

Silvestri, S., Sabine, D., Patti, K., Wiebke, F., Maren, R., Ianetta, M., Carlos, Q.F., Mario, H., Anthony, N., Nicolas, N. and Joash, M. (2015). Households and food security: lessons from food secure households in East Africa. *Agriculture & Food Security*, *4*(1), pp.1-15.

Sithole, Z., Siwela, M., Ojo, T.O., Hlatshwayo, S.I., Kajombo, R.and Ngidi, M.S.C. (2023). Contribution of Fruits and Vegetables to the Household Food Security Situation of Rural Households in Limpopo*. Nutrients, 15, 2539*. https://doi.org/ 10.3390/nu15112539

Shelembe, N. (2018). An analysis of the food baskets and their implications for household food security, uMsunduzi Local Municipality. Masters in Food Security, University of KwaZulu Natal.

Shipman, D and Durmus, B. (2017). The effect of culture on food consumption: A case of special religious in Turkey. *Journal of Food Research,6,* pp.2.

Shisanya, S.O and Hendriks, S.L. (2011). The contribution of community gardens to food security in the Maphephetheni uplands. *Development Southern Africa ,28*, pp. 509 - 526.

Shisana, O., Labadarios, D., Rehle, T., Simbayi, L., Zuma, K., Maluleke, T., Mchunu, G., Naidoo, P., Davids, Y.D., Mokopane, Z., Onoya, D. (2014). *South African national health and nutrition examination survey.*

Shahid, S.A. and Al-Shankiti, A. (2013). Sustainable food production in marginal lands—Case of GDLA member countries. *International soil and water conservation research*, *1*(1), pp.24-38.

Sisk, C., Sharkey, J.R., McIntosh, W.A. and Anding, J. (2010). Using multiple household food inventories to measure food availability in the home over 30 days: a pilot study. *Nutrition journal*, *9*(1), pp.1-12.

Siniscalco, M and Auriet, N. (2005). *Quantitative research methods in educational planning. Paris, France: International Institute for Educational Planning.*

Sikk, K. and Maasikamäe, S. (2015). Impact of agricultural landholding size on the land fragmentation. In Annual 21st International Scientific Conference. *Research for Rural Development,2*, pp. 301-306.

Singh, K.P., Bhoopathy, S. V, Worth, H., Seale, H and Richmond, R, L. (2015). Nutrition among men and household food security in an internally displaced persons camp in Kenya. *Public Health Nutrition,19(4)*, pp. 723–731.

Sisha, T.A. (2020). *Household level food insecurity assessment: Evidence from panel data, Ethiopia.*

South African Cities Network. (2015). *A study on current and future realities for urban food security in South Africa.*

Statistics South Africa (STATS SA). (2015). *General household survey 2014*. Pretoria: Statistics South Africa.

Statistics South Africa (STATS SA). (2019). Towards measuring food security in South Africa: An examination of hunger and food inadequacy. Pretoria: Statistics South Africa.

Statistics South Africa (STATS SA). (2019). *The extent of food security in South Africa*. Available at: http://www.statssa.gov.za/?p=12135.(Accessed on :09/6/2021).

Statistics South Africa (STATS SA).2020. *General Household Survey*.

Statistics South Africa (STATS SA). (2016). *Provincial profile: KwaZulu-Natal Community Survey 2016.*

Statistics South Africa (STATS). (2020). *Marriages* and divorces 2022. Available at: https://www.statssa.gov.za/publications/P0307/P03072020.pdf (Accessed on :2022/08/16).

Swanepoel, J.W. (2017)*. Analysis urban household food security in the Cape Town Metropole of South Africa, with reference to the role of urban agriculture*.

Swanepoel, J.W., Van Niekerk J.A and Van Rooyen C., J. (2018). An analysis of the indicators affecting urban household food insecurity in the informal settlement area of the Cape Town Metropole. *South African Journal of Agricultural Extension*, *46*(1), pp.113-129.

Szabo, S. (2016). Urbanisation and food insecurity risks: Assessing the role of human development. *Oxford Development Studies*, *44*(1), pp.28-48.

Suri, S. (2020). Nutrition gardens: a sustainable model for food security and diversity. *ORF Issue Brief No*, *369*.

Swedish International Development Cooperation Agency (SIDA). (2019). Gender *Equality and Water, Sanitation and Hygiene.*

Swindale, A. and Bilinsky, P. (2006). *Household dietary score for measurement of household food access indicator guide: Indicator Guide*. Washington, DC: Food and Nutrition Technical Assistance.

Tibesigwa, B., Visser, M., and Twine, W. (2014). *Investigating the sensitivity of household food security to agriculture-related shocks and the implication of informal social capital and natural resource capital: The case of rural households in Mpumalanga, South Africa.*

Taherdoost, A. (2016). Sampling Methods in Research Methodology; How to choose a sampling technique for research*. International Journal of Academic Research in Management (IJARM) ,5 (2),* Page: 18-27. Malaysia, Kuala Lumpur.

Taboka, S.K. (2016). *Evaluation of the impact of backyard gardens on household income in Southern District, Botswana*. Egerton University, Botswana.

Temple, N.J. and Steyn, N.P. (2011). The cost of a healthy diet: A South African perspective. *Nutrition, 27,*505-508.

Tesfamariam, B. Y., Owusu-Sekyere, E., Emmanuel, D., and Elizabeth, T. B. (2018). The impact of the homestead food garden programme on food security in South Africa. *Food security*, *10*(1), pp.95-110.

Torres, A. C., Nadot, S and Prévot, A.C. (2017). Specificities of French community gardens as environmental stewardships. *Ecology and Society* 22(3):28.

Trapbag. (2022). Natural disasters in Agriculture: Types and Prevention. Available at: https://www.trapbag.com/natural-disasters-in-africa/(Accessed on :2022/08/08).

Tulane University. (2021). Climate change and its threat to food security. Available at: https://publichealth.tulane.edu/blog/climate-change-and-food-security/ (Accessed on :2022/08/05).

Utonga, D. (2022). Analysis of Maize Profitability among Smallholder Farmers in Mbinga District, Tanzania. *International Journal of Research Publication and Reviews,3(2)*, pp 1031-1035.

Uzokwe, U.N., Giweze, E.A and Afouku, A.U. (2016). *Contribution of home gardens to family food security in Delta North agricultural zone, Delta State, Nigeria.*

Van der Merwe, C. (2011). *Challenges to Urban Food Supply in South Africa*.

Vosloo, J.J. (2014). *Chapter 6: Data analysis and interpretation. North West University*. Available at: http://dspace.nwu.ac.za/bitstream/handle/10394/12269/Vosloo_JJ_Chapter_6.pdf (Accessed: on 2018/03/9).

Vosloo, J.J. (2014). *Chapter 5: Research design and methodology*. *North West University*. Available at: http://dspace.nwu.ac.za/bitstream/handle/10394/12269/Vosloo_JJ_Chapter_5.pdf (Accessed: on 2018/03/9).

Veen, E. J. (2015). *Community gardens in urban areas: a critical reflection on the extent to which they strengthen social cohesion and provide alternative food*. Wageningen, Wageningen University.

Vorster, H.H., Badham, J.B., Venter, C.S. (2013). An introduction to the revised food-based dietary guidelines for South Africa. *South African Journal of Clinical Nutrition*, 26(3), pp. S1-S164.

Walsh, C.M., Fouché, M.S., Nel, M.and Booysen, F. (2020). The Impact of a Household Food Garden Intervention on Food Security in Lesotho. *Int. J. Environ. Res. Public Health*, *17*, 8625. https://doi.org/10.3390/ijerph17228625

Wang, J., Ding, X., Gao, H. and Fan, S. (2022). Reshaping food policy and governance to incentivize and empower disadvantaged groups for improving nutrition. *Nutrients 14, 648*. https://doi.org/10.3390/ nu14030648

Waidler, J and Devereux, S. (2019). Social grants, remittances, and food security: does the source of income matter?. *Food Security*, *11*(3), pp.679-702.

Wong, C. (2020). *An analysis of possible barriers to the growth of community gardens located in San Bernardino County and Los Angels County*. Masters' dissertation.

Wills, J., Chinemana, F. and Rudolph, M. (2009). Growing or connecting? An urban food garden in Johannesburg. *Health Promotion International, 25(1)*, pp.33-41.

Wegren, S.K., and Elvestad, C. (2018). Russia's food self-suciency and food security: an assessment. *Post-Communist Economies, 30(5*), pp.565–587.

Wlokas, H. (2008). The impacts of climate change on food security and health in Southern Africa*. Journal of Energy in Southern Africa 19(1)*, 12–20.

Webb, N.L. (2000). Food-gardens and nutrition: Three Southern African case studies. *J Family Ecol Consumer Sci, 28*, pp.61-67.

World Wildelife Fund (WWF). (2018*). Farming for a drier future.*

World Health Organization. (2011). *Global status report on noncommunicable diseases.*

Ziervogel, G and Frayne, B. (2011). *Climate change and food security in Southern African cities*. African Food Security Urban Network (AFSUN).

Zwane, M., T. (2015). *School feeding programmes as mechanism to improve market access for smallholder farmers in rural areas of South Africa.* Doctoral dissertation, University of Pretoria.

LIST OF APPENDICES

Appendix 1: Key informant interview guide

1.Name of the area		

2. Indicate types of vegetables you grown

a) Potatoes	0=No; 1=Yes
b) Pumpkin	0=No; 1=Yes
c) Tomatoes	0=No; 1=Yes
d) Cabbage	0=No; 1=Yes
e) Carrots	0=No; 1=Yes
f) Beetroot	0=No; 1=Yes
g) Lettuce	0=No; 1=Yes
h) Butternut	0=No; 1=Yes
i) Chinese cabbage	0=No; 1=Yes
j) Green beans	0=No; 1=Yes
k) Onion	0=No; 1=Yes
l) Spinach	0=No; 1=Yes
m) Sweet potato	0=No; 1=Yes
n) Green pepper	0=No; 1=Yes
o)Amadumbe	0=No; 1=Yes
p) Chillies	0=No; 1=Yes
q) Brinjal	0=No; 1=Yes
	0=No; 1=Yes
	0=No; 1=Yes
	0=No; 1=Yes

Appendix 2: Questionnaire

A. GENERAL INFORMATION

Questionnaire number		Date	
House number		interviewer	

Select Municipal Region (Mark with an X)	1.South	2.North	3.Outer west	4.Central

B. PARTICIPANTS CHARACTERISTICS

Number	Participant Demography	ANSWER	CODE
1.	Gender	0=Female 1=Male	
2.	Gender of the head of the household	0=Female 1=Male	
3.	Age group (in years)	1 = 18 - 35 yrs. 2 = 36 – 45 yrs. 3 = 46 – 55 yrs. 4 = Above 55 yrs.	
4.	Race	1=Black African 2=White 3=Asian or Indian 4=Coloured 5=Others (Specify)……..	
5.	Home language	1= isiZulu; 2= Xhosa; 3= Sesotho; 4= Ndebele; 5=Xitsonga; 6= Sepedi; 7= Tshivenda; 8=Sesotho Setswana; 9= Afrikaans 10=other(specify)	

<table>
<tr><td>6.</td><td>Marital status</td><td>1= Single; 2= Married;
3= Divorced; 4= Widowed 5= Cohabitation; 6=Other
(specify)</td><td></td></tr>
<tr><td>7.</td><td>Level of education</td><td>1 = No formal education
2 = Primary education
3 = Secondary education
4 = Tertiary education
5 = Other (Specify)</td><td></td></tr>
<tr><td>8.</td><td>What is your employment status</td><td>mark with an X or a Tick (✓)<table><tr><td>Unemployed</td><td>Employed (Temporary)</td><td>Employed (permanent</td><td>Self employed</td></tr><tr><td>1</td><td>2</td><td>2</td><td>3</td></tr></table></td><td></td></tr>
<tr><td>9.</td><td>Main Source of Income</td><td>1=Wages/salaries
2=Old Age Pension
3=Child Grant from Government
4.Other Grants from Government
5.Farm activities
6.Other activities</td><td></td></tr>
<tr><td>10.</td><td>How many household members are employed?</td><td></td><td></td></tr>
</table>

11	Size of the garden land	1=0,1 ha-0,5ha 2=0.5 ha – 1 ha 3=1 ha – 2 ha 4=3 – 5ha	

12. Which vegetables do you grow?	Mark with an x
a). Cabbage	0=No;1=Yes
b).Carrot	0=No;1=Yes
c).Beetroot	0=No;1=Yes
d).Pumpkin	0=No;1=Yes
e).Spinach	0=No;1=Yes
f).Onions	0=No;1=Yes
g).Beans	0=No;1=Yes

Section C: The contribution of food garden to household food security in terms of availability and access to fruits and vegetables.

(i) Contribution of food gardens to vegetables and fruits availability:

13. Please complete household food inventory list.

Vegetables	**Is this vegetable available in your Household? (1=Yes /0=No)**
Beans	1=Yes /0=No
Cowpeas	1=Yes /0=No
Cabbages	1=Yes /0=No
Tomatoes	1=Yes /0=No
Onions	1=Yes /0=No
Potatoes	1=Yes /0=No
Pumpkin	1=Yes /0=No
Banana	1=Yes /0=No
Oranges	1=Yes /0=No
Spinach	1=Yes /0=No
Maize	1=Yes /0=No
Sweet potatoes	1=Yes /0=No
Amadumbes	1=Yes /0=No
Beetroot	1=Yes /0=No

14. Does food gardens produce vegetables throughout the year? Please tick (☑) in the appropriate box.

a).No	0
b).Yes	1

15. If the answer is No in Question 14. Please circle (YES/NO) which month's vegetables are available?

	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July
Yes	1	1	1	1	1	1	1	1	1	1	1	1
No	0	0	0	0	0	0	0	0	0	0	0	0

16. Why are vegetables unavailable on a household level?	Mark circle (yes/no)
a). Low production from the food gardens	0=No;1=Yes
b). Theft of vegetables	0=No;1=Yes
c). Lack/low disposable income to buy vegetables	0=No;1=Yes
d). Support from department of agriculture(skills/knowledge)	0=No;1=Yes
e). Planting limited varieties of vegetables.	0=No;1=Yes

17. Rate the contribution of food gardens to household vegetables availability. Please tick.

1	2	3	4	5
Totally dissatisfied	A little dissatisfied	Moderately satisfied	Satisfied	Highly satisfied

18. Why is production low? Mark circle (yes/no)

a). Pests	0=No;1=Yes
b). Short of land (land size)	0=No;1=Yes
c). Climate (heavy hail, strong winds, heavy rain, drought	0=No;1=Yes
d). Lack of resources (water)	0=No;1=Yes

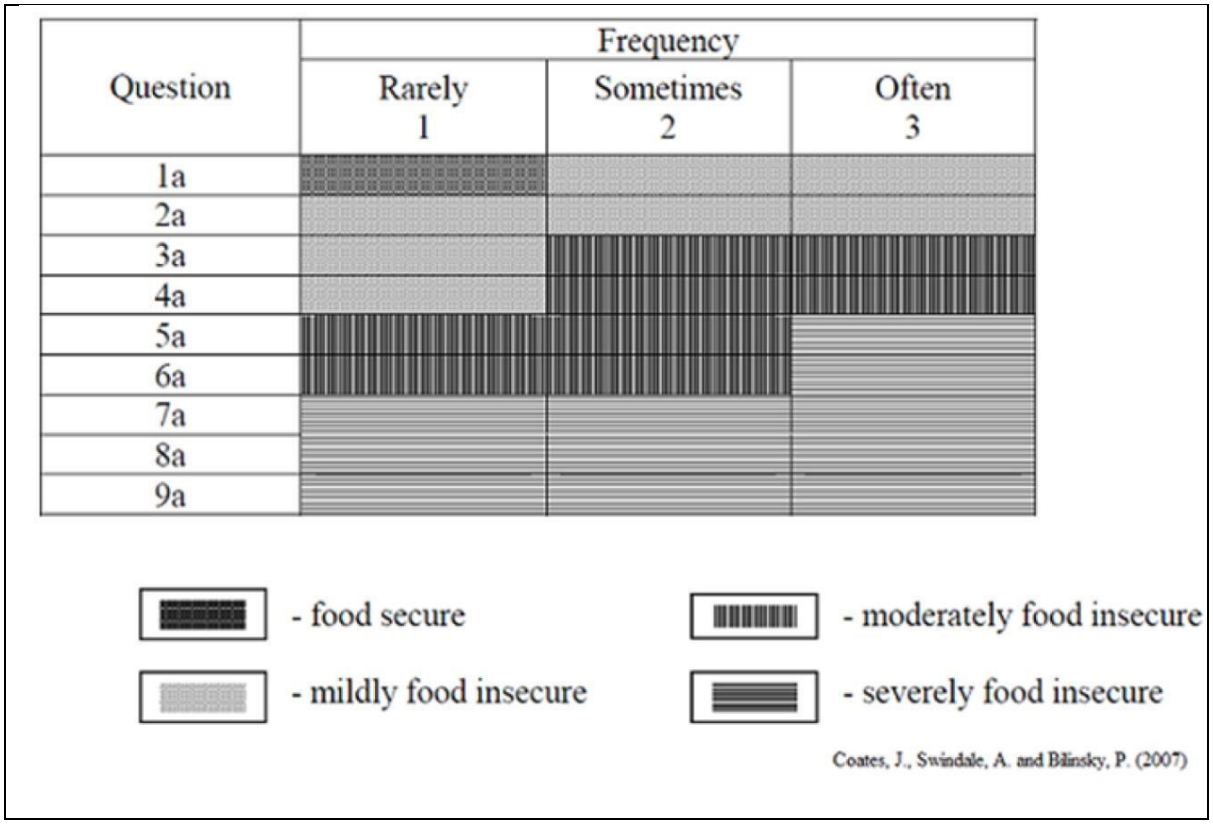
(i) Contribution of food gardens to vegetables accessibility:

19. Complete Household Dietary Diversity questionnaire

Question Number	Food Group	Examples	Yes = 1;No = 0
A.	Cereals		
B.	Tubers		
C.	Vegetables		
D.	Fruit		
E.	Meat		
F.	Eggs		
G.	Fish		
H.	Beans		
I.	Milk and milk products/		
J.	Fats/oil		
K.	Sugar and honey/Sweets		
L.	Spices		

1	In the past four weeks, did you worry that your household would not have enough food? (***if answer is No, skip to Q2)***	1: Yes	0: No	
1a	How often did this happen?	1: Rarely	2: Sometimes	3: Often
2	In the past four weeks, were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources? (***if answer is No, skip to Q3)***	1: Yes	0: No	
2a	How often did this happen?	1: Rarely	2: Sometimes	3: Often
3	In the past four weeks, did you or any household member have to eat a limited variety of foods due to a lack of resources? (***if answer is No, skip to Q4)***	1: Yes	0: No	
3a	How often did this happen?	1: Rarely	2: Sometimes	3: Often
4	In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food (***if answer is No, skip to Q5)***		1: Yes	0: No
4a	How often did this happen?	1: Rarely	2: Sometimes	3: Often
5	In the past four weeks, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food? (***if answer is No, skip to Q6)***	1: Yes	0: No	
5a	How often did this happen?	1: Rarely	2: Sometimes	3: Often
6	In the past four weeks, did you or any other household member have to eat fewer meals in a day because there was not enough food? (***if answer is No, skip to Q7)***	1: Yes	0: No	
6a	How often did this happen?	1: Rarely	2: Sometimes	3: Often
7	In the past four weeks, was there ever no food to eat of any kind in your household because of lack of resources to get food? (***if answer is No, skip to Q8)***	1: Yes	0: No	
7a	How often did this happen?	1: Rarely	2:Sometimes	3: Often
8	In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food? (***if answer is No, skip to Q9)***	1: Yes	0: No	
8a	How often did this happen?	1: Rarely	2:Sometimes	3: Often
9	In the past four weeks, did you or any household member go a whole day and night without eating anything because there was not enough food?	1: Yes	0: No	
9a	How often did this happen?	1: Rarely	2:Sometimes	3: Often

21. Household Insecurity Access Prevalence (HFIAP):



Section D: To identify strengths and challenges which the food gardeners' faces in response to their food gardens. Open –ended questions:

22. What are the strengths of working in food garden?

23. What are the challenges you face in food gardens?

Thank you

Appendix 3: Focus group discussion check list

The purpose of the Semi-structured interview is to assess the contribution of food gardens to household food security in eThekwini Municipality, KwaZulu Natal.Please answer the questions without hesitation.

Name of interviewer	•
Date of the interview	•
Time and Place	•
Questionnaire number	•

1.1. Please tick which EThekwini Municipality Region you from:

South	
North	
Outer West	
Central	

1.2. What are the challenges you face in food gardens?

.....
.....
.....
.....

1.3. What are the strengths in food gardens project?.....
.....
.....
.....

Thank you

Appendix 4: Participant information sheet

Ethics clearance reference number: **2020/CAES_HREC/107**

Research permission reference number: **2020/CAES_HREC/107**

Date:15/11/2020

Title: **The contribution of food gardens to household food security in eThekwini municipality, KwaZulu Natal.**

Greetings Potential Respondent

My name is Mthandeni Ernest Ntuli, and I am studying Agriculture Master's Degree at the University of South Africa with Dr Masekoameng and Dr Dweba-Mbombo in the Department of Agriculture and Animal Health. Please accept invitation to take part in a study examining 'The contribution of food gardens to household food security in eThekwini municipality, KwaZulu Natal".

WHAT IS THE AIM/OBJECTIVE OF THE STUDY?

This study aims to, Investigate the contribution of food gardens to household food security at eThekwini Municipality in KwaZulu-Natal. It also evaluates how food gardens affect availability and accessibility. Look into the benefits and challenges as well.

WHY AM I Been INVITED TO TAKE PART?

Since you participated from the KwaZulu Natal Department of Agriculture and Rural Development's Food Garden Program. I have chosen you to take part in the study and 307 households are the expected targeted number of participants.

WHAT KIND OF PARTICIPATION DO I HAVE IN THIS STUDY?

To take part in this study, you must complete the following tasks:

- Prior to taking part in the study, sign the consent form
- Complete the study questionnaire or take part in face-to-face interviews with the researcher
- To participate in the focus group discussion.
- During interviews and when filling out the survey questionnaire, refrain from using your real name.

Both closed-ended and open-ended questions will be asked in the semi-structured survey questionnaire. The inquiries will cover demographic details, socio-economic factors (income, family size), and the availability and accessibility of food. Discussions with focus groups were also required. It should take roughly 25 minutes to complete the questionnaire. The discussion will last for approximately 30 minutes.

AFTER AGREEING TO PARTICIPATE, CAN I STILL WITHDRAW FROM THIS STUDY?

You are not obligated to consent to this study; it is completely up to you whether you do. If you choose to participate, you will be given this information sheet to keep and asked to sign a written consent form. Your decision to participate is your own, and you are free to stop at any moment, for any reason. The participants identify won't be disclosed, and the confidentiality will be respected professionally. No participant names will appear in the research articles that result from the study.

WHAT MAY BE THE BENEFITS OF PARTICIPATING IN THIS STUDY?

- The research will add to the body of knowledge, and the results will aid the municipalities or department of agriculture's understanding of the value of food gardens and their role in ensuring household food security.
- The research may help shape policy and encourage the use of food gardens as a means of reducing hunger and poverty.
- It will help to identify the opportunities of the food gardener.

DO TAKING PART IN THE RESEARCH PROJECT HAVE ANY DISADVANTAGES FOR ME?

There are no known dangers or unfavourable outcomes from taking part in the trial. There won't be any emotional or delicate questions in the interviews or debate.

DOES THE RESEARCHER MAINTAIN THE CONFINDENTIALITY OF MY INFORMATION AND IDENTITY?

Forms for consent will be sent to the participants. The study's participants will have the option to leave at any moment if they so decide. Participants' data will be treated with the utmost confidentiality. The participant names and information will remain anonymous, and the questionnaires will be coded.

IN WHAT WAYS WILL RESEARCHER PROTECT INFORMATION

The researcher will preserve paper copies of your responses for a period of five years in the Department of Agriculture and Animal Health at the University of South Africa's Florida Science Campus for future research or instructional purposes. Digital information will be stored on a pass-code computer.

Additional Research Ethics Review and, if necessary, approval will govern future uses of the data. Paper copies will be destroyed after five years, and electronic copies will be permanently erased from the computer's hard drive using the appropriate software.

DO I GET PAID OR GET ANY OTHER PERKS FOR PARTICIPATING IN THIS STUDY?

Participation in this study is not compensated in any way.

DOES STUDY BEEN CLEARED BY ETHICS DEPARTMENT

This project has received official consent from the Health Research Ethics Committee of the College of Agriculture and Environmental Sciences, Unisa. The researcher is willing to provide you with a copy of the letter of permission.

WHEN WILL I BE INFORMED OF THE RESEARCH FINDING RESULTS?

To provide participants with comments based on the study's findings, the researcher will visit each food garden. You can reach the researcher at Ernestmthandeni@gmail.com or by calling 0732955600 if you need any additional information or want to discuss any part of this study.

You can get in touch with Dr Masekoameng at +27 11 471 3102, masekmr@unisa.ac.za, or Dr Dweba-Mbombo at +27 11 14712264, mbombtp@unisa.ac.za, if you have any concerns regarding the way the research was carried out.

If you have any ethical questions, get in touch with Prof. E.L. Kempen, the chairperson of the College of Agriculture and Environmental Science Ethics Committee, at +27 11 471 2241 or kempeel@unisa.ac.za.

We appreciate you reading this information brief and taking part in the study.

Ernest Mthandeni Ntuli

Appendix 5: Consent to participate in this study

I, _____ (participant name), confirm that the person asking my consent to take part in this research has told me about the nature, procedure, potential benefits and anticipated inconvenience of participation.

I have read (or had explained to me) and understood the study as explained in the information sheet.

I have had sufficient opportunity to ask questions and am prepared to participate in the study.

I understand that my participation is voluntary and that I am free to withdraw at any time without penalty (if applicable).

I am aware that the findings of this study will be processed into a research report, journal publications and/or conference proceedings, but that my participation will be kept confidential unless otherwise specified.

I agree to the recording of the <insert specific data collection method.

I have received a signed copy of the informed consent agreement.

Participant Name & Surname…… (please print)

Participant Signature……..Date……

Researcher's Name & Surname……(please print)

Researcher's signature……..Date……

Appendix 6: Permission letter to conduct research

agriculture
& rural development
Department:
agriculture
& rural development
PROVINCE OF KWAZULU-NATAL

KZN Department of Agriculture & Rural Development
Private Bag X9059, Pietermaritzburg, 3200
Enquiries: Mr T.E Majola
Tel: 033 355 9675
Email: thulani.majola@kzndard.gov.za
Date: 17 March 2020

Mr. M. Ntuli (Student no. 45 546 959)
6223 Thokoza Road
Kwandengezi
PINETOWN
3607

Dear Sir

1. I have pleasure in informing you that permission is granted to conduct a research on "*The contribution of food gardens to household food security in eThekwini Municipality*" within the Department of Agriculture and Rural Development.

2. You are hereby requested to comply with the following terms and condition:

a) Ensure that the Director: Human Resource Development is informed before you commence with your research study;

b) The Department will not provide any resources for your study such as transport, research assistant, etc. and

c) The Department must be informed for any publication or paper that will be presented or published containing organisational information.

3. Please ensure that you adhere to all government prescripts including departmental policies and procedures.

I take this opportunity to wish you well on your endeavor.

30/03/2020

Head of Department
Mr SD Sibande

Date

TOGETHER WE HAVE MADE KZN A BETTER PROVINCE TO LIVE IN.

Appendix 7: Research ethics clearance

UNISA university of south africa

UNISA-CAES HEALTH RESEARCH ETHICS COMMITTEE

Date: 09/06/2020

NHREC Registration # : REC-170616-051
REC Reference # : 2020/CAES_HREC/107_FR
Name : Mr ME Ntuli
Student #: 45546959

Dear Mr Ntuli

Decision: Ethics Approval from 04/06/2020 to 31/05/2023

Researcher(s): Mr ME Ntuli
ernestmthandeni@gmail.com

Supervisor (s): Dr M Masekoameng
masekmr@unisa.ac.za; 011-471-3102

Dr TP Mbombo-Dweba
mbombtp@unisa.ac.za; 011-471-2264

Working title of research:

The contribution of food gardens to household food security in eThekwini municipality, KwaZulu Natal

Qualification: MSc Agrculture

Thank you for the application for research ethics clearance by the Unisa-CAES Health Research Ethics Committee for the above mentioned research. Ethics approval is granted for three years, **subject to submission of further clarification and yearly progress reports. Failure to submit the progress report will lead to withdrawal of the ethics clearance until the report has been submitted.**

The researcher is cautioned that fieldwork may not commence until such time as the COVID-19 lockdown has been lifted.

Due date for progress report: 31 May 2021

Please note the points below for further action:

University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392 UNISA 0003 South Africa
Telephone: +27 12 429 3111 Facsimile: +27 12 429 4150
www.unisa.ac.za

Appendix 8: Turnitin report

Digital Receipt

This receipt acknowledges that Turnitin received your paper. Below you will find the receipt information regarding your submission.

The first page of your submissions is displayed below.

Me Ntuli
AAH 2023
MSc Agriculture dissertation
Final_Thesis_ME_Ntuli_7.docx
2.79M
113
27,248
160,971
19-Jan-2023 07:42AM (UTC+0200)
1995225560

The contribution of food gardens to household food security in eThekwini municipality, KwaZulu Natal.

by

MTHANDENI ERNEST NTULI

STUDENT NO: 45546959

submitted in accordance with the requirements

for the degree of

MASTER OF SCIENCE

in the subject

AGRICULTURE

at the

UNIVERSITY OF SOUTH AFRICA

SUPERVISOR: DR M R MASEKOAMENG

SUPERVISOR: DR T P MBOMBO-DWEBA