

**THE IMPACT OF SMALL-SCALE FOOD GARDENS ON HOUSEHOLD
FOOD SECURITY IN PERI-URBAN AREAS OF RAY NKONYENI
MUNICIPALITY, KWAZULU-NATAL, SOUTH AFRICA.**

by

SIMISO LEMBETE

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SUPERVISOR: DR T.P MBOMBO-DWEBE

CO-SUPERVISOR: DR A.O AGYEPONG

January 2023

DEDICATION

This dissertation is dedicated to my beloved mother, Lindiwe Mazibuko for always supporting me and taking keen interest on my studies.

DECLARATION

I **Simiso Lembete** hereby declare that the dissertation, with the title: **The impact of small-scale food gardens in household food security of peri-urban areas of Ray Nkonyeni Municipality, KwaZulu-Natal, South Africa** which I hereby submit for the degree of **Master of Science in Agriculture** at the University of South Africa, is my own work and has not previously been submitted by me for a degree at this or any other institution.

I declare that the dissertation does not contain any written work presented by other persons whether written, pictures, graphs or data or any other information without acknowledging the source.

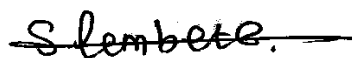
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A handwritten signature in black ink that reads "S. Lembete" with a horizontal line extending to the right.

Date: 20 January 2023

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Philippians 4: 13

“I can do everything through Christ, who gives me strength”.

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ABSTRACT

The impact of small-scale food gardens on household food security was investigated. A descriptive, quantitative research was followed. Systematic random sampling was adopted to select 360 participants. Data was collected using structured questionnaire and analysed descriptively and through binary logistic regression using SPSS version 27. Results showed that food gardening was prevalent in the area. Binary logistic regression revealed that marital status and education were marginally significant with gardening at $p < 0.10$. Household members, access to land and agricultural experience was highly significant at $p < 0.05$. HFIAS showed most households (40.3%) were moderately food insecure, however; food gardening participants were more food insecure (79.3%) than non-food gardeners (50.5%). HDDS results showed that majority of the participants had high dietary score (10.5). Therefore, this means that food gardening alone and without support is not enough to reduce food insecurity. Therefore, exploring other income generation activities and supporting of home gardeners is recommended.

ISIFINQO

Kwaphenywa ngomthelela wezingadi zokudla ezincane ekuvikelekeni kokudla emakhaya. Kwalandelwa ucwaningo oluchazayo, lobuningi, futhi ukusampula okungahleliwe nokuhlelekile kwamukelwa ukuze kukhethwe ababambiqhaza abangama-360. Idatha yaqoqwa kusetshenziswa uhlu lwemibuzo oluhlelekile futhi yahlaziywa ngendlela echazayo nangokuhlehliswa kwezinhlelo zemodeli yobudlelwano phakathi kwesethi yekuguququkayo okuzimele kanye nokuhluka okuncike kokuhamba ngabubili kusetshenziswa inguqulo ye-SPSS 27. Imiphumela yabonisa ukuthi izingadi zokudla zazidlangile endaweni ephenywayo. Imiphumela iveze ukuthi ukulinywa kwengadi yokudla bekudlangile endaweni esaphenywayo. Ukuhlela kokusebenza kanambambili kwembula ukuthi isimo somshado kanye nemfundo kwakubaluleke kancane ngokulima engadini ku- $p < 0.10$. Amalungu omndeni, ukufinyelela kumhlaba kanye nolwazi lwezolimo kwakubaluleke kakhulu ku- $p < 0.05$. I-HFIAS ikhombise ukuthi iningi lamakhaya (40.3%) belingenakho ukudla okusesilinganisweni; nokho, abahlanganyeli bezingadi zokudla bebengavikeleki kakhulu ngokudla (79.3%) kunabalimi abangalindi ukudla kwezingadi (50.5%). Imiphumela ye-HDDS ikhombise ukuthi iningi labahlanganyeli lalinamaphuzu aphezulu okudla (10.5). Ngakho-ke, lokhu kusho ukuthi ukulima ingadi yokudla kukodwa ngaphandle kokusekelwa akwanele ukunciphisa ukungavikeleki kokudla. Uma kubhekwa imiphumela, kunconywa ukuhlola ezinye izinto zokungenisa imali kanye nokweseka abalimi basemakhaya.

NKOMISO

Mbuyelo wa swirhapa leswitsongo swa swakudya eka mfikelelo wa swakudya swa le makaya wu lavisisiwile. Ndzavisiso wa nhlayo lowu hlamuselaka wu landzeleriwile, naswona endlelo ra sampulu yo tlovatlova ri tirhisiwile ku hlawula vatekaxiave vo ringana 360. Datara yi hlengeletiwile hi ku tirhisa swivutiso leswi lulamisiweke hi nkarhi na ku xopaxopiwa hi ndlela yo hlamusela na hi endlelo ra swiyenge swimbirhi ntsena hi ku tirhisa vhexini ya SPSS 27. Mbuyelo wu kombisile leswaku ku rima swakudya a swi tele ngopfu eka ndhawu leyi a yi lavisisiwa. Endlelo ra swiyenge swimbirhi ntsena ri humeserile erivaleni leswaku ku tekiwa na dyondzo na ku rima swirhapa a swi ri na nkoka. hi $p < 0.10$. Swirho swa ndyangu, mfikelelo eka misava na ntokoto wa swa vurimi a swi ri na nkoka wa le henhla hi $p < 0.05$. HFIAS yi kombisile leswaku mindyangu yotala (40.3%) a yi kayivela swakudya; hambiswiritano; vatekaxiave vo rima swirhapa hi vona a va ri na nkayivelo wa swakudya hi vuningi (79.3%) ku tlula lava nga rimeku swirhapa. (50.5%). Mbuyelo wa HDDS wu kombisile leswaku vatekaxiave vanyingi a va ri na mikutlunya ya le hehla ya swakudya (10.5). Hikwalaho, leswi swi vula leswaku ku rima swirhapa swi ri swoxe ku ri hava nseketelo a swi ringanelanga ku hunguta nkayivelo wa swakudya. Hi ku tekela enhlokweni mbuyelo, ku valanga migingiriko yin'wana yo endla mali na ku nyika nseketelo eka varimi va le kaya va swirhapa swa bumabumeriwa.

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF THE STUDY

Food and nutrition insecurity as defined by Govender et al., (2017), is the inability to access sufficient amounts of nutritious foods required for optimal growth and development. At household level, Oguttu et al., (2021), describes food insecurity as inability of families to acquire and afford nutritious foods for an active and healthy life. The global report on food crisis (GRFC, 2020) suggests that for people to be food secure, food must be consistently available and accessible in sufficient quantities. Moreover, available food must be diverse in order for households to utilize it optimally by means of cooking, storing, sharing and preparing the food in a way that has positive nutritional impact (GRFC, 2020). The primary goal of food security for individuals is to ensure that sufficient food is obtained in adequacy in order to meet the body's dietary needs (Yusuf, et al., 2015).

Globally, the burden of malnutrition and food insecurity remains a challenge. The global current estimations are that nearly 690 million people are hungry, which constitute 8.9 percent of the world population (FAO, IFAD UNICEF, WFP AND WHO, 2020). In 2019, close to 750 million people were exposed to severe levels of food security and an estimated number of 2 billion people in the world did not have regular access to safe, nutritious and sufficient food (Ibid).

In Africa, food insecurity has always been a significant concern particularly in the Eastern region of the continent. East African countries consisting of Ethiopia, Burundi, Kenya, Djibouti, Rwanda, Eritrea, Sudan, Somalia, Tanzania, South Sudan and Uganda are classified as home to some of the most food insecure people in the world (Sleet, 2020). This is mainly due to ongoing conflicts, economic instability, high levels of poverty and its vulnerability to climate shocks (Ibid). High level of poverty remains a major determinant for poor nutritional status as it limits access to nutrient dense and diverse foods (Govender et al., 2017). Additionally, the outbreak of COVID-19 pandemic in the region affected production since the first case was detected in Ethiopia and Kenya mid-March 2020. The restrictions in movement imposed by governments had implications on input supply chains, acquisition by farmers and labor availability which largely affected normal agricultural activities (World Food Programme, 2020).

South Africa is not immune to food insecurity crisis. According to reports, South Africa continues to experience food insecurity at household level despite the country being food secure at the national level (StatsSA, 2019). The latest report by Statistics South Africa (2019), in which hunger and food adequacy were examined, revealed that approximately 1.7 million households experienced hunger while over 13 million households had inadequate access to food. Furthermore, literature indicates that due to the recent outbreak of the COVID-19 pandemic globally and in South Africa these numbers has risen significantly with an estimated 9.3 million people already facing high levels of acute food insecurity (IPC, 2021). The introduction of the lockdown restrictions globally restricted movement of people which led in mass job losses due to people being unable to go to work and thus negatively affecting the purchasing power of households. Slowdown in the national economy with no employment and reduced income and a significant increase in food prices translated to millions of people not being able to afford enough food to eat (Ibid).

Adopting agriculture as a vehicle for addressing food and nutrition security remains the most viable option (Govender et al., 2017). As a result, food gardening has been identified as one of the sustainable and affordable strategies to fight against food insecurity and consequently malnutrition (Modibedi, 2021). Previous studies also suggest that gardening has a potential to combat malnutrition by improving dietary diversity through increasing access to fruits and vegetables (Audate et al., 2019). According to Modibedi (2021) cultivation of various vegetable types ensures diversity and availability of vegetables throughout the year. In addition to this, Bahta et al., (2018) also state that in terms of household food security, household food gardening provides direct access to food that can be harvested, prepared and fed to family members, often on a daily basis. This was further confirmed by Modibedi (2021), in a study that was conducted in Emfuleni Local Municipality, that households which participated in food gardens did not rely on markets and community spaza shops for vegetable supplies since the produce were freely available from their gardens, thus saving them money.

However, level of participation in household agricultural production in South Africa is generally low. According to Statistics South Africa, only 15,6 % of the households were involved in agricultural activities in a study that was conducted in 2019 (StatsSA, 2019). Furthermore, food gardening is known as a practice that is most prevalent in the rural areas than in urban areas (Zitho, 2017). Low levels of participation in urban and peri-urban areas has been attributed to neglect by policy makers, lack of time and lack of resources such as land and water and this is despite the fact that food insecurity is higher in urban areas. This is despite the fact that reports indicate that more than 60 percent of households that are food insecure are found in urban areas (StatsSA, 2019). This is also reflected on child hunger, where more than half a million households with children aged 5 years and younger were food insecure and

KwaZulu-Natal accounted as one of the provinces with the highest proportion and more prevalence in urban areas (Ibid).

1.2 PROBLEM STATEMENT

High levels of food insecurity, poverty and unemployment have prompted many people in urban and peri-urban areas to engage in food gardening. This has also resulted in a number of researchers globally and locally to advocate for food gardens as one of food insecurity mitigating strategies in urban areas (Oguttu et al., 2021; Modibedi et al., 2021; Audate et al., 2019). It is for this reason that municipalities have also launched programmes such as Poverty Alleviation and Reduction Programme (PARP) and Urban Gardens in support of food gardens in Cape Town (City of Cape Town, 2016). Similar programs such as Siyazondla homestead gardens, Siyakhula and Massive Food Production Program have also been implemented in the Eastern Cape by provincial government with the aim of improving household food production, nutrition and food security (Mcata, 2019).

As much as Ray Nkonyeni Local Municipality (RNLM) which is in the KwaZulu-Natal Province is ranked number one economically amongst the other municipalities in the district, poverty rates are still high in this municipality (RNLM, 2017). Continuing high unemployment levels remain a strong challenge in the country and could be worse at Ray Nkonyeni due to being the newly established municipality with limited resources.

Furthermore, data on the contribution of food gardens to food security in urban areas is limited and contradicting (Modibedi et al., 2021; Khumalo & Sibanda, 2019; Philander & Karriem, 2016). A study that was conducted by Modibedi et al., (2021) in Emfuleni Local Municipality in Gauteng, revealed that food gardens contributed significantly in food availability especially vegetables throughout the year. Similarly, in a study that was conducted in 2016 in Tongaat in KwaZulu-Natal, participation in urban agriculture did increase food access amongst participants when compared to non-participants (Khumalo & Sibanda, 2019). However, Philander & Karriem (2016) found no relationship between urban agriculture and food security in the study that was conducted in Langa Township, Cape Town.

Therefore, this suggests that results of these studies cannot be generalized, instead area specific studies are required to establish if food gardens are making contribution to food security. Secondly, there is no evidence based studies conducted in the contribution of small-scale food gardens to food security in Ray Nkonyeni Local Municipality. Therefore, contribution of small-scale food gardens to food security at Ray Nkonyeni Local Municipality is not understood.

1.3 AIM AND OBJECTIVES OF THE STUDY

1.3.1 Aim

The aim of this study was to assess the impact of small-scale food gardens on household food security in peri-urban areas of Ray Nkonyeni Local Municipality, KwaZulu-Natal.

1.3.2 Objectives

The objectives of the study were as follows:

- i. To determine the extent of small-scale food gardening at Ray Nkonyeni Local Municipality.
- ii. To investigate the reasons why some households, cultivate food gardens and others do not in order to determine the perceived barriers to cultivating food gardens in Ray Nkonyeni Local Municipality.
- iii. To investigate factors associated with participation in food gardens in peri-urban areas of Ray Nkonyeni Local Municipality.
- iv. To determine the contribution of small-scale food gardens to household food security at Ray Nkonyeni Local Municipality

1.4 RESEARCH QUESTIONS

From the above objectives of the study, the following research questions were formulated:

- i. What is an extent of small-scale food gardening at Ray Nkonyeni Municipality area?
- ii. What are the reasons some households cultivate food gardens and others do not and the perceived barriers to cultivating food gardens in Ray Nkonyeni Local Municipality?
- iii. What are the factors associated with participation in food gardens in peri-urban areas of Ray Nkonyeni Local Municipality?

- iv. What is the contribution of small-scale food gardens to household food security in Ray Nkonyeni Local Municipality?

1.5 HYPOTHESIS

Hypothesis was stated as follows:

H_0 = There are no factors that are significantly associated with participation in food gardens in peri-urban areas.

H_1 = There are factors that are significantly associated with participation in food gardens in peri-urban areas.

1.6 SIGNIFICANCE OF THE STUDY

The anticipated benefits of the study were:

- i. The present study will contribute towards the body of knowledge on the contribution of food gardens to food accessibility and utilisation at Ray Nkonyeni Local Municipality.
- ii. The actual food security status amongst participants and non-participants of food gardens is described for the first time at Ray Nkonyeni Local Municipality.
- iii. Factors associated with participation in food gardens will be described for the first time in this area.
- iv. The information gathered from this study could be used to inform policies and programmes focusing on development of small-scale food gardens therefore improving livelihood both locally and internationally.

1.7 DEFINITION OF KEY TERMS:

1.7.1 Small scale food gardens:

In literature, different researchers have used different names that define food gardening based on researcher's study preference. These names include homestead food gardens, household

food garden, small-scale food production gardens, backyard gardens and kitchen gardens. However, in this study small scale food gardens follows an old definition by Niñez (1984) where he perceived food gardens as a food procurement system located in the yard or close to permanent dwelling aimed at production of household consumption items that are not obtainable, readily available or affordable through wages.

1.7.2 Household Food Security:

According to FAO (2006 :1) “*Food security exists when all people at all times have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life*”. Four pillars are identified and regarded as core of food security. 1) Food availability which entails physical presence of enough food, 2) Accessibility by individuals to adequate resources in order to absorb food of nutritional diet, 3) Utilization of food for nutrient intake by an active, healthy individuals and 4) Stability by means of being food secure through availability and access of food at all times without risks (FAO, 2006; Mutea et al., 2019). Household food security is an implication of food security only at the household level.

1.7.3 Peri - Urban area:

These type of settings are regarded as areas that are located on the outskirts of cities or large urban areas, however these areas still retain rural in characteristics such as substantial reliance on agricultural production and other notable rural activities and thus characterized by a mix of rural and urban features (World Vision, 2016).

1.8 STUDY LIMITATIONS

Limitations of the study were:

- i. The study was limited to Ray-Nkonyeni local municipality, thus making the findings and recommendations more specific to the selected area. Therefore, the results cannot be generalized to other areas outside of Ray Nkonyeni municipality.
- ii. In the literature, food security consists of four pillars namely: food availability, food access, food utilization and food stability. However, the study only focused on

measuring one pillar: food access. Food availability was observed from the perspective of cultivation and production of food gardens.

- iii. The study was cross-sectional in nature, therefore it was not possible to assess food security status over different seasons of the year.

1.9 THE OUTLINE OF THE DISSERTATION

The chapter outline is as follows and the dissertation consists of five chapters:

Chapter 1: Provides the introduction and background of the study, including the problem statement, research questions and objectives as well as definition of key terms used in the study.

Chapter 2: Provides literature that was reviewed from previous studies in relation to the current study.

Chapter 3: Outlines a detailed explanation of the study area, the methodology that was applied and ethical issues that were considered in this study.

Chapter 4: Presents the results of the study.

Chapter 5: Presents the discussion of findings.

Chapter 6: Draws conclusion of the study by describing major findings and provides recommendations.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

In this chapter, literature review related to the study is presented to serve as background information with reference to the study objectives and research problem. This starts by defining food security concept, food security trends in South Africa, regionally and globally. Factors associated with food insecurity are also explained. The chapter further gives an overview and description of small-scale gardens in relation to peri-urban settings and its significance to household food security. The chapter concluded by highlighting challenges in food gardening.

2.2 FOOD SECURITY DEFINITION AND ITS DIMENSIONS

The concept of food security first appeared at the World Food Security Conference (WFSC) on global food crisis discussion in 1974, after which the term was first defined in relation to food supply (Ahmed, 2019). This international discussion was held in response to the food crises that was exacerbating global food shortages and causing political instability (Ayinde et al., 2020; Ahmed, 2019). Over the years, however, the term has evolved into a standard definition adopted at the 1996 World Food Summit (WFS) (Matemilola & Alegbede, 2017). Therefore, FAO (2010; p8) and Wodajo et al., (2020; p2) defined food security according to WFS as the situation that *“exists when all people, at a time, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life. Whereas, household food security is the application of this concept to the family level, with individuals within households as the focus of concern”*. Masara (2019) views this definition and articulate that; one measure of any country's development is its ability to feed its citizenry and have sound and proper food and nutrition system that is available to all people. Further to this definition, Sekhampu (2017) defined food security as the ability of households to have physical and economic access to sufficient food in quantity and quality in order to lead healthy lives. Gunawardhana & Ginigaddara (2021) goes on to emphasize the significance of household food security since its serves as the basic economic unit in determining the extent of individuals' food consumption. Moreover, household food security measures the impacts of various projects and programs implemented for helping vulnerable populations and evaluation of food security policies and thus monitoring

future progress. Gunawardhana & Ginigaddara (2021) further pointed out that it is critical to measure household food security more frequent because the challenges caused by food insecurity at the national level are usually first initiated by recognizing the impact at the household level. Abdullah et al., (2019) and Sekhampu (2017), continue highlighting that for the household to be food secured they must be able to attain sufficient food that is culturally accepted for healthy life through production or purchasing and that the provision and access to nutritious food must be attained through socially accepted way.

In contrast, food insecurity within the households is defined by Oguttu et al., (2021), as the inability of the household to acquire nutritious food that meet their dietary needs for an active and healthy life. Although insufficient food supply is one cause of food insecurity, however there is a great extent that lack of purchasing power and access both at national and household level are still the major factors contributing to food insecurity (Ibid). In addition, Zani et al., (2019) regard poverty and income inequalities as the highly predictive factors that contribute to the occurrence of food insecurity among other factors.

At national level, food security is the situation that focuses on the nations' ability to produce, import and retain food that is required to support its populace with a minimum per capita nutritional standard, and considering that there is enough production of food available to meet all the food demands of the whole nation (Oluwatayo, 2019). Although the hierarchy of food security dimensions range from global, to regional, to national, to local and household to individual level, however this study focus on household level of food security as a research of concern. Dunga (2020), reported that food security at household level tend to be more crucial than food security at the national level. According to the author, at national level food security concentrate only on food availability, and this does not assure food security at household level. This is because access and affordability besides availability need to be taken into account for household food security to be achieved (Dunga, 2020).

From the above-mentioned definition and extent of food security, Summerton (2020) and Matemilola & Elegbede (2017), provides four distinctive dimensions (Physical food availability, economic and physical food access, food utilization and food stability) that must be attained, maintained and satisfied concurrently over a period of time to realize the objectives of food security. These four keys will further be deliberated on.

2.2.1 Food Availability

This is the most critical aspect of food security since it concentrates on food quantity and quality as a vital measure for the nation's growth (Tantu et al., 2017). Pangaribowo et al., (2013), defined food availability as the amount of food that is physically available to the population over a period of time through production and market purchases. According to Matebeni (2018), food supply is considered as a vital factor of food availability, therefore national food supply and the ability to finance food distributions from domestic production, food imports and food that is received through food aid from foreign countries and donor partners are all critical aspects of food availability. Nonetheless, Min & Qinghua (2018) founded that although food imports are the important source of food availability, however, it is equally important to promote a nations' self-sufficiency. Conflict of interest and incompatibility of trading policies between countries may have adverse impact on food trade, thus affecting food security (Ibid). According to Min & Qinghua (2018), a country that is associated with high level of food security is usually a country that is associated with high rate of self-sufficiency and low dependence on food trade. It is equally important to note that food availability does not exclude the quality of food acquired from local, regional and international sources (Elbushra & Ahmed, 2020; Matebeni, 2018). Therefore, the agricultural sector must be effective and efficient enough in meeting the demand for food and productive enough to feed the whole nation (Oluwatayo, 2019). This is observed in the United State of America (USA), specifically in the New Hampshire State where the lowest food security rate is observed, by building of new retailers in under resourced communities and subsidizing purchases in effort to combat food insecurity among the low-income communities (Carson & Boege, 2020).

2.2.2 Food Access

Prosekov & Ivanova (2018) noted that in most developing countries, shortage of grain stocks and production incapability are not the main factors driving hunger and malnutrition but rather the income disparities among low-income earners making food products more inaccessible for a large number of people. In support of this, Min & Qinghua (2018) indicated that although enough food might be available in an area, however access to that food is solely independent to food availability. Lisanty et al., (2021) and Samim & Zhiquan (2020) provide three reasons for what was indicated by Min & Qinghua (2018). Firstly, this may be due to limited physical access where poor transportation system of goods and products is malfunctioning and

markets instability; economic access by means of financial incapability's to obtain nutritious food from market outlets and inadequate economic resources; and lastly social access by means of absence of social support including being excluded from being a member of a particular social group and gender social conflict (Ibid).

2.2.3 Food Utilization

Adequate food availability and food accessibility cannot be translated into successful food utilization (Min & Qinghua, 2018). Until available food that was accessed by individuals through production or purchases is fully utilized through consumption, resulting in positive nutritional impact on people then food security is realized (Ibid). Barrett (2010) defines this process as making good use of accessed food. Furthermore, this aspect takes into account the dietary quality of food that is available to people and its nutritional value (essential vitamins and minerals) (Ibid). Marina & Manap (2020) and Hwalla et al., (2016) noted that food utilization is also determined by a number of factors, including employment of proper food processing and correct storage techniques, as well as preparing food in a proper way taking into account hygiene practises and sound eating habits. Barrett (2010) stresses the consumption of safe and suitable foods that are properly prepared under sanitary conditions, absorption and metabolism of essential nutrients that are needed for individuals' health. In addition, Marina & Manap (2020) raises an issue of safe and readily available water and public health as one of the important factors to consider in proper food utilization. It is therefore equally important to make good use of clean water and improved water supply for improved food security (Ibid).

2.2.4 Food Stability

Leroy et al., (2015) define food stability dimension as the cross-sectional dimension that indicates the stability of the three mentioned dimensions at all times. In their argument, stability means that people at any time do not have to worry about risk and uncertainty of become food insecure during certain seasons and times of the year. Therefore, to achieve food stability, the national food supply must keep pace with the food consumption and remain constant throughout the year and in long term (StatsSA, 2019). Pangaribowo et al., (2013) points out the primary risks that might have adverse effect on food stability. These include the extreme weather events including floods and droughts, energy scarcity resulting in disturbance of food supply, economic and social disruption and malfunction of global food market are all regarded as main risks to food stability. This is the reason all four dimension (food availability, food

access, food utilization and food stability) must always be stable without risks to realize the food outcome of food security (Pangaribowo et al., 2013).

2.3 FOOD SECURITY AS A DEVELOPMENT ISSUE

A conspicuous deterioration in food security in numerous countries as well as malnourishment and hunger has increased drastically despite all the joint efforts to improve global food security (Prosekov & Ivanova, 2018). Therefore, the issue of food insecurity has become an issue of global concern and is recognized as a significant and topical research topic since malnutrition and hunger limit the economic and social growth of the country (Forero-Cantor, et al., 2020; Prosekov & Ivanova, 2018). McCarthy et al., (2018) suggests that for food security to be achieved it must keep in pace with the ever-increasing global population which conversely increase food shortages and reduce crop productivity. Food demand resulting therefore from food shortages and increased population brings about instability in food prices which are already affected by income inequalities and in turn affects food access and availability to poor households (Pawlak & Kolodziejczak, 2020). McCarthy et al., (2018) further revealed that, a predicted increase of 1.7 billion in world population is expected by the year 2050, which will put more pressure on already limited natural resources used for food production.

In addition to food shortages and limited resources, FAO (2021) raises a concern of affordability resulting in purchasing of cheaper food items that are of poor nutritional quality due to economic stress. This is more worrisome in underdeveloped countries compared to developing and developed countries (Gwada et al., 2020). According to Masara (2019), countries level of development differs according to their level of food security. It is then noted that in developing countries, the amount of undernourished people can reach up to 13% of the population compared to less than 5% in developed countries (Prosekov & Ivanova, 2018). The reason for this is reported by Ahmed et al., (2017), stating that in most developing countries the issue of limited resources and access to market are still prevailing and leading factors of undernourishment and hinders the efforts to achieve food security. In addition, it becomes even worse to those developing and underdeveloped countries with low per capita Gross Domestic Products (GDP) to maintain food security because of unfavourable agricultural conditions and lack of infrastructure (Pawlak & Kolodziejczak, 2020). These authors further identified physical and economic unavailability of food and social inequalities in nutrition observed in Sub-Saharan Africa and Asia as the two main reasons for food insecurity in developing and underdeveloped countries. FAO, IFAD, UNICEF, WFP, WHO (2019) provided statistics focusing on developing countries of Asia and Africa where approximately 770 million undernourished people reside. Adding to that, recent statistics revealed that between 720 and

811 million people globally experienced hunger in year 2020 and close to 690 million in 2019 which translate to 8.9% of the world population (FAO, 2021; Ayinde et al., 2020). That being noted, FAO, IFAD, UNICEF, WFP, WHO (2019) argued that although levels of food insecurity are more prevalent in underdeveloped and developing countries, food insecurity is still prevalent in Europe and Northern America with approximately 8% of their population experiencing severe to moderate food insecurity.

2.4 FOOD SECURITY TRENDS IN SOUTH AFRICA

A country is considered food secure according to its ability to produce and distribute food to its citizens (Sekhampu, 2017). According to Mbhatsani et al., (2021) South Africa is still a developing country with a diverse socio-economic and cultural diversity. Statistics South Africa (2019) further goes on categorizing South Africa as the middle-income country and food secure nationally. However, about 20% of the population is still unable to acquire adequate food to meet their dietary needs (Ibid). Oluwatayo (2019) confirms this and further goes on by saying that although at the national level South Africa is food secure that cannot be said in household and individual level. This is attributed to poverty and high rate of unemployment (Ndlovu & Masuku, 2021). On the other hand, Sekhampu (2017) argues that this may be due to food distribution or access favouring those with resources which varies by province, population group and household size.

A study conducted in Limpopo province by Mbhatsani (2021) revealed that the prevalence of food insecurity was higher in the province than that of the national level. The findings further revealed that 32.5% of the households surveyed were food secure, whereas 36.3% and 31.3% were at risk of hunger and experienced hunger respectively. To compare these findings, Mojela et al., (2018) conducted a study in Gauteng province and found that only 38% of the survey population were food secure, translating to over 60% of households that were food insecure.

South Africa became a democratic country in 1994, where food security was first identified as a focus of concern (du Toit, 2011). According to du Toit (2011; p1), embedded in the constitutional law of 1996 section 26 and 27, "*every South African citizen has a right to sufficient food and water as well as social security*". Furthermore, food needs to be acquired and accessed by everyone without any form of discrimination (David & Grobler, 2020). The South African agricultural sector and the Department of Agriculture, Forestry and Fisheries (DAFF) are the biggest drivers in ensuring deliverance of this act and development of programs and policies that ensures adequate food production and food availability to meet

basic food needs (Ndlovu & Masuku, 2021; Oluwatayo, 2021). To ensure that, the DAFF has formulated many agricultural cooperatives in response to poverty and increasing food insecurity specifically in the household level (Ndlovu & Masuku, 2021).

In support of that, in 1994, the South African government framework for action identified food security as a core priority for sustainable growth and development and launched the Reconstruction and Development Program (RDP) (Cheteni et al., 2020). According to ANC (1994), this program was formulated as the post-apartheid strategy to eradicate poverty and building of the democratic, non-racial, and non-sexist future. Its mandate was to address the issues that were largely impacting on the country's economic development, inequality and soaring poverty (Cheteni et al., 2020). The main priority of this program as stipulated by the ANC (1994), was to provide the basic needs of people such as providing proper houses for everyone, clean and safe water, providing land to previously disadvantaged communities, increase employment opportunities, reconstruction of proper transportation systems, providing electricity and improving the health care and social welfare system. However, evidence shows that the main goals of this program in terms of meeting the basic needs of people and poverty eradication is yet not clear (Cheteni, et al., 2020).

Subsequently to this, in 2002, the Department of Agriculture formulated the Integrated Food Security Strategy (IFSS) as the national food security strategy that would link up all the food provision programmes into the integrated system towards meeting people food needs (IFSS, 2002). According to the Department of Agriculture (2002), the objectives of this initiative was to ensure that the food security as defined by FAO (2010) is achieved by making food available to all the citizens, allowing income to keep pace with food prices which would ultimately make food accessible to all and empower people to make absolute choices on nutritious and safe food. Furthermore, IFSS was aimed at ensuring that there are proper safety nets and emergency management systems to provide food to vulnerable people that are unable to meet their food needs from their efforts, and to alleviate utmost natural disasters on people (Ibid). According to De Cock., et al (2013), the vision of the IFSS was complementary to the definition of food security of the FAO. Moreover, the goals of the IFSS were in line with the Millennium Development Goal (MDGs), particularly the MDG1 which were aimed at reducing hunger, malnutrition, and food security by 2015. MDGs were ultimately replaced by Sustainable Development Goals (SDGs) when it ended in 2015.

2.5 FOOD SECURITY TRENDS IN AFRICA

Despite many efforts and accomplishment to address the issue of poverty and malnutrition over the years, many African countries are still suffering from economic recession, where livelihoods and income is still deteriorating and extremely affecting many people living in Africa (Mohamed et al., 2021). Concerning food security, evidence shows that in most developing African countries, food security has not been achieved despite evident progress in economic growth and welfare improvement (Mota et al., 2019). These authors further state that, food security continues to be a profound issue more especially in Sub-Saharan countries. According to Robert et al., (2019), there are number of reasons resulting in this widespread chronic food insecurity. They further indicate that Sub-Saharan Africa is dealing with a lot of inadequate power supply which is observed in numerous countries resulting in continuing poverty and lack of hygienic water. They conclude by identifying what is called transitory emergency related food insecurity, which is prolonged famine that exists in time of extreme pressure caused by natural disasters and economic collapse and conflict occurring in Africa.

According to the United Nations in Ayanlade & Radeny (2020), Sub-Saharan Africa still accounts for the highest number of people living in poverty and undernourished communities. The authors reported that 13% of the world's impoverished and undernourished people are found in Sub-Saharan region (Ibid). Population growth is one of the contributing factors to food insecurity and the African continent has been experiencing fast growth in population which does not match per capita food production (Ndhleve et al., 2021). Even if the fertility rates were to decline from their current level, Owoo (2021) projected the population to even increase in the region putting more pressure on food availability.

Ethiopia in East Africa and the horn of Africa is one of the 46 Sub-Saharan African countries (Ahmed, 2019). The projected population growth of Ethiopia is expected to be over 100 million and being placed as the second largest populous country in Africa after Nigeria (Ibid). Ahmed (2019) added that Ethiopians are largely exposed to chronic and transitory food insecurity which keeps on getting more and more severe. This is due to severe recurring food shortages and famine in the country that is correlated with recurrent drought and consecutive poor rainy seasons. This prolonged drought has led to total number of 13 million people impacted and 7.2 million people requiring food assistance (WFP, 2022). Mota et al., (2019), concluded by linking up poverty and food security in Ethiopia as closely related issues that hinders development of the country.

Nigeria in West Africa is one of the countries in Africa with the recorded alarming rate of food insecurity requiring immediate and serious interventions (Abu & Soom, 2016). According to the

authors this is due to food demands generally growing faster than total supply. Ayinde et al., (2020) and Owoo (2021) goes on to mention that about half of the Nigerian total population live in utmost poverty. The country continues to be associated with fast growing population that is expected to double over the years as it currently ranked the most populous country in Africa with approximately 198 million people living in Nigeria as of 2020 (Ibid). Ayinde et al., (2020) reported that Nigeria sitting at 2.4% growth rate per annum has since overtaken India as a country accounting to the largest population living in extreme poverty.

In Southern Africa, it is Mozambique which is also reported to be food insecure (FAO, 2022). According to the report nearly 1.9 million people are experiencing high levels of acute food insecurity with 71% concentrated in Cabo Delgado, Niassa, Nampula and Zambézia (FAO, 2022). Mozambique gained its independence from Portugal over 40 years ago; however, evidence shows that the country has remained poor despite its rich deposits of mineral resources (Macassa et al., 2018; Ferrao et al., 2018). According to Pitoro & Chagomoka (2017), this is quite surprising, because it contradicts with the economic growth that is being observed as a result of government's attempt to implement numerous programs and policies including the National Action Plan for the Reduction of Absolute Poverty (NAPRAP). Some interventions that have been implemented by the Mozambican government to combat food insecurity include the construction of silos for grain storage in Tete Province and improvement of infrastructure (Pitoro & Chagomoka, 2017). However, it is unclear whether Mozambique will be able to fully achieve the second Sustainable Development Goal (SDG2) of the 2030 Sustainable Development Agenda, which aims to "*end hunger, achieve food security and improved nutrition, and promote sustainable agriculture*" (Macassa et al., 2018).

2.5 GLOBAL TRENDS ON FOOD SECURITY

Food insecurity is associated with massive disruption in global public health, claiming over 30 0000 deaths each year (Drammeh et al., 2019). This is expected to worsen as the projected hike in global pollution growth is estimated at 9.8 billion people by 2050 (Oluwatayo, 2019). This increase will see the highest proportion coming from the developing countries particularly Sub-Saharan Africa and Asia (Ibid). Already 795 million people in the world were undernourished in the period of 2014 to 2016 and a large number of people still lacked the food they need for an active and healthy life FAO (2017). These numbers have been growing yearly reaching over 820 million people in 2018 which is approximately 12% of the total world's population (Abdullah et al., 2019). In 2020 alone FAO, IFAD, UNICEF, WFP, WHO (2021) cited that one in three people in the world were unable to access adequate food.

Globally, South Asia is one region which has been reported to have a slow progress in reducing hunger and improving food security (George & McKay, 2019). While the global food insecurity in some parts of the regions has slowed down, there is still a large population of people experiencing food insecurity living in Asia (Ibid). The FAO, IFAD, UNICEF, WFP, WHO (2020), reported that more than 50% of the world's undernourished people are found in Asia accounting to 418 million people. Kelegama & Hirimuthugodage (2019) on food security framework in Sri Lanka state that food security indicators for Sri Lanka show a comparatively better position among other South Asian countries. Even so, Gunawardhana & Ginigaddara (2021) indicate that there are a great number of people who still live in slums with poor conditions and minimum facilities in Sri Lanka. Therefore, due to observed destitution, many underprivileged households in these slums are struggling to meet their daily dietary needs (Ibid). This inaccessibility to sufficient nutritional food makes it even more impossible to take advantage of educational and job opportunities (Gunawardhana & Ginigaddara, 2021). Moreover, there Sri Lankan economy is largely depending on agriculture and therefore there are a large concentrate of people (more than 70%) living in countryside and rural areas of the country relying on farming as a source of livelihood (Rajapaksha et al., 2021).

Another South Asian country which has the largest concentration of impoverished people in the world and hub of food insecure population is India (Joshi, 2016). The pressure resulted from food shortages have been felt more significantly over the recent years due to the extensive expansion of population in the country (Jaswal, 2014). It is estimated that about 29% of the estimated 1.27 billion populations are malnourished and 77% of that population is considered poor and vulnerable while tons of people fail to get square meal per day (UKEssays, 2018; Jaswal, 2014). It is reported that despite the governments' constant effort to maintain food security, India has been subject to the irregularities of agricultural production (Ibid). This is associated with the climate variation that is happening throughout the world, vagaries of monsoon and constantly irregular rainfall (UKEssays, 2018). India is part of the five major emerging economies with Brazil, Russia, China and South Africa. It is believed that in terms of economic development India has successfully surpassed China, Brazil and South Africa (Joshi, 2016). It is noted that the economy of India is growing spontaneously on an average of 7% annual economic growth rate (Ibid). Although poverty and food insecurity are still impacting on India, but these issues remain high on policy agenda of the country (Joshi, 2016). In attempt to strengthen food security in India, the cabinet and government have adopted and formulated a range of strategies and policies over the last half century (George & McKay, 2019). Public Distribution System (PDS) is the government food and nutrition policy aimed at targeting food insecurity, poverty and hunger in India by acting as a safety net in

providing essentials like wheat, sugar, rice and kerosene to people at the subsidized rate (Ibid).

Australia in the Southern Hemisphere is regarded as developed and a wealthy country, however there is evidence that there is a quite high percentage of Aboriginal and Torres Strait Islander (ATSI) people that are vulnerable to food insecurity (Bowden, 2020). According to Davy (2016), this may be associated with the low-income variation and lack of access to adequate, affordable and healthy food within these communities. In addition, Sherriff et al., (2022), identified gaps in the local food system, on-going impacts of colonization, as well as community commitments and responsibilities as primary reasons for prevalence of food insecurity among Aboriginal community. Despite interventions by the Australian government to enhance food access, availability and nutrition status by implementing range of policies, food insecurity remains persisting for many ATSI people especially those living in remote parts of the country (Davy, 2016).

2.6 FACTORS ASSOCIATED WITH FOOD INSECURITY

In literature food insecurity at the household level is associated with several factors, including employment status, household head gender, household size, level of education and food prices. Below is description of these factors in brief.

2.6.1 Unemployment

Unemployment and inflation are continuing to have a negative impact on the South African economy and therefore making employment opportunities very scarce and minimal particular to people living in rural areas (Dodd & Nyabvudzi, 2014). This predisposes people who are already vulnerable to starvation and food insecurity (Ibid). A study conducted by Etana & Tolossa (2017) on employment and food security showed that the prevalence of food insecurity is lower among households headed by employed persons. On their study they further identified lack of education together with the economic factors as two drivers through which unemployment leads to food insecurity. They further elaborate that without formal education chances of employment are greatly reduced, with the economic factors taking into account the coping strategies possessed by households towards the soaring food prices and seasonal unemployment. Similarly, Dodd & Nyabvudzi (2017) on the study conducted in the Eastern Cape on the relationship between unemployment, living wages and food security

found that the unemployment is directly proportional to lower living wages and household food insecurity.

2.6.2 Household head gender

The household head gender is one of the important aspects that determine the level of food security in the households (Tibesigwa & Visser, 2016). While the women are generally regarded as the primary caregivers in most households and responsible for food acquiring and preparation of food, literature shows that female headed households are still vulnerable and largely associated with food insecurity (Zakari et al., 2014). This assertion was further confirmed in a study conducted by Tibesigwa & Visser (2016), examining the role of household gender in the outcome of food security level. The Authors came into the conclusion that this is due to differences of male headed and female headed households in off-farm labour participation (Ibid). Literature further indicate that female headed households tend to be more prone to food price increase as they spend their income more on food purchases compared to male headed households (Gustafson, 2013). Moreover, Ibnouf (2011) argues that women contribute significantly to household food security through food preparation, processing and food preservation. The report also revealed that the major problems women face as food producers are lack of access to improved production methods such as high-quality seeds, fertilizers, pesticides, credit and market access due to gender biased traditions (Ibid).

2.6.3 Household size

Drammeh et al., (2019), identified sharing of limited foods among family members as one of the challenges in food insecure households. Olayemi (2012); Drammeh et al., (2019), stresses that households with more family members tend to compete for limited resources and ultimately affect the nutritional status of the household. Owoo (2020) found a consistent relationship between household size and food security in Nigeria. The author found that the larger the household size the more likely being reported food insecure. According to Owoo (2020), larger households are sometimes forced to adopt coping strategies such as skipping a meal, eating smaller meals and eating cheap meals of a low nutritional value.

2.6.4 Level of education

Level of education greatly influences the food security status of the household. To prove this, Halam et al., (2017) conducted a study in the Eastern Cape on the influence of educational level on household food security. The study revealed that the level of education plays a crucial role in enhancing household income and thus improving household food security. Agidew & Singh (2018) linked up level of education to household size and food availability. On the study they revealed that educated household heads tend to practice family planning more thereby limiting their family size and in turn this enables them to manage resources including food demands in the households better. Education also gives them knowledge and awareness of food processing methods and also provides enhanced employment opportunities (Drammer et al., 2019). Moreover, educated household heads are more likely to engage themselves and their family members in various income generating activities thereby enhancing food security of the household (Agidew & Singh, 2018). The findings of Nkomoki et al., (2019) on the study in Zambia indicated that, the increase in education level of the household head, gives a lower probability of households being in the severe hunger and moderate hunger categories of household hunger scale. Furthermore, according to Mutisya et al., (2016), investment in the education of rural or illiterate households may in the long term contribute minimizing prevalence of food insecurity in our society.

2.6.5 Food Prices

Inflation has a negative effect on poor households' ability to afford basic food basket (Mkhawani et al., 2016). This is true according to Drammeh et al., (2019), since poverty and food price hikes are regarded as the primary factors hindering access to adequate food among poor households with low income. In addition, poverty can have a major impact on already vulnerable households, pushing those least able to cope further into hunger and poverty (Gustafson, 2013). A study conducted in Mopani District observed the same phenomenon, noting that rising food prices forced to change their eating and dietary patterns by buying and consuming less and low-cost food. In addition, spending most of the income on food restricts the affordability of other basic necessities such as education and health (Mkhawani et al., 2016).

2.7 DESCRIPTION OF FOOD GARDENS

The inception of modern agriculture can be traced back to subsistence production systems that began in small garden plots around the households and emerged from the common practice of the occupants to plant trees around their habitations (Galhena et al., 2013; Yapa, 2018). These small plots were managed by at least one member of the household as opposed

to community gardens and the produce was primarily intended for family consumption (Mullins et al., 2021; Rybak et al., 2018). However, these days' home gardening is not only limited to household production but can also be in a form of a community gardens, or collective gardens (Saediman et al., 2021).

Worldwide food gardens may be referred to as home, mixed, backyard, kitchen, farmyard or even a homestead and compound gardens according to a place and region they are found, however, the common goal is to contribute to family food production (Chakraborty & Basu, 2018). Similarly, Suza et al., (2021) regard home gardening as an ancient method of production that is commonly practiced throughout the world. An old definition by Niñez (1984) in Galhena et al., (2013) defined household garden as a small-scale production system supplying plant and animal consumption and utilitarian items either not obtainable, affordable, or readily available through retail markets and wage earnings. Recent authors including Mullins et al., (2021) defines home garden as one where at least one fruit or vegetable is grown on property attached to the residence of the grower. Whereas McMahan et al., (2014), views food gardening as a method of improving household produce consumption, as well as increasing food security and self-sufficiency.

According to Jindal & Dhaliwal (2017), the classification of food gardens is according to the size cultivated, the method of cultivation, as well as the purpose of production. Olney et al., (2009) make this classification and concluded that gardens can either be traditional, improved and developed. According to this classification, traditional gardens are regarded as those gardens that are seasonal and are maintained in scattered plots with very limited crops cultivated on (Ibid). Improved gardens on the other hand are similar to traditional however they are fixed plots that have more variety of crops on a particular season of the year while developed gardens produce a wide variety of crops that are available throughout the year and are mostly maintained on fixed plots (Olney et al., 2009).

Because of food garden's ability to be easily maintained with low costs and low risk technology, they are therefore regarded easy and accessible to poor communities (Bahta et al., 2018). These gardens are developed with minimal economic resources and often use locally available planting material and indigenous methods for crops biosecurity (Bahta et al., 2018). In support of this, Chakraborty & Basu (2018) noted that even the poorest with limited space available can be able to engage in food gardening by planting on small patches of homestead land, vacant lots or even on containers. Moreover, establishment of food gardens

in rural areas is regarded easy due to availability of space and given the fact that farm families are already engaged in agricultural practices (Arya et al., 2018).

2.8 SMALL SCALE HOME FOOD GARDENING TRENDS IN SOUTH AFRICA

The South African agriculture is highly subjected to heavily capitalized industrial and trade sector, in which many small-scale farmers produce only a fraction of household food needs (ACBIO, 2017). According to Bahta & Owusu-Sekyere (2019), small-scale farmers means small in size and shows a lesser gross margin in production compared to vegetable farmers with larger farm plots and produce on a larger scale. Nevertheless, there is evidence in the literature that home gardening has been a source of food production for the longest time in South Africa, with the first recognized food gardening project dated back in 1998 in Ndunakazi, a rural in the valley of a thousand hills in KwaZulu-Natal (Faber & Laurine, 2010).

South Africa is characterized by a large number of deprived communities who depend primarily on social assistance and not able to afford a balanced diet (Govender et al., 2017). Under such circumstances promoting households and community gardens improves food availability and access to healthy nutritious foods thus addressing malnutrition in poor areas (Ibid). Mdiya & Mdoda (2021) is in support of this and view home gardening as one way to improve food security and potentially provide a good solution to several problems related to poverty alleviation and local incomes. This is because over the years, there has been growing concern about increasing food prices and the need to boost local food production to help the rural people overcome these negative effects (Ibid). Similarly, boosting local food production according is very crucial in rural South Africa where poverty is widespread (Maselwa & Oyekale, 2019). It is for this reason that the South African government developed programs that encourage participation of vulnerable and poor households in small and medium enterprises (SMEs) activities (Ibid).

There are several small-scale food programmes that exist in South Africa. Such programmes include Siyazondla Homestead Gardens, Siyakhula and Massive Food Production Program among others that were initiated by the provincial government of the Eastern Cape focusing on improving household food production, nutrition, and food security (Mcata, 2019). These programmes are also found in other provinces. For example, in Mpumalanga Province the provincial government introduced the Masibuyele Emasimini programme now

Phezukomkhono Mlimi (PKM) to assist the beneficiaries in a form of providing production input to improve accessibility and availability of food (Sambo et al., 2021). Additionally, Oguttu et al., (2021) reported on the “Homestead Food Garden” as one of the provincial government projects that was implemented in Gauteng Province. This project was aimed at promoting cultivation of vegetables and therefore contribute to food insecurity in the province.

According to Ngema et al., (2018), it is critical for households to participate in these government food security intervention programmes in order to alleviate food production of those households who are already having their own production. Ngema et al., (2018) assessed whether participation in “One Home One Garden” program that was implemented by the South African government had an influence on food security of beneficiary households when compared to non-beneficiary households. The study found that the probability of households becoming food secure within the participating beneficiary households was even greater than their counterparts.

The General Household Survey by StatsSA (2018) pointed out that only 14.8% of South African households were involved in agricultural activities in 2018. Statistics on StatsSA (2018) further reported that 75.6% of those involved in agriculture indicated that, participating in agriculture was to secure additional source of food. Adekunle (2013) arrived at the same conclusion, noting that agriculture improves the nutritional status of households, especially when it is used to generate income, or when it enables a substantial reduction in household food expenditure. The report by Statistics South Africa further revealed that the province of Limpopo, Eastern Cape, and Mpumalanga at 37.1%, 29.3% and 24.1% respectively were leading on the number of household’s participating in agriculture nationally (StatsSA, 2018). The report further highlights that Western Cape and Gauteng showed least participation in agriculture at 2.5% and 4.0 % respectively (Ibid). It is noted that the main reason for least participation is due to the fact that agriculture is not common in Gauteng compared to other provinces and many households engage in agriculture as a last option, whereas in the Western Cape households practiced agriculture as a leisure activity (StatsSA, 2018).

Mdiya & Mdoda (2021) on the study of home gardens and livelihood in the Eastern Cape found that most of the rural households engaged exclusively in home gardening to feed their families. The study also indicated that some households were generating income from home gardens, however; they were only selling locally the remaining surpluses. Modibedi et al., (2021) supports this view, revealing that the practice of food gardening is also prevalent in urban areas of South Africa. In the study of urban community garden’s contribution to food availability in Gauteng province, the results show that food gardening is a common practice which is supported by 86.2% of urban farmers (Modibedi et al, 2021).

2.9 SMALL-SCALE HOME FOOD GARDENING TRENDS IN AFRICA

African indigenous vegetables form an important segment on the food system in Sub-Saharan and rest of Africa (Muhanji et al., 2011). According to Fortes et al., (2020), these involve a variety of fairly small structures, production levels and capitalization according to different social and economic conditions and use limited landholdings to engage in a variety of agricultural activities. A study conducted in the Sub-Saharan Africa by Drechsel & Dongus (2010), shows that home food production in urban and peri-urban areas is a dynamic, profitable and mostly sustainable livelihood strategy providing jobs and food for the cities especially for poor dwellers. Home food production exhibits an exceptional resistance against a number of limitations in Sub-Saharan African countries and maintains its niche without external initiative and support (Ibid).

Despite that, in East Africa particular in Tanzania it has been reported by Roothaert & Schreinemachers (2018) that the average intake of vegetables considered for a healthy and balanced diet does not match the recommended level of quantity. Although it is noted that the food gardening in Tanzania is facing numerous constraints however, many households are still depending on basic farming activities including gardening to meet household food needs (Rybak et al., 2018). A study in Kibogwa village of Uluguru Mountains found that the main three staple foods (maize, rice and cassava) that were mostly consumed by households were entirely cultivated in the home gardens of the villagers, with bananas being the main commercial crop cultivated (Yamane et al., 2018). Furthermore, Yamane et al., (2018) noticed that there was a high proportion of cereal consumption when compared to the levels of production. The profits gained from selling bananas were ultimately used to supplement the shortage of self-produced cereals (Yamane et al., 2018).

Another country in Southern Africa with the majority of individuals in rural areas that are dependent on agriculture for survival is Lesotho (Walsh et al., 2020). Population of Lesotho stand at 2.2 million with over half living in rural areas (Ibid). The country is considered underdeveloped and poor (Walsh et al., 2020). The authors further report that over 90% of the country's total area is not suitable for food production. As a result, the home gardens in Lesotho tend to be small in size and grow one or two crops often maize and potatoes (Billingsley et al., 2013). Nonetheless, in spite of that the government introduced a concept of community gardens which were ultimately a failure due to some challenges which affected their optimum operation (Muroyiwa & Ts'elisang, 2021). Keyhole gardens were then introduced as a potential contributor to food provision and nutrition supplement (Ibid). The keyhole gardens in Lesotho are widely promoted since they intend to grow more varied crops in order to meet the household dietary needs and produce vegetables even in winter because

of its structure which helps to retain heat and thus improve household food security (Billingsley et al., 2013). Muroyiwa & Ts'elisang (2021) sees this type of food production system as a mechanism to reduce poverty and as a source of income for subsistence farming households in developing regions.

In Uganda Kasese district, Gerny et al., (2021) explored whether home gardening is an effective way to improve household nutrition and welfare and made comparison on households that were involved in food gardening and those without food gardens. The study found that nearly a third of the food gardening participants reported improved food availability compared to no change in food availability on those households without food gardens. In addition, Gerny et al., (2021) found that households that were participating in food gardening in Kasese district consumed vegetables per day more frequently compared to their counterparts.

2.10 GLOBAL TRENDS ON SMALL SCALE HOME FOOD GARDENING PRACTICE

While Altman et al., (2009) consider small scale agricultural production as significant contributor of food insecurity alleviation, Fortes et al., (2020) believe small-scale agriculture to be the dominant form of food production in the world. While the technology of food production is highly advanced in developed countries, according to Mutotsi et al., (2008), gardening remains a significant form of food production for most people in developing countries. However, according to the authors, high population densities are exerting great pressure on the land needed for settlement, adversely affecting food production (Ibid). In addition to the population growth, poverty, climate variability, and low agricultural productivity are also threatening food supply (Kleemann et al., 2017).

With the world's population expected to exceed nine billion by 2050, competition for settlement and food production is intensifying, hence government organizational structures are working on developing and implementation of farming systems that will have a positive impact on output land use (Bahta et al., 2018). Although, encouraging self-sufficiency and small-scale agricultural production in a semi-industrialized economy like South Africa seems impractical, however, many countries in Europe, Japan and Indonesia have adopted and successfully supported smallholder food production (Uys, 2017; Altaman, 2009). Galhena et al., (2013) support this and believe that in order to reduce the unfavorable global food shocks and volatile food prices, local food production need to be prioritized especially on those countries where food scarcity and hunger is prevalent. Therefore, they have identified home gardens as an integral part of local food system that could be used to enhance household food security and nutrition.

Karim et al., (2021) consider agriculture to be the backbone of the economy of Bangladesh. Bangladesh is one of the countries that are considered to be heavily populated such that the increase in population has decreased cultivable land (Ibid). The availability of fertile and cultivable land in the country is therefore one of the major challenges in meeting the country's food demands and achieving food security (Suza et al., 2021). It is reported that over two third of the total population in the country lives in countryside where their livelihood greatly depends on farming and agriculture (Karim et al., 2021). According to Suza et al., (2021), almost 30 million of 97.5 million rural households are without land, with no additional arable land beyond their homestead. Suza et al., (2021) further explain that the portion of land that is accessible for cultivation is minimal as a result majority of farming households cultivates land of less than one hectare.

Furthermore, in Sri Lanka, home gardening is a common practice that has been adopted as a livelihood strategy for many years and home gardens covering over 13% of land area (Galhena et al., 2013; Yapa, 2018). Thamilini et al., (2019) also views the country's involvement in home gardening as a long-standing practice, where over 35% of the Sri Lankan population are engaged in the agricultural sector. However, the Authors argued that with such involvement in agriculture and particularly in home gardening the productivity of home gardens in the country is generally low (Ibid). The reasons for this are further specified by the authors as insufficient knowledge of crop production and the unavailability of good quality seeds and other agricultural inputs. However, to deal with this, the Sri Lankan department of agriculture together with non-government organizations in line with the national programs on food production are at work in providing training to farmers about crop production and raising awareness, distribution of planting materials including quality seeds and farming inputs (Thamilini et al., 2019).

Similarly, in Indonesia, the government has adopted initiatives to promote home gardening throughout the country (Saediman et al., 2021). This was observed in 2010 where the food gardening program was first introduced to optimally utilize home yards for household food production (Ibid). The Ministry of Agriculture launched a program called Acceleration of Diversification of Food Consumption with the objectives of increasing the utilization of local foods, their processed products and increasing participation of women groups in the provision of nutritious food through home garden (Saediman et al., 2021). To support this, the increase of land conversion made the community to do some alternatives in fulfilling food and nutrition needs on narrow land, by utilizing the house yard with one of the optimization strategies of yard area being a sustainable reserve food garden (SRFG) (Indartato et al., 2019). This program is one of the strategies for optimizing yards that is eco- friendly and can also fulfill the

needs of food, family nutrition, and increasing income, in which it can improve the community prosperity so that to be able to realize food self-sufficiency in the community (Ibid).

The government of Indonesia established the National Food Security Agency (BKP) which led to the development of the program for Increasing Diversification and Community Food Security (IDCP) (Andoko & Doretha, 2020). This include the M-KRPL (Model Kawasan Rumah Pangan Lestari), or Model for Sustainable Home Food Garden Area which is the KRPL program (KRPL) started in 2011 and aimed to increase household-level food self-sufficiency through home yard utilization, local resource based food diversification, conservation of food crops, and improved household welfare (Saediman et al., 2021).

2.11 COMMONLY GROWN CROPS IN FOOD GARDENS

Laurie et al., (2017) assessed food gardens in South Africa and found spinach, carrot and beetroot, onion and cabbage as the dominants crops accounting for more than 80%, while butternut and traditional leafy vegetables were grown the least at 29% and below. These authors also found that tomatoes and lettuce were commonly planted at 67% and 42 % respectively compared to potato and pumpkin (ranging from 39% to 30%) in their study that was conducted in South Africa. In another study that was conducted in Emfuleni Local Municipality, Modibedi et al., (2021) found out that potatoes, pumpkins, tomatoes, cabbage, carrots, beetroot, lettuce, butternuts, chinese cabbage, onions, spinach, sweet potatoes, green pepper, chomolia, chinese spinach, brinjal, kale, chilli pepper, turnips and green beans vegetables that were commonly planted in the community gardens. These findings however may differ from households, location, environmental climate and preference of respective households.

2.12 SIGNIFICANCE OF FOOD GARDENING

According to literature, food gardens offer multiple benefits. These include social, economic benefits, food safety benefits, sharing and reciprocity, connection to nature and personal well-being. These benefits are described below in brief.

2.12.1 Economic benefit

According to Langellotto (2014), food gardening is regarded as way to reduce household expenditure by providing affordable access to fruits and vegetables. Also, with the current

increase in food prices, people opt for food gardening as another way of saving money on fruits and vegetables purchases (Ibid). In support of this, Modibedi et al., (2022) concluded that through food gardens households are able to save money and use it for other household needs including electricity, school fees, transport and other food types that are not readily available through gardening. Ngcaba & Maroyi (2021) obtained similar results in their study of home gardens in the Eastern Cape Province, pointing out that home gardeners often sell their produce to relatives and neighbours in order to generate income.

2.12.2 Food safety benefits

The pressure to increase food production intensifies with the recent global increase in population growth, which has exacerbated the use of more chemicals (fertilizers and pesticides) in order to duplicate food production including the development of Genetically Modified Organisms (GMOs). However, surveys have shown that contamination and impact of agrochemicals residues in soils, terrestrial and ecosystem and their effects on human's biota is impacting on the quality of human food, water and environment (Gautam et al., 2006). Home vegetable gardens are largely organic based with minimal or zero use of chemicals (Ibid). This in turn ensures production of healthy food that is free of contaminants.

2.12.3 Sharing and reciprocity

A study by Warner et al., (2017) on factors influencing engagement in homestead vegetable production reveals that some community members engage in food gardening as a way to connect with their families and their community. The relationship amongst community members is strengthened where all neighbours participate in home gardening and grow different vegetable plants and exchange with other community members. Eng et al., (2019) confirmed this by stating that sharing garden produce creates social capital among gardeners and is also perceived as a way to express kindness and joy. The fulfilment of social needs through participation in gardening was also observed in a qualitative study that was conducted in Prague (Spilková & Rypáčková, 2019). Furthermore, Warner et al., (2017) noted that gardeners are able to exchange of information on different techniques and management practises (Warner, 2017).

2.12.4 Personal well-being and health

In literature, it is found that home gardening contributes towards peoples' health and wellbeing as physical activity through gardening leads to mental relaxation and stimulation (Schmutz et al., 2014). Authors further state that people will purposely choose to grow vegetable gardens for simply viewing green space which has been proven to have a positive effect on mental health and space. Galhena et al. (2013) also added that gardens contribute to well-being and health by being sources of herbs and medicinal plants.

2.13 THE IMPACT OF FOOD GARDENS ON FOOD SECURITY

There is great evidence that home gardening is associated with the improved food consumption and dietary diversity (Castañeda-Navarrete, 2021). Home gardens have been used throughout the world as an important additional source of food to improve household food security and nutritional diversity (Saediman et al., 2021). Domestic production of fruits and vegetables gives households direct access to essential nutrients that are not obtainable or economically accessible (Arya et al., 2018). For poor households, homestead food production is often the only source of micronutrients in the family diet (Ibid).

According to David & Grobler (2022) even in South Africa, home food gardens have a higher tendency of increasing food supply and reducing food insecurity. Research by Ngcaba & Maroyi (2021) on home gardens in the Eastern Cape revealed that cultivating home gardens have a direct contribution to food security and associated with increased food availability, accessibility and utilization. This is due to the food garden's ability to provide diversity of fresh foods that improves quantity and quality of nutrients available for the household (Chakraborty & Basu, 2018). In furtherance to this, literature also suggests that home garden enable destitute and vulnerable households produce a year-round the variety of food plants required for creating and maintaining sustainable household food security (Ngcaba & Maroyi, 2021; Modibedi et al., 2021). Ngcaba & Maroyi (2021) and Adekunle et al., (2013) continue identifying poverty alleviation and reduction of food inequalities within households as a benefit derived from utilization of home gardens as food source. Rammohan et al., (2019) reflected this phenomenon in yet another way, pointing that home gardens act as predictors of enhanced dietary diversity and food security in rural Myanmar. Through gardens households are able to have access to diverse crops (Rammohan et al., 2019; Modibedi et al., 2021), which translates to better dietary diversity.

2.14 CHALLENGES IN FOOD GARDENING

Although home gardens have many advantages, more especially for developing countries, however the literature also shows that there are some limitations hindering the productivity and feasibility of small-scale home gardens (Galhena et al., 2013; Mitchell & Hanstad, 2004). These limitations include access to suitable land, lack of experience, monetary expenses, lack of commitment, generational disconnect, unfavourable weather conditions amongst others listed by Warner et al., (2017), on the study that explored factors influencing engagement in home production. Fan et al., (2013), also pointed out lack of human capital and limited access to infrastructure, market and technologies as serious constraints in developing small scale food productions from subsistence farming to commercially oriented and profitable farming system. Adding to that small scale food production has become more exposed to a wide range of climatic conditions, soaring price of inputs and financial risk.

A study conducted by Adekunle (2013) on challenges facing small scale home food gardens in the Eastern Cape Nkonkobe Area revealed that from the total of 60 farmers, the major factor affecting small scale farmers was the use of uncertified seeds, lack of capital and lack of the technical knowhow. However as stipulated by the author, this was due to the fact that small-scale garden farmers did not have access to extension services. As a result, with these constraints and barriers small scale farmers find it difficult to participate in the agricultural market even after producing a marketable surplus due to their product being wasted after harvest or sold at very low prices (Adekunle, 2013). Additionally, Matsane & Oyekale (2014) on the study of small-scale vegetable marketing in the North West Province revealed that major restriction of vegetable marketing among small scale farmers were inaccessibility to credit, inconvenient storage facilities, lack of market information, inadequacy of financing the farm operations, producer prices at unrealistic levels, perishment of produce, inaccessibility to roads and high transportation costs among others. Following are some of the observed barriers in the literature.

2.14.1 Access to land

Access to cultivable land that suitable and sufficiently fertile to set up a food garden with the household appropriate proprietorship right has been mentioned as one of the key challenges in the literature (Mitchell & Hanstad, 2004). In South Africa, most small-scale food farmers are located in rural areas away from cities and economic hubs where lack of infrastructure restricts their development (DAFF, 2012). Asia has also reported that lack of access to adequate land and land instability are the major challenges for small scale farmers in the region (Marks, 2019). Renting land or either owning a limited amount of land makes it unviable for smallholders to improve their income considerably since the chances of expansion and

development is limited (Ibid). Moreover, in lesser developed countries there is much evidence that people tend to live on land they do not legally own, thereby making them legally landless (Marks, 2019).

2.14.2 Unfavorable climatic conditions

Food gardens tends to be sensitive to increased temperature, fluctuating precipitation patterns, accelerating risk of crop pests and diseases outbreak, and more frequent extreme weather events which can all raise the incidence of crop failure and low production returns (Fan et al., 2013). These conditions adversely affect crop yields particular the rise in number and intensity of floods, droughts, heat waves and the increase in rain variation (Marks, 2019). Since most small-scale food gardens rely of rainfall and have limited access to irrigation means that if there is insufficient rainfall, they cannot access additional water therefore one season of poor yields could devastate them financially with little or no savings and crop insurances (Marks, 2019).

2.14.3 Limited resources and marketing

A study conducted in Limpopo Province identifying problems facing small-scale farmers discovered different constraints facing the farming community, including having limited resources and marketing (Ndlovu et al., 2021). Small-scale farmers are generally not accessible to farm machinery and often required to use more labour and less capital per hector (Rapsomanikis, 2015). It is noted that farmers often lack transportation to take their produce to market, ending up using wheelbarrows to sell produce to the community or nearby supermarket if available (Ibid.) Another constraint in marketing is identified by Mpandeli & Maponya (2013) in Vhembe district (Limpopo), where farmers have no fixed or formal market for their products. Although commercializing and the transformation of food supply chains, best reflected by the rise of supermarkets in the developing world offers new opportunities for small-scale farmers, it can also marginalize them, isolating them from lucrative markets and making them unviable economic units (Rapsomanikis, 2015). In South Africa, small scale food production farmers are still struggling to engage in food value chain due to the product quality standards that are set by industries which ultimately exclude them (DAFF, 2012). As a result, this inconvenience to enter high value market equate to exclusion from capital markets and general struggle for economic survival (von Loeper et al., 2016).

2.14.4 Access to water

Water scarcity is becoming a growing challenge worldwide with agriculture accounting for 70% of global water withdrawal (FAO, 2018). The growing of competition for natural resources due to climate change, urbanisation and industrial development is already compromising agricultural activities thus affecting water availability needed for agricultural activities (Giordano et al., 2018). The fluctuating weather patterns is compromising the production of small-scale food farmers who solely depend on rain fed as a source of water for their crops, thus making irrigation a major determinant of land productivity which lead significant increase in crop yield (Rapsomanikis, 2015). However, since irrigation can be costly to install and run, Nouri et al., (2019) recommended the use of mulching as one of the possible ways to reduce the use of water in crop production in order to alleviate water scarcity.

CHAPTER 3:

STUDY AREA AND RESEARCH METHODOLOGY

3.1 INTRODUCTION

Literature review discussed in chapter 2 and objectives of this study were used to select the appropriate research design and methods for this study. As described by Kothari (2017), research methodology is a way to systematically solve the research problem and therefore perceived as a science of studying how research is done scientifically. It entails the various steps that are adopted by the researcher in studying the research problem, including why the research study was undertaken, how the research problem was defined, what data have been collected and what particular method has been adopted and to why a particular technique of analyzing data has been used (Ibid). To realize this, this chapter presents the research methodology that was used to conduct the study and the process that was followed to collect and analysed the data in order to achieve the research goals of this study. The chapter outline includes the description of the study area and its geographic location, the research design, sampling method, pilot study, data collection procedures and data analyses as well as ethical considerations concerned.

3.2 DESCRIPTION OF THE STUDY AREA

This study was conducted in Ray Nkonyeni Local Municipality which is commonly referred to as South Coast because of its geographic location in relation to the southern coastal part of KwaZulu-Natal (KZN). Ray Nkonyeni Local Municipality is a newly established local municipality which emerged as a result of the merger between the former Hibiscus Coast and Eziqoleni local municipalities (RNLM, 2017). It is the largest of four municipalities in the Ugu District Municipality (**Figure 3.1**), covering approximately 1594 km² in geographic area (Municipalities of South Africa, 2017). According to RNLM (2017), Ray Nkonyeni stretches along the coastal strip from Heberden to Port Edward covering 67 km and about 60 km into the interior primarily via N2 to Eastern Cape. The Indian Ocean borders the Eastern part of the municipality, while the Southern part runs Umtamvuna River which is the boundary between KZN and the Eastern Cape. The Ugu District Municipality is one of the eleven district municipalities in KZN (Ibid).



Figure 3. 1 : Map showing the position of Ray Nkonyeni Local Municipality in the Ugu District
 (Source: UGU District municipality GIS. 2016)

3.3 RESEARCH DESIGN AND APPROACH

As defined by Akhtar (2016), a research design is the plan of a proposed research work and structure of research that holds all the elements in a research project together. For this study, non-experimental research was used as it is done in natural environment or field studies and data collected in field situation (Welman, et al., 2005). The study was descriptive in nature. According to Lans & van de Voordt (2002), descriptive research provides a detailed account of a social setting about a group of people and other phenomenon and describing how reality is. It is aimed at portraying accurately the characteristics of a particular group or situation (Akhtar, 2016). Williams (2007) describes descriptive research design as a basic design that examines the situation, as it exists in its current state. The choice of descriptive design was motivated by its ability to yield rich data that lead to important recommendations in practice. In terms of approach, the study was quantitative in nature. Quantitative research as explained by Matthews and Ross (2010) is the approach that is concerned with gathering and working with data that is structured and can be represented numerically, and to build accurate and reliable measurements that allow statistically analyses (Goertzen, 2017). In terms of time

frame, this study was cross-sectional study. This means the condition and potentially related factors were measured at a specific point in time for a defined population (NEDARC, 2010).

3.4 SAMPLING METHOD

According to Welman et al., (2005), in large-scale surveys it is usually difficult, if not impossible to obtain lists of all members of the population. Therefore, Mweshi & Sakyi (2020) defines the process of sampling as a situation where the researcher carefully selects a number of individuals from a larger population of interest to include in the study. Under this section the target population and sampling procedure used in this study is described.

3.4.1 Target population

The target population is the study's population of interest that it intends to study and generalize the conclusions (Majid. 2018). For this study the targeted population were household heads within the peri-urban areas of Ray Nkonyeni Local Municipality. The targeted population was selected based on the participants' characteristics to yield accurate data to fulfill the objectives of the study. According to Statistics South Africa there are approximately 7584 households at Ray-Nkonyeni Local Municipality (STATS SA, 2011). Therefore, this was the targeted population for this study. However as it is explained by Majid (2018), it is not feasible to study the entire population of interest to partake in the study , therefore a sampling is used to select participants of the study from the target population.

3.4.2 Sampling procedure

In this study sampling was done in two phases: Sampling of the peri-urban areas and sampling of the households as described below:

3.4.2.1 Sampling of peri-urban areas

Practically, within the population of Ray-Nkonyeni Local Municipality, all 4 peri-urban urban areas (Ezingolweni, Murchison, Fairview and Louisiana) were identified for sampling and the study was limited to the 4 peri-urban areas using purposive sampling. The purposive sampling was used to concentrate on locations with particular characteristics relevant for this research. Etikan et al., (2016) defines purposive sampling technique as a deliberate choice of a participant due to the qualities the participant possesses; it allows the researcher to

concentrate on people with particular characteristics and will better be able to assist with the relevant research. This method was employed to capture the true reflection of peri-urban households in the Municipality.

3.4.2.2 Sampling of households

Due to the absence of sampling frame, systematic random sampling was used as a standard sampling technique to select households that will participate in the study. Systematic sampling is described as a process whereby the researcher selects subjects to be included in the sample based on a systematic rule, using a fixed interval (Elfil & Negida, 2016). For this study the technique rule included the last household from every five households (5 fixed intervals). This sampling technique ensured that all households have equal chance of being selected which then enhanced the validity of the results. Furthermore, this technique enabled the researcher to determine the extent of the home gardening in the study area.

As stated by the Statistics South Africa that there are approximately 7584 households at Ray-Nkonyeni Local Municipality (STATS SA, 2011). Krejcie & Morgan (1970) formula was then used to determine the sample size in this study, using the following formula: -

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

Where:

S = Required Sample size

X = Z value (e.g. 1.96 for 95% confidence level)

N = Population Size

P = Population proportion (expressed as decimal) (assumed to be 0.5 (50%))

d = Degree of accuracy (5%), expressed as a proportion (.05); It is margin of error

According to Krejcie & Morgan (1970), the population of 7584 is represented by a sample size of 364 (Table 3.1).

Table 3. 1 : Sample size

KREJCIE & MORGAN (1970)

Populasi	Sampel	Populasi	Sampel	Populasi	Sampel	Populasi	Sampel	Populasi	Sampel	Populasi	Sampel
10	10	85	70	220	140	440	205	1200	291	4000	351
15	14	90	73	230	144	460	210	1300	297	4500	354
20	19	95	76	240	148	480	214	1400	302	5000	357
25	24	100	80	250	152	500	217	1500	306	6000	361
30	28	110	86	260	155	550	226	1600	310	7000	364
35	32	120	92	270	159	600	234	1700	313	8000	367
40	36	130	97	280	162	650	242	1800	317	9000	368
45	40	140	103	290	165	700	248	1900	320	10000	370
50	44	150	108	300	169	750	254	2000	322	15000	375
55	48	160	113	320	175	800	260	2200	327	20000	377
60	52	170	118	340	181	850	265	2400	331	30000	379
65	56	180	123	360	186	900	269	2600	335	40000	380
70	59	190	127	380	191	950	274	2800	338	50000	381
75	63	200	132	400	196	1000	278	3000	341	75000	382
80	66	210	136	420	201	1100	285	3500	346	100000	384

The inclusion criteria included all households that lived in the area and were available to participate in the study. In addition to this, explained by Kennedy et al., (2011), when assessing Household Dietary Diversity (HDDS) the participant should be the person who was responsible for meal preparation for the household the previous day or had eaten at home in the reference period. Therefore, this criterion formed part of the inclusion criterion.

Due to unavailability of participants either away for work or personal reasons the study ended up with 360 participants out of 364 proposed sampled size. **Table 3.2** below shows what each area accounted for from the whole sample.

Table 3. 2: Sample size per peri-urban area

Area	Sample
I = Izingolweni	136
M = Murchison	112
L = Lousiana	56
F = Fairview	56

3.5 RESEARCH METHODS AND INSTRUMENTS

Data was collected using structured survey questionnaires which were administered face-to-face as a main data collection instrument. Administering the questionnaire ensured the accuracy of data collected and improved response rate. The questionnaire was first validated and subjected to reliability test to improve the efficiency of the use of the questionnaire. The questionnaire was written in English (see Annexure A) and translated to IsiZulu which is the study area's native language. The data was collected from October- November 2019.

3.5.1 Development of the data collection instrument

The structured questionnaire consisted of the close-ended questions, where the participants were required to select from a set of alternatives. This type of survey questions is defined by Hyman & Sierra (2016) as an analogous to the multiple-choice questions. The questionnaire was structured and consisted of 5 sections to answer the research questions and achieve study objectives (see Annexure A). Section A was based on the household socio-demographic details to address certain characteristics each participant possesses. Section B focused on the extent food gardens by defining the food gardens status and characterises in the study. Section C focussed on objective 2 in order to identify the reasons why some households cultivate food gardens and others do not, with a focus to determine the barriers in cultivation of food gardens at Ray Nkonyeni Local Municipality. Section D and E both concentrated on objective 3 of the study in order to determine the contribution of small-scale food gardens to household food security in the study area.

Dekker et al., (2018) provides a list of methods that are used to measure food access and utilization which consist of income levels and household budget, food related expenses and spending surveys, production levels, individual food intake surveys and caloric content of diets, however research proves that these turn out to be technically difficult, data intensive and costly to collect. Castell et al., (2015) confirmed this by stating that although these methods provide information that may be complementary however they tend to be long and costly. In addition to this, instead of directly measuring the access of food security these methods assess the consequences of food insecurity (Ibid). Therefore, Household Food Insecurity Access Scale (HFIAS) and HDDS were chosen and used in this study to measure food security as described below:

3.5.1.1 HFIAS

Food and Nutrition Technical Assistance (FANTA) project identified a set of questions that distinguish households that are food secure from the food insecure households and named that tool “HFIAS” (Dekker et al., 2018). The HFIAS (see Annexure A) section D on the questionnaire focused on the objective 3 of the study. HFIAS is the method used to measure the prevalence of food insecurity (Access) based on the idea that the experience of food access causes predictable reactions and responses that can be captured, quantified through the scale and summarized in a scale (Coates et al., 2007). The HFIAS consists of 9 items specific to an experience of food insecurity occurring within the previous four weeks where participants indicate whether they had experienced lack of food or money to buy in the last month (Hussein et al., 2018). HFIAS was used to determine food access in relation to food gardening in Ray Nkonyeni Local Municipality.

The response to each question is registered as “yes” or “no” and so in case the answer is “no” the frequency questions is skipped and in case the answer is “yes” then the frequency of occurrence is asked. The occurrence is then scored from 1 to 3 where score 1 means rarely (once or twice in the past four weeks), score 2 translate to sometimes (three to ten times in the past four weeks) and score 3 indicate often (more than 10 times in the past four weeks).

3.5.1.2 HDDS

HDDS is a food security measurement tool that is used to assess the dietary quality component of food insecurity (Crush & Caesar, 2014). The participants were asked if anyone in the household consumed any item from the food groups listed in HDDS (see Annexure A) in the previous 24 hours and the score was calculated by summing equally weighted response data on the consumption of 12 food group (Jones et al., 2013). According to Hussein et al., (2018) on the study of HFIAS and HDDS as a proxy indicator of nutritional status in Ethiopia found that both methods are valid and reliable proxy indicator for measuring nutritional status especially in limited resource setting.

3.6 DATA COLLECTION

This section describes how pilot study was conducted in preparation of the main data collection and how the main data collection was conducted.

3.6.1 Pilot study

A pilot study refers to small-scale research that is conducted in preparation for the final main study to analyse its validity (In, 2017). This enables the researcher to make necessary adjustments and refine research methodology before attempting the main study (Ibid). For this study, after the questionnaire was finalised it was then tested by having 10 participants to complete it in order to verify any indistinctness and how much time it would take to complete the questionnaire. The pilot study was conducted in September 2019, 5 weeks prior to the main data collection. The pilot study was done at a similar environment to the main study to ensure that the pilot study is conducted with persons who have similar characteristics to those of the target group (De Vos, 2002). The pilot study was conducted in Bhobhoyi location in Ray Nkonyeni Local Municipality, which is an area that is adjacent to one of the peri-urban area (Murchison) sampled in study. This place is not labelled as peri-urban or urban area since it is adjoining the Murchison location and possesses the similar settlement characteristics.

During the pilot study the following areas that needed adjustments were identified. Firstly, there were some repetitions in the questions which were causing confusion to the participants. These were addressed accordingly. It was also noted that some participants were not comfortable in disclosing their income amount and therefore the categorical range system was fitted, giving participant's options to select from without giving the actual amount. The HFIAS (see Annexure A) needed to be simplified since there were a lot of similarities in questions which translated to confusion to the participants thus taking more time to complete answering a questionnaire.

3.6.2 Main data collection

To help with the data collection, the researcher employed 2 research assistants who were recruited based on the previous experience and ability to administer the surveys in the community. Once translation and adaptation of the questionnaire was completed, the research assistants were trained to conduct properly structured interviews in the households as described by Kennedy et al., (2011). Training of research assistants included presenting the final questionnaire to research assistants and going through all the questions to ensure that all the concepts are covered and understood. This method played a huge role in allowing research assistants to familiarize themselves with the procedure for completing the questionnaire before the pilot and main study data collection. Other aspect of training that both the researcher and assistants covered was administering the questionnaires amongst

each other to get a sense of responses from the participants. Training also included ethical issues. The data collection took place at the participant's homestead.

3.7 DATA CAPTURING AND ANALYSIS

Data retrieved from the questionnaire was first coded in order to transform collected information to a set of meaningful and cohesive categories. The process included summarizing and representing data in order to provide a systemic account of the recorded phenomenon. Data was coded and captured in Microsoft Excel 2016. Data capturing is defined by Hamzah et al., (2018) as the the method of putting a document into an electronic format. The quantitative numeric data was analysed using the Statistical Package for the Social Science (SPSS) version 27.

3.7.1 Analysis of the socio-demographics characteristics

The socio-demographic charecteristics of the respondents were analysed using descriptive statistics such as frequency distribution table and percentage.

3.7.2 Analysis for objective 1

To determine the extent of food gardening between the two groups namely: food garden participants and food garden non-participants, descriptive statistics were used for this analysis and data was present in frequencies and percentages.

3.7.3 Analysis for objective 2

Descriptive statistics were used to investigate the reasons for not participating in food gardening and data was presented in frequencies and percentages.

3.7.4 Analysis for Objective 3

Binary logistic regression was fitted to investigate factors associated with participation in food gardens. Yang (2017) describes Regression analysis as a form of predictive modelling technique and statistical tool to investigate the relationship between dependent and independent variables. In addition, the regression helps in understanding the variation in a dependant variable using variation in independent variables with other confounding variables controlled (Ibid). To assess the relationship between independent variables (race, age of the household head, marital status, occupation, highest standard passed, number of the

household members, number of employed household members, total household income, number of the sources of income, household structure) and outcome (participating in food gardens), a binary logistic regression model was fitted to the data. Prior to fitting variables into a logistic regression model, bivariate analysis for each individual independent variable and the dependent variables was conducted. The logistic regression function models the probability that the binary response is a function of a set of predictor variables $\mathbf{X} = [X_1, X_2, \dots, X_p]^T$ and regression coefficients $\boldsymbol{\beta} = [\beta_0, \beta_1, \dots, \beta_p]^T$ as given by the equation below:

$$\pi(\mathbf{X}) = \left[\frac{e^{\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_p X_p}}{1 + e^{\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_p X_p}} \right]$$

As explained by Midi et al., (2010), binary logistic regression is a statistical technique for predicting the probability of an event, given a set of predictor variables. They further state that binary logistic regression describes the relationship between a dichotomous response variable and a set of explanatory variables. The dependent (X) variable was dichotomous and binary in nature and fits into two categories which were represented by 0 and 1 respectively. An outcome of “not participating in food gardening” was represented by 0 whereby the outcome of “participating in food gardening” was represented by 1. The independent (Y) variables were discrete since data fits into named group which do not represent any kind of order or scale. Table 3 below presents the variables used in the analysis and priority expected signs of independent variables specified as socio economic factors associated with participation in food gardening.

The binary logit model that was fitted:

$$\ln\left(\frac{P}{1-P}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_k X_k$$

Table 3. 3: Definition of the independent variables used in the logit

Dependent variable
participating in food gardens
(0- not participating, 1- participating)
Independent variable

Variable code	Description	Values	Expected sign
HR (X1)	Race	0 –African, 1- White, 2- Indian, 3- Coloured, 4- Other	
GEN (X2)	Gender	0-Male 1-Female	+
HHA (X3)	Age of the household head	Proceed	+
MSTS (X4)	Marital status	0-Single,1- married,2- Divorced,3-widower,4- cohabiting	+or -
OCHH (X5)	Occupation	0-Unemployed, 1 employed part-time, full time employment	+
EDU(X6)	Highest standard passed	Proceed	
NHM (X7)	Number of the household members	Proceed	+or -
NEHM (X8)	Number of employed household members	Proceed	+or -
HS (X9)	Household structure	Proceed	
THI (X10)	Total household income	Proceed	+
NSOI (X11)	Number of sources of income	Proceed	+
SHI (X12)	Sources of household income	0 Wages, 1Pension, 2 Family business, 3 Social welfare grants, 4 Remittances, 5 Other	+
THD (X13)	Type of household dwelling	0-Formal, 1 Informal	+
ATAL (X14)	Access to arable land	0-Yes, 1 No	+
PEAP (X15)	Previous experience to agricultural production	0-Yes, 1 No	+

3.7.5 Analysis of objective 4

HFIAS and HDDS were used to determine the contribution of small-scale food gardens to household food security.

(i) Analysis of HFIAS

As mentioned under section 3.5.1.1 HFIAS tool consisted on nine standardized frequency questions that can be used to assess the prevalence of household food insecurity on all household members over the period of 30 days (Dekker, 2018). As indicated by Coates et al., (2007), 0 was awarded when the event was not experienced in the past 30 days, 1 if the event rarely happened, 2 if the event between two to ten times and 3 if it happened more than 10 times. This resulted to four categories of food insecurity: These responses were then analysed descriptively using the SPSS (version 27). The four indicators of food insecurity were assessed: 'Household Food Insecurity Access-related Conditions', 'Household Food Insecurity Access-related Domains', 'Household Food Insecurity Access Scale Score' and 'Household Food Insecurity Access Prevalence'.

i. Household Food insecurity Access-related Conditions

Under this indicator a number of households that reported to have experienced food insecurity in the past 30 days were calculated as follows: -

Households experiencing food insecurity condition at any time during 30 days' recall period	=	No. of households experienced food insecurity condition <u>directed by each question</u>	X 100
		Total number of households responding to each question	

In furtherance to these, these figures were analysed to assess the frequency of food insecurity amongst the households and computed as follows: -

Households, which sometimes experience food insecurity condition	=	No. of households, which sometimes experienced food insecurity condition <u>as directed by each question</u>	X 100
		Total number of households responding to each question	

ii. Household food insecurity access-related domains

Using the nine HFIAS standardized questions the households were further classified into three categories, as follows: -

- Judgements of uncertainty or anxiety about food stocks in the household (addressed by question 1);
- Feelings that household food is of insufficient quality and food type preference (addressed by question 2–4);
- Insufficient food intake and its physical consequences (addressed by questions 5–9).

Each category was summed up, for example, households that sometimes faced food insecurity, directed by specific questions, were worked out as follows: -

Households experiencing any of the conditions at any level of severity in each domain	=	$\frac{\text{Number of households with positive response to Q2 or Q3 or Q4}}{\text{Total number of households responding to Q2 or Q3 or Q4}} \times 100$
---	---	--

iii. Household Food Insecurity Scale Score

Then HFIAS score was calculated for each household by summing the codes of each frequency of occurrence question. The lower the score the less food insecurity a household experienced, alternatively the higher the score (maximum 27) the more food insecurity and access the household experienced (Coates et al., 2007).

The average HFIAS score was then calculated as follows:

$$\frac{\text{Sum of HFIAS Score in the sample}}{\text{Number of HFIAS score (Household) in the sample}}$$

iv. Household Food Insecurity Access Prevalence (Categories)

The prevalence of food insecurity access was categorized into two: household who obtained a score of 0-1 were classified as food secure while those that obtained a score of more than 2 were classified as food insecure. The scores obtained by food insecure households were classified into 3: mildly food insecure (score of between 2-7); mildly food insecure (score of 8-14) and severely food insecure (15-27) as suggested by Coates et al. (2007). The categorization (Table 2) is designed in a sense that a household's set of responses places them in a single, unique category (Coates et al., 2007).




Table 3. 4: Categorisation of food insecure status

Questions	Frequency		
	Rarely	Sometimes	Often
1a			

2a			
3a			
4a			
5a			
6a			
7a			
8a			
9a			

(Adopted from: Dekker, 2018).

Keys:

	Food secure
	Mildly food insecure
	Moderate food insecure
	Severely food insecure

Algorithm applied to determine the HFIAS category.

HFIAS category 1

[(Q1a=0 or Q1a=1) and Q2=0 and Q3=0 and Q4=0 and Q5=0 and Q6=0 and Q7=0 and Q8=0 and Q9=0].

HFIAS category 2

[(Q1a=2 or Q1a=3 or Q2a=1 or Q2a=2 or Q2a=3 or Q3a=1 or Q4a=1) and Q5=0 and Q6=0 and Q7=0 and Q8=0 and Q9=0].

HFIAS category 3

[(Q3a=2 or Q3a=3 or Q4a=2 or Q4a=3 or Q5a=1 or Q5a=2 or Q6a=1 or Q6a=2) and Q7=0 and Q8=0 and Q9=0].

HFIAS Category 4

[Q5a=3 or Q6a=3 or Q7a=1 or Q7a=2 or Q7a=3 or Q8a=1 or Q8a=2 or Q8a=3 or Q9a=1 or Q9a=2 or Q9a=3].

Thus HFIA prevalence of household food security access calculated using the following formula:

$$\frac{\text{Number of households with HFIA category (1-4)}}{\text{Total number of households with HFIA category}} \times 100$$

The data analysed from HFIA was then analysed descriptively and presented in tables (Frequencies and percentages).

(ii) Analysis of HDDS

The set of 12 food groups used to calculate the HDDS is cereals, root and tubers, vegetables, fruits, meat, poultry, offal, eggs, fish and seafood, legumes and nuts, milk and milk products, oil fats, sugar/honey and miscellaneous. Each group is assigned a score of 1 if anyone in the household consumed in the last 24 hours, a score of 0 if no one consumed. The household score ranges from 0 to 12 and is equal to the total number of food groups consumed by the household (INDDX Project, 2018). The aim of the household dietary diversity scores is to reflect nutrient adequacy where the increase in HDDS is related to increased nutrient adequacy of the diet (Kennedy et al., 2011).

$$\text{HDDS} = \text{Sum} [(Food\ group) A + B + C + D + E + F + G + H + I + J + K]$$

$$\text{Where the average HDDS} = \frac{\text{Sum (HDDS)}}{\text{Total number of household surveyed}}$$

The data collected from HDDS was then analysed descriptively.

3.8 ETHICAL CONSIDERATIONS

According to UNISA, Research Ethics is an important part of any research undertaking to safeguard the dignity, safety and welfare of prospective human participants, communities, and

environment. For the researcher to adhere to the Policy on Research ethics of the University of South Africa and maintain ethically responsible research practices, an ethical clearance for this research was granted by the College of Agriculture and Environmental Sciences (CAES) Research Ethics Review Committee (**Reference number: 2019/CAES/047- see Annexure B**). The permission to conduct the study was also approved by the Municipal official/Manager of Ray Nkonyeni local municipality (**see Annexure C**). The researcher together with the participants signed a consent letter for the purpose of ensuring the participants' secrecy and guarantee that they remain unknown, and both the researcher and the participant keep a copy of the signed consent letter (**Annexure D**). The objectives of the study were clearly explained to each participant and the nature of their participation in the study, as to why they were considered for participation. Participants were also informed that they may withdraw from the study at any time. It was further explained that participation is completely voluntary and if ones decide not to participate there will not be any negative consequences.

CHAPTER 4: STUDY RESULTS

4.1 INTRODUCTION

This chapter presents the results of the study. The study had four (4) objectives as outlined under section 1.3.2. These objectives were then used to formulate the headings of this chapter to ensure that each objective is answered adequately. The chapter is thus structured as follows: (i) Demographic information of the participants, (ii) Socio-economic information, (iii) The extent of food gardening in the study area, (iv) Reasons for participation in food gardens, (v) Factors associated with participation in food gardens, and lastly (vi) The contribution of food gardens to food security.

4.2 DEMOGRAPHIC INFORMATION OF THE PARTICIPANTS

Demographic information of the participants is discussed under the following headings: race, gender, age, marital status, and educational level.

4.2.1 Race and gender of the household head

With regards to age (**Table 4.1**), the results showed that majority of participants (99.2%; n= 357) were Africans while only 0.8% (n=3) were coloureds. As demonstrated in **Table 4.1**, the study revealed that there were more (69.2%; n=249) females in this study than males (30.8%; n=111).

Table 4. 1: Race and gender (n=360)

Variable	All households (n=360)	
	Frequency (n)	Percentage (%)
Race		
African	357	99.2
Coloured	3	0.8
Total	360	100
Gender		
Male	111	30.8
Female	249	69.2
Total	360	100

4.2.2 Age, marital status and education of the participants

The age and marital status of the participants are presented in **Table 4.2**. Overall results with regards to age showed that there were only 29.7% (n= 107) participants that were over the pensionable age of 60 years in this study, while 21.1% (n=76) were 40 years and below. Nearly half (49.1; n= 177) of the participants were between 41- 60 years of age.

Table 4. 2: Age, marital status and education level of the participants (n=360)

Variable	All households (n=360)	
	Frequency (n)	Percentage (%)
Age		
18-30	18	5.0
31-40	58	16.1
41-50	80	22.2
51-60	97	26.9
61-70	76	21.1
71-80	24	6.7
Over 80	7	1.9
Total	360	100
Marital Status		
Single	196	54.4
Married	98	27.2
Divorced	31	8.6
Widow	23	6.4
Cohabiting	12	3.3
Total	360	100
Educational Level		
No formal education	30	8.3
Primary school	86	23.9
High school	201	55.8
Tertiary	43	11.9
Total	360	100

With regards to marital status of the participants as illustrated in **Table 4.2**, the results revealed that 54.4% (n=196) were single, 27.2% (n=98) were married, 8.6% (n=31) divorced, 6.4% (n=23) widowed and 3.3% (n=12) who were cohabiting.

In term of educational levels (**Table 4.2**), more than half (55.8 %; n= 201) participants in this study had high school education. This was followed by 23.9% (n=86) participants with primary school level, while those with tertiary education only accounted for 11.9% (n=43). The results also indicated that there were few 8.3% (n= 30) participants without formal education.

4.3 SOCIO-ECONOMIC CHARACTERISTICS

The socio-economic factors are described in terms of employment status of the household head, total monthly income, sources of income, number of household members, number of employed members in a household, number of sources of income, the household structure, land access and agricultural experience.

4.3.1 Employment status, total monthly income and sources of income

Table 4.3 presents the employment status, total monthly income and sources of income of the participants in the study. The employment status of the participants was categorized according to the following categories: unemployed part-time employed and full-time employed. Most participants in this study were unemployed (47.8%; n= 172), followed by those that were employed full-time (32.2%; n=116), while 20.0% (n= 76) were in part-time employment.

With regards to the household's total monthly income, most households (29.4%; n=106) were earning between R2000 to R3000; followed by those that were earning between R1000 to R2000 (25.6%; n=92). Households who had a monthly income of less than R1000 were the least and accounted for 6.4% (n=23). There were also few (10%; n=35) households that were earning more than R5000.

Sources of income are also presented in **Table 4.3**. The study permitted multiple responses on the number of the household's sources of income hence the percentages are exceeding 100%. Most households (70%; n=252) mentioned wages as their source of income. This was followed by social welfare grants (34.2%, n=123) and pension (23.9%; n=86). There were few participants that indicated informal income and family business as their source of income, accounting for 4.2% (n=15) and 2.2 % (n=8) respectively. There were no households that indicated remittance as a source of income.

Table 4. 3 : Employment status, total monthly income and sources of income (n=360)

Variable	All households (n=360)	
Employment status	Frequency (n)	Percentage (%)
Unemployed	172	47.8
Employed Part-time	72	20.0
Employed Full-time	116	32.2
Total	360	100
Total monthly income		
>R1000	23	6.4
R1000-R2000	92	25.6
R2001-R3000	106	29.4
R3001-R4000	68	18.9
R4001-R5000	35	9.7
Over R5000	35	10.0
Total	360	100
Sources of income		
Wages	252	70.0
Pension	86	23.9
Family business	8	2.2
Informal income	15	4.2
Social welfare grants	123	34.2
Total	360	100

4.3.2 Number of household members, number of employed members and total number of households source of income.

As demonstrated in **Table 4.4**, most households in this study comprised of 4-6 members (50.3%; n=181). This was then followed by households made up of 1-3 members (28.1%; n=101) and 7-9 members (20.6%; n=74) respectively. There were fewer households that consisted of more than 9 members (1.1%, n=4). **Table 4.4** further provides statistics on the number of employed members in each household. It clearly shows that there were only 3% (n=1) of households with over 6 members that were employed and 23.1% (n=83) households which had no one employed. As indicated, most households constituted of 1-2 members who were employed (67.2%; n=242).

Table 4. 4: Number of household members, number of employed members and number of household sources of income (n=360)

Variables	All households (n=360)	
	Frequency (n)	Percentage (%)
No. of household members		
1-3 members	101	28.1
4-6 members	181	50.3
7-9 members	74	20.6
>9 members	4	1.1
Total	360	100
No. of Employed members		
No members	83	23.1
1-2 members	242	67.2
3-4 members	28	7.8
5-6 members	6	1.7
>6 members	1	3
Total	360	100
Total no. of sources of household income		
1 source of income	248	68.9
2 sources of income	96	26.7
3 sources of income	16	4.4
Total	360	100

With regards to total number of income sources, majority of the households had 1 source of income (68.9%; n=248), followed by those with 2 sources of income (26.7%; n=96) and 3 sources of income (4.4%; n=16), as indicated in **Table 4.4**.

4.3.3 Household structure, access to land and experience in agriculture

Results on household structure, land access and experience in agriculture are presented in **Table 4.5**. The majority (89.5 %; n= 322) of households in this study owned formal structures while the rest were renting (7.2%; n= 26) and 3.3 % (n=12) owning informal structures. Similarly, majority 84.2% (n= 303) of the participants had access to land with only 15.8% (n=57) participants who did not have access to arable land. Lastly, majority of the participants had an experience in agriculture (80.8% n=291) while 19.2% (n=69) did not have experience in agriculture.

Table 4. 5: Household structure, access to land and experience in agriculture (n=360)

Variable	All households (n=360)	
Household structure	Frequency (n)	Percentage (%)
Formal (Own)	322	89.5
Informal (Own)	12	3.3
Renting	26	7.2
Total	360	100
Access to land		
Yes	303	84.2
No	57	15.8
Total	360	100
Experience in agriculture		
Yes	291	80.8
No	69	19.2
Total	360	100

4.4 THE EXTENT OF FOOD GARDENING IN THE STUDY AREA

These results are presented to show the extent of gardening between the two groups namely: food garden participants and non-food garden participants.

The current study as illustrated in **Figure 4.1**, revealed that food gardening was prevalent in the study area, with garden participants and non-garden participants constituting 72.5% (n=261) and 27.5% (n=99) respectively.

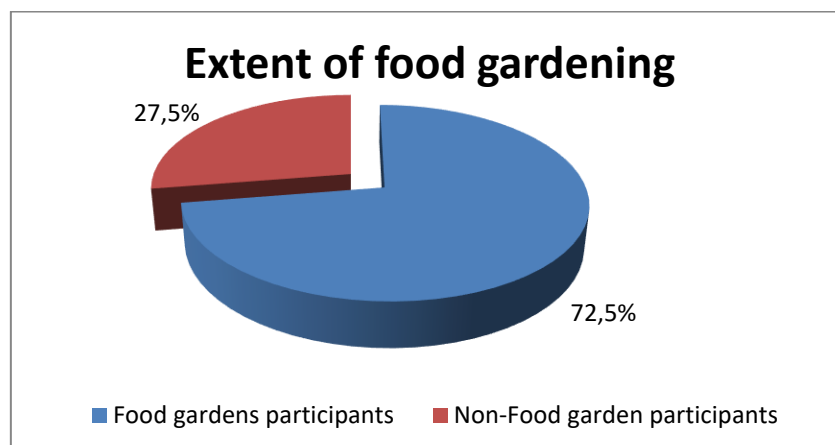


Figure 4. 1: Extent of food gardening

4.4.1 Differences in demographic information of food garden participants and non-Food garden participants.

The differences in demographic information are presented using the same sub-heading that was adopted under section 4.2.

- i. Race and gender disparities between participants of food gardens and non-participants of food gardens.

With regards to disparities between owners of food gardens and non-food garden owners, the results (**Table 4.6**) showed that the proportion of females participating in food gardens and those that were not participating constituted 69.7% (n= 182) and 67.7% (n= 67) respectively. There were also more males (32.3%; n=32) within the group that did not own food gardens than those who owned food gardens (30.3%; n=79).

Table 4. 6: The extent of food gardening between food gardeners and non-food gardeners by race and gender of the participants

Variable	Food gardens participants (n=261)		Food gardens non- participants (n=99)	
	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
Race				
African	259	99.2	98	99.0
Coloured	2	0.8	1	1.0
Total	261	100	99	100
Gender				
Male	79	30.3	32	32.3
Female	182	69.7	67	67.7
Total	261	100	99	100

- ii. Age, marital status and education level disparities between food gardens participants and non-garden participants.

Of the 21.1% (n=76) participants that were below 40 years (**Table 4.2**), only 14.6% (n= 38) were participating in food gardens (**Table 4.7**). Most participants (54%; n= 141) of those that owned food gardens belonged to 41–60-years age group, followed by 31.4% (n= 82) participants who were the above 60 years of age.

Table 4. 7 : The extent of food gardening between food gardeners and non-food gardeners by age, marital status and educational level of the participants

Variable	Food gardens participants (n=261)		Food gardens non- participants (n=99)	
	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
Age				
18-30	7	2.7	11	11.1
31-40	31	11.9	27	27.3
41-50	63	24.1	17	17.2
51-60	78	29.9	19	19.2
61-70	65	24.9	11	11.1
71-80	15	5.7	9	9.1
Over 80	2	0.8	5	5.1
Total	261	100	99	100
Marital Status				
Single	145	55.6	51	51.5
Married	74	28.4	24	24.2
Divorced	26	10.0	5	5.1
Widow	14	5.4	9	9.1
Cohabiting	2	0.8	10	10.1
Total	261	100	99	100
Educational level				
No formal education	16	6.1	14	14.1
Primary school	70	26.8	16	16.2
High school	154	59.0	47	47.5
Tertiary	21	8.0	22	22.2
Total	261	100	99	100

As observed in the preceding section, food gardens participants consisted of more (55.6%; n= 145) participants that were single when compared to the group that was not involved in food gardening (51.5%; n=51). However, of the widowed group, those that did not participate in food gardens was slightly higher (9.1%; n= 9) than those who participated (5.4%; n=14) in food gardens.

In terms of distribution between the two groups, a large proportion (59.0%; n=154) of garden participants had high school education, followed 26.8% (n= 70) respondents with primary

school education. Non-participants of food gardens had more respondents with tertiary education (22.2%; n= 22) and those without any form of education (14.1; n=14) than their counterparts.

4.4.2 Differences in socio-economic information between food garden participants and non-food garden participants.

The differences in socio economic information are presented using the same sub-heading that were adopted under 4.2.

- i. Employment status, total monthly income and sources of income disparities between food garden participants and non-food garden participants.

Most participants that were in full time employment did not participate in food gardens (42%; n=42), while most unemployment participants (50.6%; n=132) owned food gardens in this study (**Table 4.8**). Furthermore, with regards to monthly income, most participants (31.3%; n= 31) that were earning between R2000- R3000 did not have food gardens compared to 28.7% (n=75) in this group that had food gardens. In the low-income group of less than R1000 per month, most participants (7.1%; n=7) did not own food garden. Only the income bracket of R1000-R2000 consisted of more participants who owned food gardens when compared to those that did not own food gardens.

However, there were more households who indicated social welfare grants as their source of income within the food gardening participating households (37.55; n=98) than non-gardening participating households (25.3%; n=25). Additionally, most households who indicated wages as a source of income, did not own food gardens (64.8%; n=169) when compared to 83.8% (n=83) households without food gardens in this group.

Table 4. 8: The extent of food gardening between food gardeners and non-food gardeners by employment status, total monthly income and sources of income

Variable	Food gardens participants (n=261)		Food gardens non- participants (n=99)	
	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
Employment status				
Unemployed	132	50.6	40	40.4
Employed Part-time	55	21.1	17	17.2
Employed Full-time	74	28.4	42	42.4
Total	261	100	99	100
Total monthly income				
>R1000	16	6.1	7	7.1
R1000-R2000	73	28.0	19	19.2
R2001-R3000	75	28.7	31	31.3
R3001-R4000	47	18.0	21	21.2
R4001-R5000	24	9.2	11	11.1
Over R5000	26	10.0	10	10.1
Total	261	100	99	100
Sources of income				
Wages	169	64.8	83	83.8
Pension	60	23.0	26	26.3
Family business	7	2.7	1	1.0
Informal income	12	4.6	3	3.0
Social welfare grants	98	37.5	25	25.3
Remittances	0	0	0	0
Total	261	100	99	100

- ii. Number of household members, number of employed members and total number of households source of income disparities between participants of food gardens and non-garden participants.

The results on number of household members, number of members employed and number of sources of household income are presented in **Table 4.9**. More than half (53.5%; n=53) of non-gardening households had 1-3 members. Only 18.4% (n=48) participants in this group (households with 1-3 members) had food gardens. However, as the number of family members increased, the interest in food gardening also increased. For example, most households with 4-6 members and those with 7-9 family members owned food gardens. All the members with more than 9 family members owned food gardens.

With regards to the number of employed members (**Table 4.9**), there were more households (26.4%; n=64) with no employed family members that were involved in gardening. Furthermore, within the households that consisted of 1-2 employed members, most households (75.8%; 75) were not involved in gardening compared to their counterparts. The results also showed that households who had one source of income were more involved in food gardening (70.9; n=185). There were also fewer households (24.5%; n=64) involved in gardening amongst the group that had 2 sources of income in comparison to the 32.3% (n=32) that did not engage in gardening in this group.

Table 4. 9: The extent of food gardening between food gardeners and non-food gardeners by number of household members, number of employed members and number of sources of income

Variables	Food gardens participants (n=261)		Food gardens non-participants (n=99)	
No. of household members				
	Frequency (n)	Percentage (%)	Frequency(n)	Percentage (%)
1-3 members	48	18.4	53	53.5
4-6 members	145	55.6	36	36.4
7-9 members	64	24.5	10	10.1
>9 members	4	1.5	0	0
Total	261	100	99	100
No. of Employed members				
No members	69	26.4	14	14.1
1-2 members	167	64.0	75	75.8
3-4 members	21	8.0	7	7.1
5-6 members	4	1.5	2	2.0
>6 members	0	0	1	1.0
Total	261	100	99	100
Total no. of sources of household income				
1 source of income	185	70.9	63	63.6
2 sources of income	64	24.5	32	32.3
3 sources of income	12	4.6	4	4.0
Total	261	100	99	100

iii. Household structure, access to land and experience in agriculture disparities between participants of food gardens and non-garden participants.

As indicated in **Table 4.10**, majority of households (93.5%; n=244) with formal structures were involved in gardening. Moreover, most of those that were either renting the dwelling (16.2%; n=16) or had an informal structure (5.1%; n=5) did not own food gardens.

With regards to access to arable land, majority (98.5%; n=257) of those that participated in gardening had access to arable land. Most respondents (53.5; n=53) that did not own food gardens did not have access to land. Of those who have food gardens, majority (98.5%; n=257) had experience in agriculture, while most respondents (58.6%; n=58) who did not have agricultural experience were without food gardens.

Table 4. 10: The extent of food gardening between food gardeners and non-food gardeners by household structure, access to land and experience in agriculture

Variable	Food gardens participants (n=261)		Food gardens non- participants (n=99)	
	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
Household structure				
Formal (Own)	244	93.5	78	78.8
Informal (Own)	7	2.7	5	5.1
Renting	10	3.8	16	16.2
Total	261	100	99	100
Access to land				
Yes	257	98.5	46	46.5
No	4	1.5	53	53.5
Experience in agriculture				
Yes	250	95.8	41	41.4
No	11	4.2	58	58.6
Total	261	100	99	100

4.4.3 Status of small-scale food gardens in the study

As mentioned in section 4.4, 72.5 % (n=261) of the participants were involved in food gardening, therefore this section is presenting the status of the food gardens in the study.

i. Classification of food gardens

The types of food gardens in the study were categorized into two groups, namely, homestead food garden and community gardens. Of those who were involved in food gardening, 84.7% (n=221) were homestead gardeners and 15.3% (n=40) were involved in community gardens (Figure 4.2).

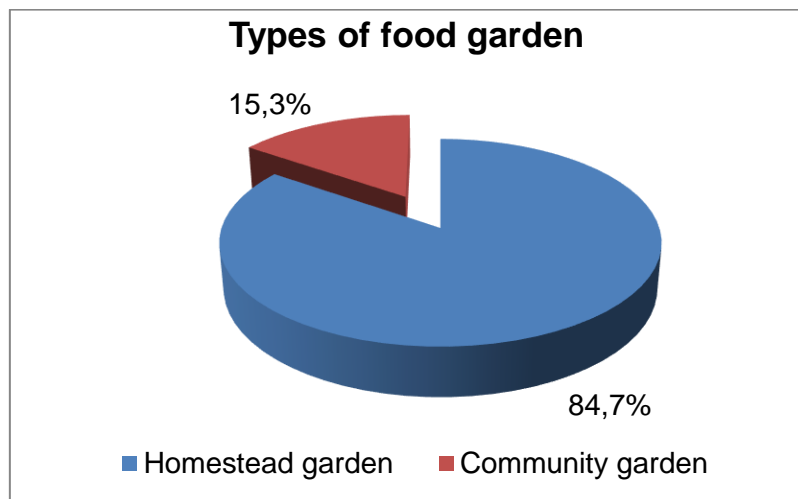


Figure 4. 2: Types of food gardens

ii. Distribution of food gardens according to reasons for participating in gardening

Figure 4.3 demonstrate the reasons participants were involved in food gardening. Reasons for participating in food gardening included: source of food, improving health and nutrition, and generating income. It was revealed that most households regarded food gardening as a source of food (91.2%; n=238) rather than to improve health and nutrition (14.9%; n=39) or as a way of generating income (6.1%; n=16).

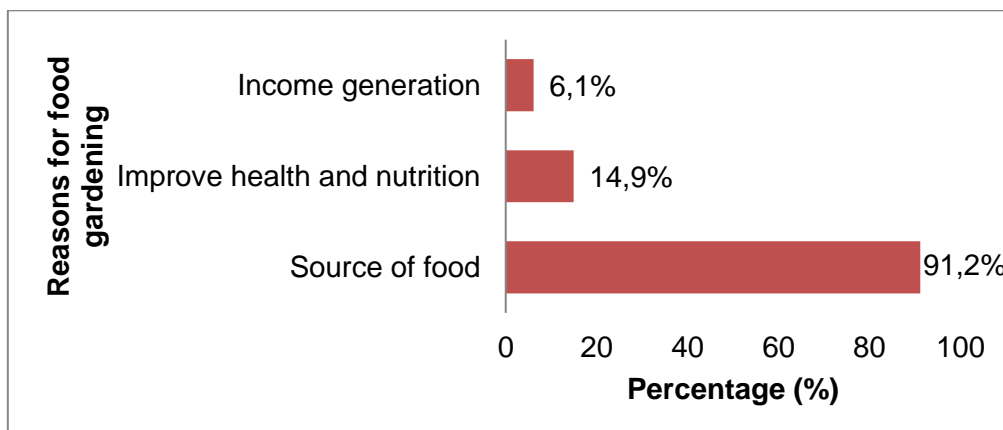


Figure 4. 3 : Reasons for participating in food gardening

iii. Distribution of food gardens according to type of crops

Households cultivated different types of crops; therefore, **Figure 4.4** presents crops that were cultivated by households in the study. Most participants had planted spinach (92.3%; n=241), cabbage (73.9%; n=193), taro tubers commonly known as amadumbe (70.1%; n=183), maize (60.9%; n=159) and beans (50.6%; n=132). Less than half of the study participants had planted onions (47.5%; n=124), beetroot (39.5%; n=103), sweet potato (38.7%; n=101) and carrot (36.8%; n=96). Butternut (23%; n=60), tomato (19.2%; n=50) and banana (5.4%; n=14) were the least grown crops in the study.

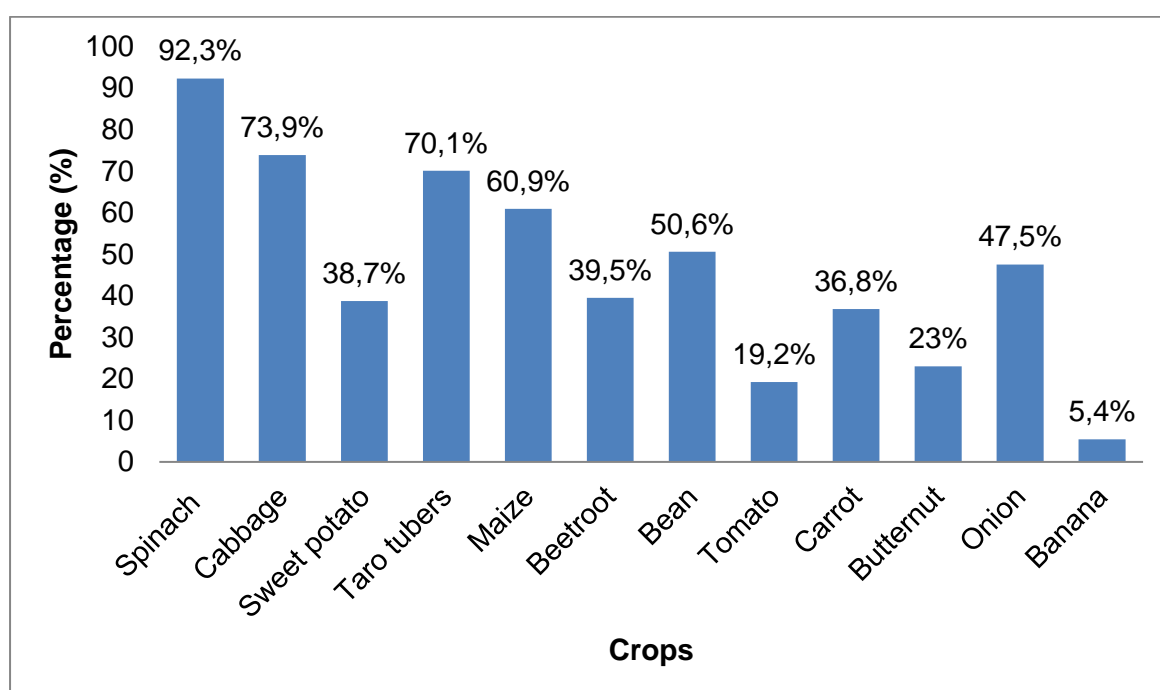


Figure 4. 4: Status of food gardens according to type of crops

iv. Distribution of food gardens according to use of crop and number of active members in food gardening.

Table 4.11 presents the results according to use of crop grown and household members active in gardening activities. Majority of the households were involved in food gardening for food consumption (93.9%; n=245). Only few participants were (1.1%; n=93) selling their produce.

With regards to the number of people active in gardening activities, **Table 4.11** further shows that in majority of the households (93.1%; n=242) less than 4 people within the household

were actively involved in gardening. This is despite the fact that most households in this study consisted of more than 4 members.

Table 4. 11 : Status of food gardens according to use of crops and active members

Variable	Frequency (n)	Percentage (%)
Use of crop		
Household consumption only	245	93.9
Sales only	3	1.1
Household consumption and Sales	13	5.0
Total	261	100
Number of active members		
1-3	242	93.1
4-6	15	5.7
7-9	2	0.8
>9	1	0.4
Total	261	100

- v. Distribution of food gardens according to source of irrigation, marketplace and income made from gardening

Food garden participants were largely dependent on tap water (72.8%; n=190) and rainwater tanks (39.8%; n=104) for irrigation. However, there was only 1.1% (n=3) participants that were not irrigating their crops. Concerning the income made through sales, about 6.1% (n=16) were farming to generate income. Of those, majority were getting an income of less than R500 per month (4.6%; n=12), with only just above 1% who were receiving an income of more than R1000 (1.1%; n=3). As shown in **Table 4.12**, the produce was sold to the community (5.4%; n=14), schools (1.5%; n=4), and tuck-shops (1.1%; n=3). Retails, pension pay-outs and clinics also accounted for 2.4% (n=6) of the marketplaces.

Table 4. 12: Status of food gardens according to source of irrigation, market place and income generated from gardening

	Frequency (n)	Percentage (%)
Variables		
Sources of irrigation		
Taps	190	72.8
Dam	52	19.9
Rain water tanks	104	39.8
Borehole	1	0.4
Spring	1	0.4
No irrigation	3	1.1
Income from gardening/month		
Not selling	245	93.9
<R500	12	4.6
R501-R1000	1	0.4
>R1000	3	1.1
Market place		
Schools	4	1.5
Community	14	5.4
Tuck-shops	3	1.1
Retail	2	0.8
Pension payout	2	0.8
Clinics	2	0.8

- vi. Distribution of food gardens according to activities carried out, applied inputs and challenges encountered.

Table 4.13 presents the activities that were carried out by food gardeners, types of inputs applied, and challenges endured by participants. All participants performed planting and harvesting (100%, n=261) followed by land clearing (99.2%; n=259) and irrigation (98.9%; n=258). Over half performed weeding (52.9%; n=138) and less than a quarter had own nurseries (12.3%; n=32). Fertilizer and manure application were performed by 52.1% (n=136) and 42.9% (n=112) participants respectively. Spraying of pesticides were performed only by 6.9% (n=18) of the participants.

In terms of challenges experienced by gardeners, presence of pests and diseases were most predominant challenge encountered by participants (70.1%; n=183). This was followed by water scarcity (65.1%; n=170) and cost of seeds (10%; n=26). Unfavourable weather

conditions (6.9%; n=18), unavailability of land (5.7%; n=15), lack of implements (4.6%; n=12), infertile soils (3.1%; n=8) and damage by animals (0.8%; n=2) were reported the least.

Table 4. 13 : Status of food gardens according to activities carried out, applied inputs and challenges in food gardening.

	Frequency (n)	Percentage (%)
Activities carried out		
Land clearing	259	99.2
Ploughing	56	21.5
Nursery	32	12.3
Planting	261	100
Weeding	138	52.9
Fertilizer application	136	52.1
Manure application	112	42.9
Irrigation	258	98.9
Ridging	4	1.5
Spraying of pesticides	18	6.9
Harvesting	261	100
Types of input		
Fertilizer	136	52.1
Manure	112	42.9
Chemicals (Pest and Diseases)	18	6.9
Challenges		
Water scarcity	170	65.1
Pest and diseases	183	70.1
Unfavourable weather conditions	18	6.9
Cost of seeds and seedlings	26	10.0
Unavailability of land	15	5.7
Lack of implements	12	4.6
Infertile soil	8	3.1
Damage by animals	2	0.8

4.5 REASONS FOR NOT PARTICIPATING IN FOOD GARDENING

As indicated in section 4.4, 27.5 % (n=99) of the participants were not involved in food gardening therefore the reasons for non-participation are presented in **figure 4.5**. The study permitted multiple responses on this section hence the percentages are exceeding 100. Results revealed that lack of information (34.4%; n=34), not having enough time (29.3%; n=29) and unavailability of land were amongst the most cited reasons for not partaking in food gardening. There were participants who indicated health conditions (18.2%; n=18) as a reason they did not have a food garden. Only 6.1% (n=6) and 4.0% (n=4) indicated lack of water and lack of resources, respectively, for non-participation. About 9.1% (n=9) were not interested in food gardening.

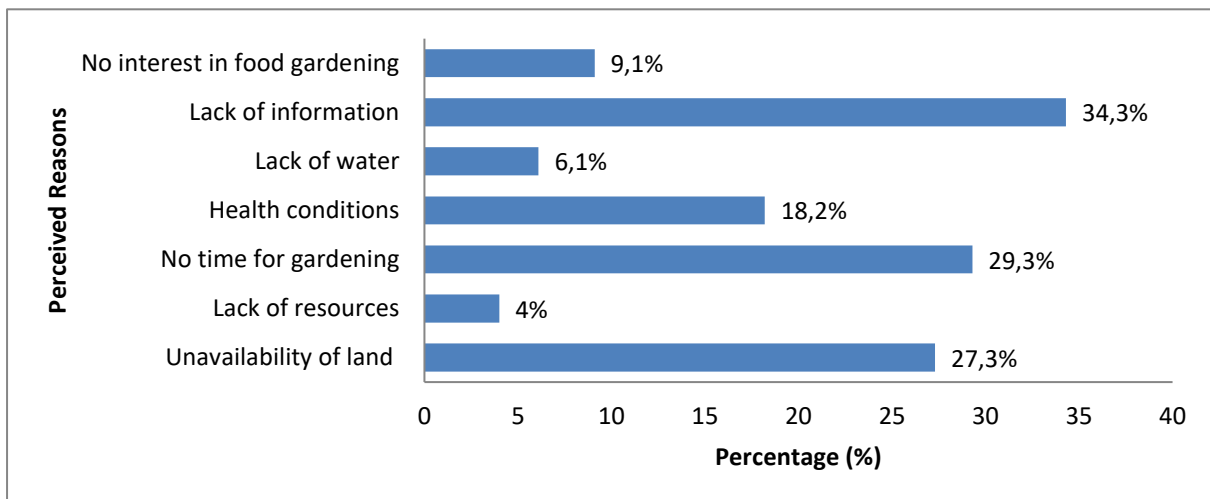


Figure 4. 5 : Distribution of food garden non-participating households according to reasons of non-adoption

4.6 FACTORS ASSOCIATED WITH PARTICIPATION IN FOOD GARDENING

As mentioned in section 3.7.4, a binary logistics regression was fitted to investigate factors associated with participation in food gardening. Since the dependent variable (family practice food gardening) is dichotomous (0 = Yes and 1 = No), the multivariable binary logistic regression model was employed. The equation of the binary logistic regression model is as follows:

$$\ell = \log_b \frac{p}{1-p} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 \dots \dots \dots (1)$$

Where, l is the log-odds; b is the base of the logarithm; and β_i are parameters of the model. The above formula shows that once β_i is fixed, we can compute the log odds that $Y = 1$ for a given observation. Therefore, the logistic regression enables us to compute the probability p that $Y = 1$ given a set of observations ($X_1, X_2 \dots X_i$).

The model building process included performing the univariate analysis to identify independent variables significantly associated with the depended variable at a cut-off point of $p \leq 0.20$. Later, a multivariable binary logistic regression model was fitted using manual backward selection method, using all the variables that are significantly associated with the depended variable in the univariate analysis. Confounders were tested in the model by assessing the measure of association before and after adjusting for a potential confounding variable. A particular variable is confirmed a confounder when the estimated measure of association varies by more than 10%. All confounding variables were kept in the model.

Multicollinearity was assessed by calculating the Variance Inflation Factor (VIF) and tolerance values. All the independent variables had VIFs of less than 3 and tolerance values greater than 0.20. These confirmed that there was multicollinearity was not a problem. The Omnibus test was conducted to evaluate the model's goodness of fit. It was evident from the likelihood ratio chi-square tests that the model with the predictors fits the data more appropriately than the null model [$\chi^2(23) = 222.74; p = 0.00$]. In addition, as depicted in **table 4.14** the Hosmer-Lemeshow test was performed to assess the goodness of fit of the model, and the results showed that the model fit the data well [$\chi^2(8) = 13.89; p = 0.09$]. Statistical significance was assessed at $\alpha = 0.05$.

Table 4. 14: Hosmer and Lemeshow test showing goodness of fit

Hosmer and Lemeshow Test			
Step	Chi-square	Df	Sig.
1	13.89	8	0.09

Table 4.15 below presents Multivariate Analysis of binary logistic regression of the factors associated with participation in food gardening. The results of the binary logistic model revealed that three (3) out of eight (8) chosen independent variables (number of household members, access to land and agricultural experience) were statically significant at 5% level

($p < 0.05$) while two (2) (marital status and level of education) were marginally significant at 10% level ($p < 0.10$) of significance.

Participants that are divorced were ($p = 0.097$: OR=9.552) likely to be involved in food gardening than those who were single.

With regards to formal education, participants with tertiary education were more likely ($p = 0.070$: OR=6.599) to own food gardens than those with no education.

Accounting for the number of household members, the results showed that the odds of households with 4-6 members to own food gardens is 2.426 times higher than those consisting of 1-3 members. The difference was highly significant. Likewise, the likelihood of those that consisted of 7-9 members to own food gardens was higher ($p = 0.008$: OR=6.126) than the reference group of 1-3 members.

Having access to land was highly significant at ($p < 0.001$: OR=133.882). This means, those who owned land had higher odds of owning food gardens than those without land. Similarly, agricultural experience was highly significant at ($p < 0.001$: OR=12.398), meaning the respondents with agricultural experience were more likely to be involved in food gardening.

Table 4. 15 : Multivariate Analysis of the factors correlated with participation in food gardening

Variables	Coefficients	P value	AOR	95%CI	
	B			Lower	Upper
Constant	-6.716	<0.001	0.001		
Age of household head					
<i>Reference (18-30 years)</i>					
31-40	-0.378	0.714	0.685	0.072	6.482
41-50	0.560	0.634	1.751	0.174	417.609
51-60	0.271	0.819	1.452	0.128	13.397
61-60	0.373	0.775	1.452	0.113	18.638
71-80	-0.060	0.967	0.941	0.053	16.871
>81	-1.234	0.459	0.291	0.011	7.651
Marital status					
<i>Reference (Single)</i>					
Married	-0.183	0.690	0.833	0.339	2.045
Divorced	2.257	0.097**	9.552	0.664	137.425
Widowed	-0.867	0.218	0.420	0.106	1.672
Cohabiting	-1.670	0.244	0.188	0.011	3.121
Level of education					
<i>Reference (No formal education)</i>					
Primary education	0.625	0.361	1.869	0.488	7.153
Matric	1.186	0.121	3.274	0.732	14.631
Tertiary education	1.887	0.070**	6.599	0.855	50.942
Number of household members					
<i>Reference (1-3 members)</i>					
4-6 members	0.886	0.042*	2.426	1.032	5.708
7-9 members	1.813	0.008*	6.126	1.590	23.611
>9 members	19.672	1.000	350234731.78	0.000	
Number of employed household members					
<i>Reference (No members employed)</i>					
1-2 members employed	-0.444	0.430	0.641	0.213	1.934
3-4 members employed	-0.913	0.282	0.401	0.076	2.118
>4 members employed	-25.460	0.999	0.000	0.000	
Dwelling type					
<i>Reference (Formal)</i>					
Informal	1.454	0.236	4.282	0.386	47.462
Renting	1.330	0.246	3.780	0.400	35.691
Access to land	4.897	<0.001*	133.882	017.712	1011.984
Agric experience	2.518	<0.001*	12.398	4.674	32.887

• *Significant at p < 0.05

• ** Marginally significant at p < 0.10

4.7 CONTRIBUTION OF FOOD GARDENS TO FOOD SECURITY

As indicated in section 3.5.1, HFIAS and HDDS were used to assess the food security status of the respondents. The results obtained from both food security measurement tools are presented below.

4.7.1 ASSESSING FOOD SECURITY STATUS BY HFIAS

As mentioned in section 3.5.1.1, HFIAS tool consist of nine standardized frequency questions which are used to assess the prevalence of food insecurity in the preceding 30 days. The nine standardised HFIAS questions were used to compute the the four indicators of food insecurity 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'. Results were presented according to the total surveyed population (n=360) and then variation between the participants (n=261) and non-participants of food gardens (n=99), are also presented in order to compare the results.

i. Household food insecurity access related condition

The nine occurrence conditions were informed by participant's perceptions of food vulnerability and stress, and their behavioural responses to food insecurity. Therefore, the household food insecurity access related condition measured the percentage of households experiencing these conditions at any level of severity, regardless of the frequency of experience.

Table 4.16 revealed that majority of the participant's (70.6%; n= 254) worried about household not having enough food. This was followed by respondents who were unable to eat preferred food (70.3%; n=253); ate limited variety of food (65.6%; n=236); ate undesired food (65.0%; n=234) and those that ate smaller meals (58.3%; n=210). Less than 50% complained about eating fewer meals (46.7%; n=168), not having any kind of food (25.8%; n=93), going to sleep hungry (20.3%; n=73) or go the whole day without food (18.9%; n=68).

Table 4. 16 : Household food insecurity access related conditions for all households (n=360)

HFIAS Questions	No		Yes	
	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
1. Worry about food.	106	29.4	254	70.6
2. Unable to eat preferred food	107	29.7	253	70.3
3. eating limited variety of food	124	34.4	236	65.6
4. eating undesired food	126	35.0	234	65.0
5. Eat a smaller meal	150	41.7	210	58.3
6. Eat fewer meals in a day	192	53.3	168	46.7
7. No food of any kind in the household	267	74.2	93	25.8
8. Go to sleep hungry	287	79.7	73	20.3
9. Go a whole day and night without eating.	292	81.1	68	18.9

With regards to the household food insecurity access related conditions between participants and non-participants of food gardens (**Table 4.17**); the study showed that participants of food gardens had more respondents that responded positively to all nine HFIAS questions than non-participants of food gardens. For example, 78.2% (n=204) respondents worried about not having enough food than 50.5% (n=50) none-participants of food gardens, while 78.2% (n=204) food gardeners were unable to eat preferred food when compared to 49.5% (n=49) non-food gardeners.

Table 4. 17 : Household food insecurity access related conditions variations between food gardeners and non-food gardeners

HFIAS Questions	Food gardens participants (n=261)				Food gardens non participants (n=99)			
	No (F)	(%)	Yes (F)	(%)	No (F)	(%)	Yes (F)	(%)
1. Worry about food.	57	21.8	204	78.2	49	49.5	50	50.5
2. Unable to eat preferred food	57	21.8	204	78.2	50	50.5	49	49.5
3. eating limited variety of food	70	26.8	191	73.2	54	54.5	45	45.5
4. eating undesired food	69	26.4	192	73.6	57	57.6	42	42.4
5. Eat a smaller meal	87	33.3	174	66.7	63	63.6	36	36.4
6. Eat fewer meals in a day	127	48.7	134	51.3	65	65.7	34	34.3
7. No food of any kind in the household	192	73.6	69	26.4	75	75.8	24	24.2
8. Go to sleep hungry	207	79.3	54	20.7	80	80.8	19	19.2
9. Go a whole day and night without eating.	211	80.8	50	19.2	81	81.8	18	18.2

ii. Household food insecurity access- related domains

Using the nine HFIAS standardized questions the households were further classified into three domains based on the prevalence of households experiencing one or more behaviours in each of these domains (i) The judgements of uncertainty or anxiety about food stocks in the household (addressed by question 1); (ii) Feelings that household's food is of insufficient quality and food type preference (addressed by question 2–4); and (iii) Insufficient food intake and its physical consequences (addressed by questions 5–9).

As shown in **Figure 4.6**, majority of participants experienced insufficient food quality (70.8%; n=255) and anxiety or uncertainty concerning food stock (70.6%; n=254). Insufficient food intake and its physical consequences was experienced by least number (58.1%; n=209) of participants in this study.

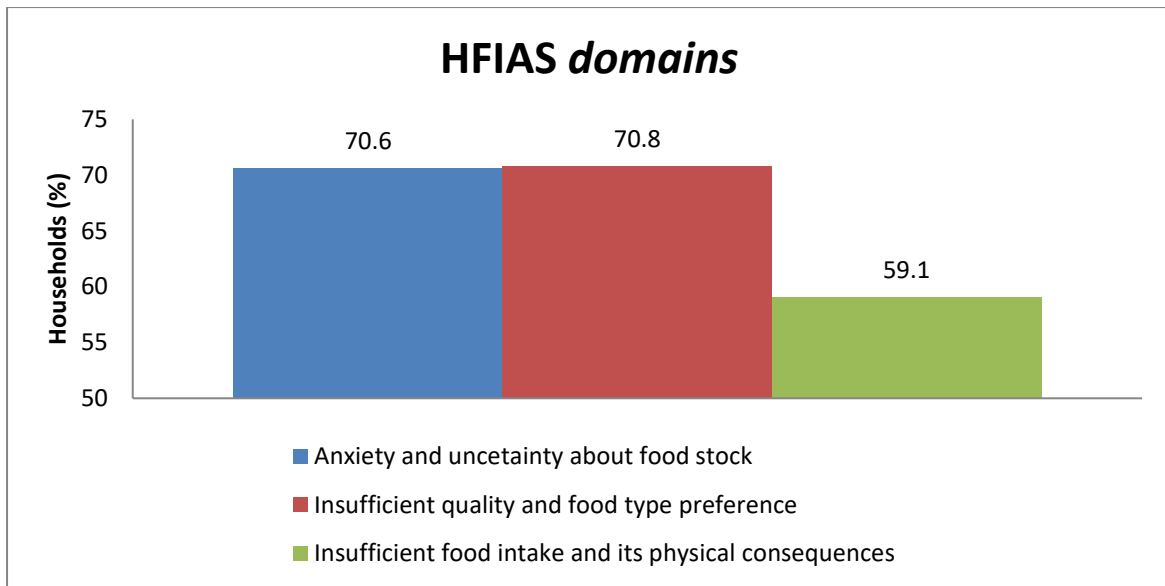


Figure 4. 6 : Presentation of HFIAS domains according to all households

When comparing the participants having food gardens and those that do not have food garden **Figure 4.7**, the results revealed that participants with food gardens dominated in all three domains. There were over 27% more participants experiencing insufficient quality and food type preference and anxiety and uncertainty about food stock amongst food gardeners than in non-food gardeners. Likewise, 65.9% (n= 175) gardeners experienced insufficient food intake when compared to 37.4% (n=37) of the participants who were not involved in food gardening.

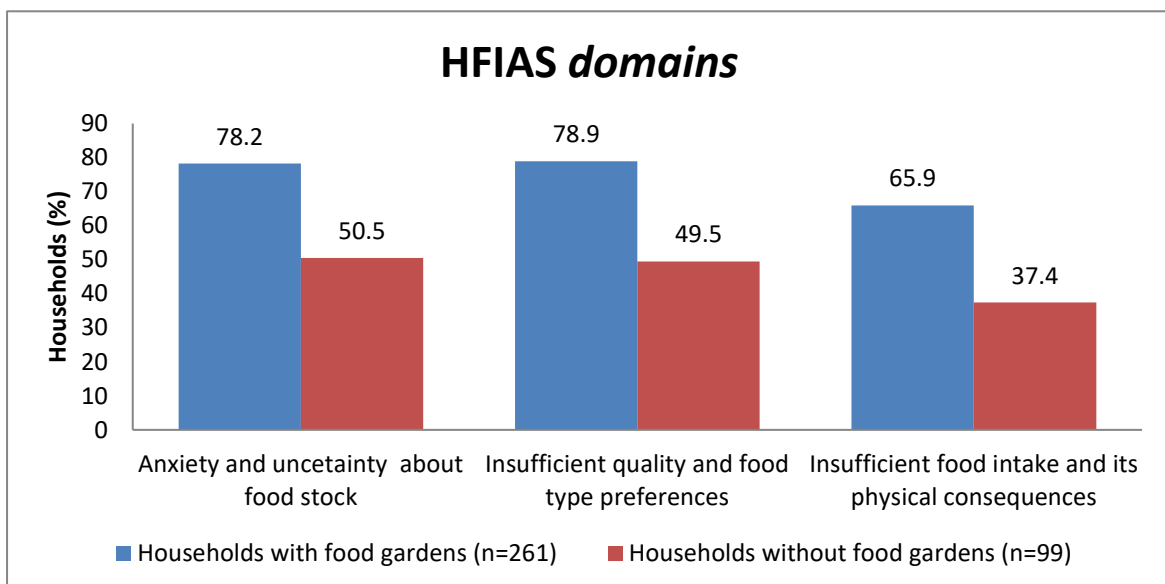


Figure 4. 7: Presentation of HFIAS domains according to food gardens participation

iii. Food Insecurity Access Scale Score

The HFIAS score was calculated for each household by summing the codes of each frequency of occurrence question. The score indicated the level of food insecurity in the past 30 days. Firstly, the frequency of occurrence was coded as 0 for all cases where the answer to the occurrence question was negative. Frequency of occurrence in a case of a positive response was coded according to these three responses representing a range of frequencies (1=rarely, 2=sometimes, 3=Often). Then, the HFIAS score was calculated for each household by summing the codes represented by these range of frequencies. The lower the score the less food insecurity a household experienced, alternatively the the higher the score (maximum 27) the more food insecurity and access the household experienced. The average HFIAS score of the whole study sample (n=360) was 8.5. (Table 4.18). The mean score variations between participants with food gardens and those without food gardens were 9.4 and 6.2 respectively.

$$\frac{\text{Sum of HFIAS Score in the sample}}{\text{Number of HFIAS score (Household) in the sample}}$$

Table 4. 18: HFIAS mean score

	All households(n=360)	Food gardens participants (n=261)	Food gardens non-participants (n=99)
Frequency (n)	360	261	99
HFIAS sum score	3067	2450	617
HFIAS mean score	8.5	9.4	6.2

i. Household Food Insecurity Access Prevalence

Lastly on the HFIAS indicators is the Household Food Insecurity Access Prevalence. This indicator categorizes households into four levels of household food insecurity (access) using the Household Food Insecurity Access Scale Score as indicated in **Figure 4.8**. Food secure, mildly food insecure, moderately food insecure and severely food insecure households were classified according to households increasingly experiences food access conditions more frequently. Results indicate that most households (40.3%; n=145) were moderately food insecure, followed by food secure households (28.6%; n= 103). There were 18.6% (n=67) participants who were severely food insecure while 12.5% (n=45) were mildly food insecure.

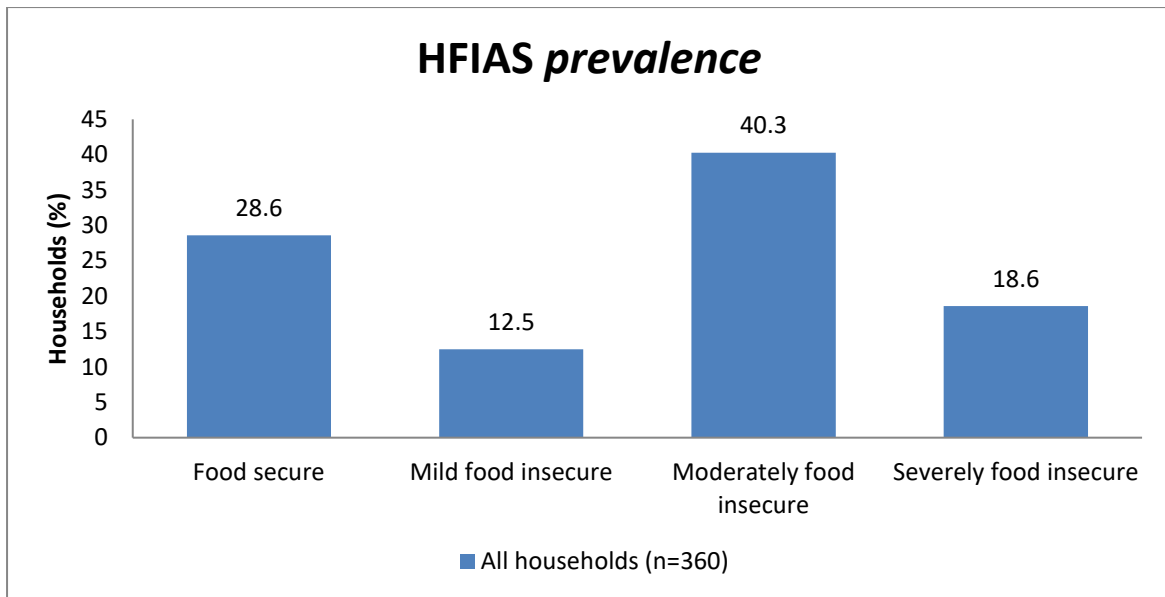


Figure 4. 8: Presentation of HFIAS prevalence according to all households

When comparing the HFIAS categories between the two groups (**Figure 4.9**), those not owning food gardens were more food secure (49.5%; n=49) while there were only 20.7% (n=54) food gardeners that were food secure. Subsequently, nearly half 46.7% (n= 122) of food gardeners were moderately food insecure than 23.2% (n=23) of those participants without food gardens. Similarly, over 4% more participants were severely food insecure in the latter group.

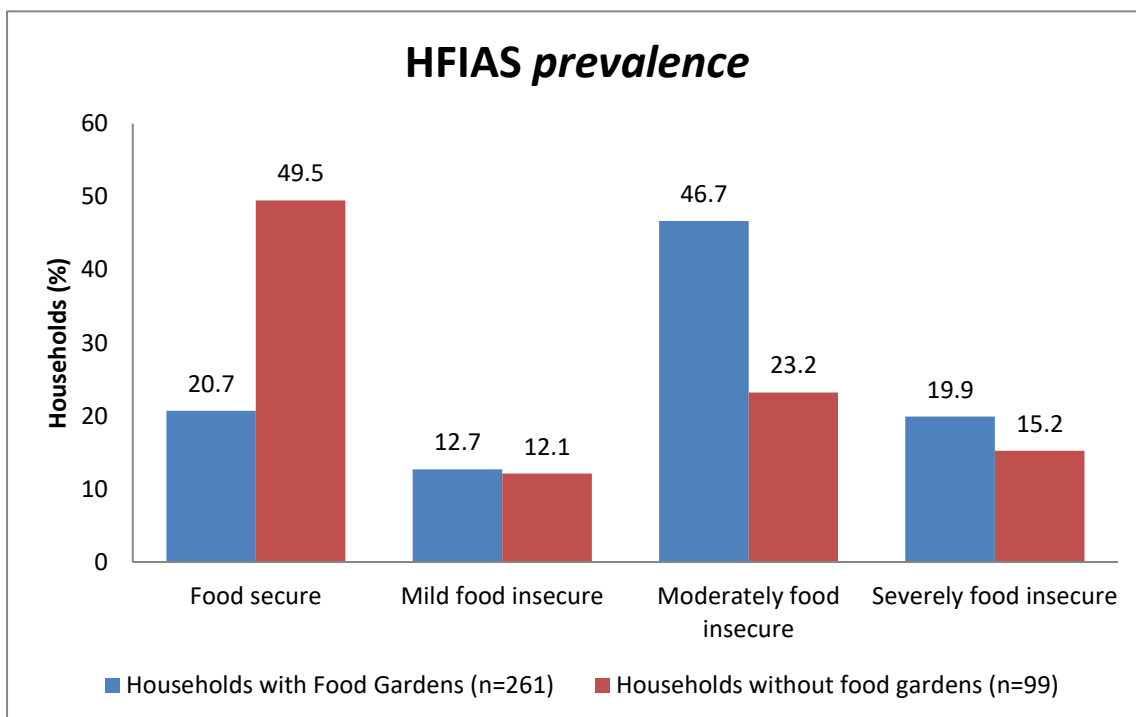


Figure 4. 9: Presentation of HFIAS prevalence according to food gardens participation

4.7.2 ASSESSING FOOD SECURITY STATUS BY HDDS

As indicated in section 3.7.3, HDDS examined dietary diversity based on the set of 12 food groups consumed by households in the last 24 hour-recall period. The set of 12 food groups used to calculate the HDDS were the cereals, root and tubers, vegetables, fruits, meat, poultry, offal, eggs, fish and seafood, legumes and nuts, milk and milk products, oil fats, sugar/honey and miscellaneous. This HDD data was used to indicate the proportions of food groups eaten, determine HDDS and levels as described by Swindale and Bilinsky (2006).

As presented in **Table 4.19**, cereals and sugar were consumed by majority (99.2%;n=357) in the study area followed by vegetables and fats/oils both at 98.1% (n=353). Also, coffee/tea (96.9%; n=349), tubers (96.4%; n=347), meat (93.1%, n=335), legumes (91.4%; n=329) milk/dairy products(82.2%, n=296), eggs (74.7%; n=269) were most consumed food groups. Fish (32.8%;n=118) was the least consumed by participants of study.

With regards to differences between food garden owners and non-food garden owners, the study further revealed that cereals were popular amongst both groups. However, there were slight differences in the consumption of the following groups with participants with food gardens consumed more tubers (96.6%; n=252), vegetables (98.9%; n=258), meat (95.4%; n=249), eggs (76.2%; n=199), legumes (91.6%; n=239) and sugar (99.6%; n=260). Results further revealed that fruits (91.9%; n=91), fish (47.5%; n=47), milk (90.9%; n=90), oils/fats (99.0%, n=98) and coffee/tea (97.0%; n=96) were consumed most by households without food gardens than those with food gardens.

Table 4. 19: Distribution of households by food groups consumed in the past 24 hours.

Food groups	All households (n=360)		Food gardens participants (n=261)		Food gardens non- participants (n=99)	
	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
Cereals	357	99.2	258	98.9	99	100.0
Tubers	347	96.4	252	96.6	95	96.0
Vegetables	353	98.1	258	98.9	95	96.0
Fruits	319	88.6	228	87.4	91	91.9
Meat	335	93.1	249	95.4	86	86.9
Eggs	269	74.7	199	76.2	70	70.7
Fish	118	32.8	71	27.2	47	47.5
Legumes	329	91.4	239	91.6	90	90.9
Milk	296	82.2	206	78.9	90	90.9
Oil/fats	353	98.1	255	97.7	98	99.0
Sugar	357	99.2	260	99.6	97	98.0
Coffee/tea	349	96.9	253	96.9	96	97.0

i. Presentation of HDDS results according to dietary diversity levels

The score range of 0-12 was computed to get the distribution of households by level of dietary diversity. The HDDS was then categorical coded into three dietary diversity levels. A score of 1-3 was classified as low dietary diversity, 4-5 medium dietary diversity and 6-12 high dietary diversity as explained by Swindale and Bilinsky (2006) and previous regional studies (Sambo et al., 2022; Ngema et al., 2018; Getaneh et al., 2022).

Table 4.20 indicate that the dietary diversity score of all households was generally high (99, 4 %; n=358) and only 0.6 % (n=2) of households had medium HDDS. There were no households that had a low diversity dietary score in this study. Furthermore, there was no significant difference between food garden (99.6%; n=260) and non-food garden participants (99.0%; n=98) in terms of the HDDS as the majority of both groups had high HDD score. As indicated in **Table 4.21**, the average HDDS for food garden participants was 10.4 and 10.6 for food garden non-participants. The average HDDS for all households was 10.5; meaning each household in the study consumed an average of almost 11 food groups in the past 24 hours. This indicates that households had a high dietary diversity.

Table 4. 20: Presentation of the households by levels of household dietary diversity

HDDS Level and Score range	All households (n=360)		Food gardens participants (n=261)		Food garden non- participants (n=99)	
	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
Low (≥3)	0	0	0	0	0	0
Medium (4-6)	2	0.6	1	0.4	1	1.0
High (6-12)	358	99.4	260	99.6	98	99.0
Total	360	100	261	100	99	100

HDDS= $\text{Sum} [(Food\ group) A + B + C + D + E + F + G + H + I + J + K] = 3780$

$$\text{Evarage HDDS} = \frac{\text{Sum (HDDS)}}{\text{Total number of household surveyed } 360 (n)} = \frac{3780}{360} = 10.5$$

Table 4. 21: Presentation of the households by HDD Score

HDDS	All households (n=360)	Food garden participants (n=261)	Food garden non- participants (n=99)
Sum	3780	2728	1052
Average HDDS	10.5	10.4	10.6

CHAPTER 5: DISSUSSION OF RESULTS

5.1 INTRODUCTION

The purpose of this chapter is to discuss the results of the study as presented in chapter 4. The discussion of the results is presented according to the subsections of the preceding chapter in order to address each objective of the study.

5.2 DEMOGRAPHIC INFORMATION OF THE PARTICIPANTS

Demographic information of the participants is discussed under the following headings; race, gender, age, marital status and educational level.

5.2.1 Race and gender of the household head.

Race of the participants were included in the study to show racial differences in the study area. The results revealed that the majority of the participants were African (99.2%; n=357) while only 0.8% (n=3) were classified as coloureds. These results were consistent with the findings obtained by Ningi et al., (2021) in Hamburg and Melani, Eastern Cape. The predominance of Africans in this study is influenced by the municipal statistics where Africans are regarded as dominant by a huge margin of 82% at Ray Nkonyeni (Ray Nkonyeni Municipality IDP, 2022).

Nationally, the proportion of male and female-headed households is almost equal (Cheteni et al., 2020). However, this study revealed that there were more female-headed households (69.2%; n=249) than males (30.8%; n=249). According to Tibesigwa & Visser (2016), in South Africa female-headed households stands at 41.9% and are considered the highest among other African countries. Similar findings were also indicated by Ningi et al., (2021) where female-headed households constituted more (70.7%) of the total study population compared to males (29.3%). Cheteni et al., (2020) came to the same conclusion of female-headed households' dominance (87%) in the Eastern Cape and articulated that males usually migrate to urban areas leaving their female partners and wives to run the households. Santos et al., (2022) found the proportion of unemployment higher within the female-headed households in Peru. Wage gap was also identified in Europe where males earn more than females and thus making females more at risk of experiencing food insecurity (Grimaccia & Naccarato, 2020). While Silvestri et al., (2015) suggest that food insecurity may not be more severe in female-

headed households than male-headed households, Santos et al., (2022) reported that food insecurity severity tend to increase in those households headed by females.

5.2.2 Age, marital status and educational level of the participants.

Age of the household-head was included in the study since this aspect influences the distributions of roles and management practises within the household (Kumba, 2015). Drammeh et al., (2019) and Kumba (2015) regard age of the household-head as an essential factor in decision making for the household, particularly in relation to land use and food security. The overall results of the current study revealed that only 29.7% (n=107) participants were over the pensionable age of 60 years while 21.1% (n=76) were 40 years and below. Nearly half (49.1%; n=177) of the participants were between 41-60 years. In a similar study by Yusuf et al., (2015) in Nigeria, the majority of sampled participants were between the ages of 41-60 years in Oyo State. The authors consider this age group as active working age and willing to adopt innovations that positively affect their productivity and income. Distribution of age categories further revealed that the minority of 5% (n=18) of the household heads were between 18-30 years in the study. This low proportion of household-heads within that age group may be because the individuals are probably away to study in higher education and had not yet established their own households (Kumba, 2015).

With regard to marital status, most participants were single (54.4 %; n=196). These findings are comparable with the findings of Mbhatsani et al., (2021) who found that more participants in Limpopo province were single (61.6%) compared to 38.4% that were married. Akukwe (2020) noted that single and unmarried people tend to be more food secure because of their smaller household sizes and fewer people to feed. However, these results were contrary to the findings of Tantu et al., (2017), who revealed that the larger proportion of 78.7% in the study conducted in Wolaita Sodo town were married compared to just 1% that were single. In harmony, Sambo et al., (2021) and Ngema et al., (2018) discovered married participants to be the majority in Nkomazi local municipality (49.9%) and in Maphumulo local municipality (51%), respectively. This trend was also observed in western Sudan region and in Sri Lanka where over 77.8% and 90% participants were married, respectively (Ibnouf, 2011; Gunawardhana & Ginigaddara, 2021). The proportion of married households in this study was 27.2% (n=98). Yusuf et al., (2015) concluded that households where household-head is married and employed is more food secure than households, which are headed by single, widowed, divorced or separated individuals. This is likely because in married household heads are associated with more than one income earner and therefore are more likely to contribute to household income than households headed by unmarried individuals (Kumba, 2015).

More than half (55.8%; n=201) of participants in this study had high school education. This means, a large proportion of households did not have college education. These results are considered low in the literature (De Cock et al., 2013). This is because reports seem to suggest that chances of employment are greater for those with tertiary education when compared to individuals with matric (Business Tech, 2021). In addition to this, this low educational level is often associated with food insecurity (Drammeh et al., 2019). This could be attributed to the fact that education plays a crucial role in knowledge regarding food habits, nutrition and households' sanitation (Gunawardhana & Ginigaddara, 2021). These results are similar to those observed by other authors in the country (Mcata 2019; Modibedi et al., 2021; Sambo et al., 2022). Low educational levels in the country could be attributed to lack of resources, lack of funding from government to support education and under qualified teachers (du Plessis & Mestry, 2019).

5.3 SOCIO-DEMOGRAPHIC CHARACTERISTICS

Socio-economic factors of the participants are presented and discussed under the following headings: employment status of the household head, total monthly income, sources of income, number of members of the households, number of employed members, number of sources of income, the household structure, land access and agricultural experience.

5.3.1 Employment status, total monthly income and sources of income.

The results of this study revealed that unemployment was high, with 47.8% respondents that were unemployed. These findings are in agreement with those that were reported by Dodd & Nyabvudzi (2014) in the Eastern Cape, who found unemployment to be prevalent standing at 54%. Ngema et al., (2018) who obtained 99% unemployment levels in Maphumulo Local Municipality associate these results with the national unemployment trend that is currently experienced in South Africa.

Poverty is said to be the primary factor that hinders access to adequate food among households with low income (Drammeh et al., 2019). Therefore, household income is a great deterrent of food security and dietary diversity. Majority of households (74.2%, n=266) in the study were earning between R2001-R4000. Although this income bracket is slightly higher than the one reported by Maponya et al., (2021) where most households fell in the income level of R1001-R2500, this income is still considerable low especially the rising cost of living in South Africa. For example, Crush et al., (2018) found that households comprising of 4 members in Cape Town are already spending an average of R1742 monthly on food and

groceries excluding other major expenses such as municipal services (Water and electricity), sanitation, rent, education and health. Additionally, Mazenda & Mushayanyama (2021) reported that low-income households in the City of Tshwane with 4 members are already spending an average of R1642 monthly on food expenditure on an average income of R8322 per month. Therefore, this implies that some households in the present study are either unable to afford other household expenses or they have to cut down on food expenditure in order to accommodate other household expenses.

Despite unemployment rate standing at 47.8% (n=172) in this study, findings showed that most participants were depending on wages for income (70%; n=252). This suggests that some participants who were in temporary employment did not regard that as either full-time or part-time employment. Temporary employment in the study may include the Extended Public Works Programme (EPWP) and other temporary work that occurs during a specific season. Similarly, Mcata (2019) found salaries and wages to be the dominant source of income over social welfare grant and retirement pensions. Another study depicted the similar results, revealing wages as a main income of the household-head (53.5%) in Tembisa Township (Mojela et al., 2018).

5.3.2 Number of household members, number of employed members and total number of households sources of income.

Drammeh et al., (2019) noted that sharing of limited foods within the family members was one of the challenges within the food insecure households. For that reason, household size was then explored in this study. It was found that most households (50.3%; n=181) comprised of 4-6 members. Tantu et al., (2017) found similar results, where about two thirds (66%) of the households in South-West Ethiopia had 4-6 members. Farhadian et al., (2015) in Sabah Malaysia also concluded that among the participants, majority of them had an average of 4-5 members in the household. Therefore, the household size of this study was regarded as average.

According to Musemwa et al., (2015) a household is only financially better off if the members of the household are employed and earn some income. In this study, 23.1% (n=83) households had no one employed. This is a group that is most worrying where food security is concerned. This is also compounded by the low-income levels in this study. Unemployed households struggle to meet their food demands, hence majority of them are largely dependent on social grants (David & Grobler, 2022). However, literature also suggest although social grants are helpful, they that are unable to keep up with the inflation rate, thus making these households to be vulnerable to food insecurity (Musemwa et al., 2015).

Dev et al., (2016) highlighted the importance of income diversification for raising the total household income and food security status. Mcata & Ajuruchukwu (2015) believe income from various sources helps in purchasing of food and other households essentials. However, this study revealed that the majority of the households had only one source of income (68.9%; n=248). Similar results were observed by Dev et al., (2016) in Bangladesh in a study that was conducted amongst the Upazilla, Paba and Mohanpur households in the Rajshahi District. This could have negative implications on total incomes and subsequently buying power of the participants.

5.3.3 Household structure, access to land and experience in agriculture.

Access to land is still a major constraint amongst farming households which was also attributed in this study as one of the reasons some households do not involve in food gardening. However, this study revealed that most (84.2%; n=303) households had access to land within the proximity of their homes. Nengovhela et al., (2022) obtained similar findings in Limpopo Province with majority 84.4% of respondents in their study having access to land. Mcata & Ajuruchukwu (2015) goes on to conclude that households with access to land are more likely to be food secure since they have access to land to use for food production.

Furthermore, it is imperative to note that having access to land is as important as having own formal dwelling structure. Therefore, about 89.5% (n=322) of the households in this study were owning formal structures while 7.2% (n=26) were renting and 3.3% (n= 12) owning informal structures. These findings differ from the South African General Household Survey (GHS), that only a third (33%) of households lived in formal housing while about 31% lived in semi-formal housing and over 36% were owning informal structures (GHS, 2017). The differences could be attributed to the fact the General Household Survey is a nation study, therefore differences are expected at different locations in the country. Furthermore, according to the RNM Integrated Development Plan, a number of housing projects have been initiation to address the housing issues in the study area (RNM, 2022).

A vast majority of participants in the study had an experience in agriculture (80.8%; n=291). This means that participants are knowledgeable in regard to aspects of crop husbandry from land preparation, management to harvesting. This is greatly influenced by the demographic characteristics of the participants particularly age and gender of this study. Moreover, experience in farming influences the participation in food production and home gardening.

5.4 THE EXTENT OF FOOD GARDENING IN THE STUDY AREA

The extent of food gardening between food garden participants and non-food garden participants' results are further deliberated on in this section.

The study revealed that food gardening was prevalent in the study, with food garden participants constituting 72.5% (n=261). These findings are contradicting those of previous studies conducted in other parts of South Africa (Bahta et al., 2018; Oguttu et al., 2021, StatsSA, 2020). For example, Bahta et al., (2018) in their study that was conducted in Gauteng found that more than half (53.2%) of the households were not participating in home food garden. Similarly, Oguttu et al., (2021) found that over 80% of the participants did not own a food garden in Gauteng province. Low participation in agricultural activities is also in line with national trends which have revealed that only 17.5% South African households were involved in agricultural production (StatsSA, 2020). These contradictions suggest that the level of participation in food gardening vary from one place to another and further support the need for area specific studies instead of generalising. The high participation of participants in gardening in this study could be attributed to the reported unemployment rate and good agricultural land in the study area (RNM, 2022). According to literature, food gardens become one of the main livelihood strategies to fight food insecurity by vulnerable households (Rammohan et al., 2019).

5.4.1 Differences in demographic information of food garden participants and non-food garden participants.

The discussion of demographic information is presented below in accordance with the results presented in section 4.4.1

- i. Race and gender disparities between participants and non-participants of food gardens.

This study revealed that females headed households were dominating the food garden participants. These results concurred with previous literature which found that majority of participants of home gardens in KwaZulu-Natal, Eastern Cape and Gauteng province were females (Khumalo & Sibanda, 2019; Mdiya & Mdoda, 2021; Mcata, 2019; Maponya et al., 2021). Literature has shown that females dominate in agricultural activities while men tend to pursue other income generating activities (Khumalo & Sibanda, 2019). In support of this view,

Thamilini et al., (2019) found that less than one third (28%) of the male headed households in Sri Lanka involved in home gardening while others were employed either in the government, private sector or self-employed. The involvement of more women in gardening was expected and encouraging since females have more decision-making power and influence on the household's food related behaviours (Phulkerd et al., 2020).

- ii. Age, marital status and educational level disparities between food gardens participants and non-garden participants.

The age group of the participants ranged between 18 and over 80 years, with a large proportion of food gardens participants being between 41-60 years (54%; n=141). Oguttu et al., (2021) and Bahtu & Owusu-Sekyere (2018), noted that the likelihood of participating in food gardening increases with increasing of age, with older people being more likely to participate in home food garden compared with younger people. Bahtu & Owusu-Sekyere (2018) in the study of homestead food garden programme and land ownership in South Africa noted that the mean age of food garden participants was higher (47 years). Oguttu et al., (2021) also confirmed this, revealing that respondents that were older than 65 years were more likely to own a food garden when compared to younger age group. This was attributed to the fact that older people are usually retired and therefore wants to keep their bodies active (Modibedi et al., 2021). The low representation of people 40 years of age in gardening was not surprising. According to Mcata (2019), this is because young people of that age group are usually employed and often face time limitations to be involve in food gardening.

Concerning marital status of the household head, in this study most respondents amongst the food garden participating group were single (55.6%; n=145). These findings were different from those that are reported in the previous studies (Muroyiwa & Ts'elisang, 2021; Sambo et al., 2021). In Liribe District, Lesotho the authors found that most participants of food gardens tend to be married (Muroyiwa & Ts'elisang, 2021). Sambo et al., (2021), confirmed this, noting that half of agricultural household's head were married. However, the findings are in line with those of the GHS that revealed that most people in South Africa are single (StatsSA, 2021).

The current results also showed that food garden participants were mainly having high school education while the non-participants were dominated by respondents with tertiary education. The high participation of people with low educational levels has been reported in previous studies (Oguttu et al., 2021; Mcata and Obi, 2015). This suggests that food gardening decreases as the educational level increases. According to Tesfamariam et al., (2018), highly educated people are less likely to participate in food gardening because they are able to secure good jobs with high incomes leaving very little time for gardening

5.4.2 Difference in socio-economic information between food garden participants and non-food garden participants

The discussion of socio-economic information is presented below in accordance with the results presented in section 4.4.2

- i. Employment status, total monthly income and sources of income disparities between food garden participants and non-food garden participants.

In this study, unemployed participants were most prevalent (50.6%; n=132) amongst garden owners. Khumalo & Sibanda (2019) in a similar study of the contribution of peri-urban farming to household food security in eThekweni Municipality also revealed that high unemployment was most prevalent in households that were not involved in peri-urban agriculture (65%) when compared to their counterparts. Similarly, almost half (48%) of the gardeners in the Eastern Cape reported that none of their household members were in permanent employment (Roberts & Shackleton, 2018). This was attributed to the fact that unemployed participants stay at home and have more time to work the land in comparison to employed participants who face time limitation (Mcata, 2019). Furthermore, high unemployment results particularly can make households to be extremely vulnerable to poverty and food insecurity (Khumalo & Sibanda, 2019), therefore it is not surprising that they would resort to gardening to mitigate these effects.

Participation in food gardening were inversely correlated to the increase of income. Most participants of food gardens in the study were within the R1000-R4000 income range (74.7%; n=195). However, as the income hierarchy increases the participation in food gardens deteriorated. Grebitus (2021) noted this and concluded that participants with higher income are less likely to be involved in home gardening. This was proven by Ngcaba & Maroyi (2021) where majority of food garden participants were surviving on less than R1000 of income per month. In furtherance to this, Tesfamariam et al., (2018) found that the households average monthly income of food garden non-participants was R3942.61 more than of households participating in food gardens. This shows the huge difference in household income between these two groups.

The study further revealed that there were more households who indicated social welfare grants as their only source of income within the participants of food gardens. This is consistent with the finding of Shisanya & Hendriks (2011) in Maphephetheni uplands where nearly 50% of the food gardeners were depended on social grants as the main source of income.

- ii. Number of household members, number of employed members and total number of households' source of income disparities between participants of food gardens and non-food gardens participants.

Results of this study indicated that as the number of family members increased, the interest in food gardening also increased. Most of the households with 4-6 members (55.6%, n=145) and those with 7-9 members (24.5%, n=64) owned food gardens. Oguttu et al., (2021) also came to the same conclusion indicating that larger households are more likely to own a home food garden compared to the smaller households. According to Grebitus (2021), the reason for this is that larger households are more likely to have a house with a yard where growing of food is more feasible. More than half (53.5%, n=53) of the non-gardening households had the least number of households' members (1-3 members). Similarly, Tesfamariam et al., (2018) found that non-participants in homestead food garden programmes had significantly smaller household sizes of 3 members and below compared to an average of 5 members who tend to be more involved in homestead food garden programmes. In collaboration with these results Oguttu et al., (2021) revealed that households with the least number of people sharing dwelling have the lowest proportion of people engaging in home gardening.

When looking at households with no employed family members in the current study, out of the total of 83 (n=23.1) households, most households (n=69) in this group were involved in gardening. This translates to 77% of this group. Furthermore, within the households that consisted of 1-2 employed members, most households were involved in food gardening. This implies that, not participating in food gardening is associated with the increase in number of employed household members. However, these results contradict with the findings of Yousaf et al., (2018) in a study that was conducted in Pakistan, who found that participants involved in home food production had more household members that are employed. In a study that was conducted in the Eastern Cape, South Africa, this positive relationship between increased number of employed household's members was attributed to the fact that employment enables household members to have more money to spend on agricultural inputs (Nontu and Taruvinga, 2021). However, it can also be argued that being employed leaves very little time for gardening. Time constraints were mentioned as a barrier to food gardening in a study that was conducted by Warner et al., (2017) at Trinidad. In addition to this, literature has revealed home food gardening relies mainly of manual labour due to lack of funds to purchase modern farming tools (Mdiya and Mdoda, 2021).

Again, the number of sources of income is as vital as total number of household members employed. Findings revealed that most households (70.9%; n=185) who had one source of income were more involved in food gardening. This implies that involvement in food gardening

in the study was influenced by the decrease in total number of household's income sources. As alluded to in the above section, these results further suggest that having more than one source of income might have implications on the time availability for food gardening. This was confirmed by Mdiya and Mdoda (2021), in their study that was conducted in the Eastern Cape that as household members get involved in more income earning activities, they tend to neglect home gardening.

- iii. Household structure, access to land and experience in agriculture disparities between participants of food gardens and non-garden participants.

Owning a formal structure, informal and renting the dwelling had an impact on participation in food gardening. As indicated in section 4.4.2.3, the majority (93.5%; n=244) of households with formal structures were involved in food gardening. Only 17% of households that were either renting or living in informal structures were involved in gardening. Oguttu et al., (2021) made similar observations, revealing that the possibility of participants living in rented dwellings to partake if food gardening is low. This suggests that the type of household dwelling greatly influences access to land and subsequent participation in home gardening production.

According to David & Grobler (2021), land access is one of the key factors of production that ultimately determines the involvement of households in gardening. In the current study and majority of those with access to land (98.5%; n=257) participated in gardening, while nearly half (46.5%, n=46) of respondents who were without land did not partake in food gardening. Similarly, Bongiwa & Obi (2015) found that the majority of participants that were involved in food gardening owned land, while the majority that were not participating in growing a garden did not own land. Therefore, having access to cost-effective and efficient land motivates household involvement in food gardens (David & Grobler (2021).

Lastly, the majority of participants that had an experience in agriculture were more involved in gardening (95.8%; n=250), while those without experience in agriculture constituted the majority of non-participants in food gardening (58.6%; n=58). According to Muroyiwa and Ts'elisang (2021) agricultural experience improves the farmers farming skills. This shows that the more experienced the household is in farming the more involvement they become in food production.

5.4.3 Status of small-scale food gardens in the study.

The status of food gardens was derived from the 72.5% (n=261) of the food gardens participants in the study.

i. Classification of food gardens.

Food garden was further classified into homestead and community food gardens. The results indicated that 84.7% (n=221) of those who were involved in food garden were homestead gardeners while the remaining 15.3% (n=40) were involved in community gardens. This revealed that the prevalent of community gardens in the study area was generally low which could be associated with unavailability of land for such establishments.

ii. Distribution of food gardens according to reasons for participating in gardening.

The main reason for participating in food gardening in this study was to use the produce as a source of food. Very few respondents participated in to improve health or generate income. This is characteristic of most food gardens according to previous studies. (Phulkerd et al., 2020; Roberts and Shackleton, 2018). Roberts and Shackleton, 2018 concluded in their study that was conducted in the Eastern Cape, that the primary reason for most people to engage in food garden is to produce food for own consumption. Despite low participation in food gardening in a study by Phulkerd et al., (2020), in a study that was conducted in Thailand, all those that practised gardening did so for household consumption. This was further confirmed by Maponya et al., (2021) where over 84% of the households indicated that gardens were for providing food for the family rather than generating income. This is due to the fact that most of these households, do not have enough money to procure food from the markets hence they resort to own production (Roberts and Shackleton, 2018).

iii. Distribution of food gardens according to type of crops.

The results of this study showed that all households cultivated different types of crops as opposed to monocropping. Majority of over 50% had planted spinach, cabbage, taro tubers, maize and beans while less than half had planted tubers which included onions, beetroot, sweet potato and carrot. Butternut, tomato and banana were least grown crops in the study. Silvestri et al., (2015) noted that crop diversification in food gardening is largely associated with diverse diets and subsequent improvement of household's food security status. All these planted crops are well-known exotic species that are domesticated and cultivated in South Africa (Ngcaba & Maroyi, 2021). Ngarava (2022) found potatoes, maize and sugar beans as commonly planted crops in the Eastern Cape, while Khumalo & Sibanda (2019) reported on cabbage, spinach and sweet potato as widely cultivated in KwaZulu-Natal. Diversity of plants

cultivated is also observed in the United Arab Emirate where tomatoes, pepper, cucumber, carrot, lettuce and eggplant were commonly grown in home gardens (Degefa et al., 2021). This shows that gardeners prefer cultivating different crops according to the location and season of production.

iv. Use of crop and number of active members in food gardening.

Home produced food products are used in various ways as reported by Degefa et al., (2021). Majority of the households (93.9%; n=245) in this study revealed most of the crops produced was consumed in the households with only few respondents (6.1%; n=16) reporting that they sold what they produced. Degefa et al., (2021) found similar results, with only 15% households indicating that they sold their garden produce. Additionally, Tibesigwa & Visser (2016) found similar results where most of the crops that were harvested were kept for household consumption (57.8%) while 30.1% was sold to market. Despite the fact that most households in this study consisted of more than 4 members, findings revealed the few household members were actively involved in gardening. (93.1% n= 242). This suggests that most households in this did not produce surplus, which could explain why most could not sell their agricultural produce.

v. Distribution of food gardens according to source of irrigation, marketplace and income from gardening.

Access to reliable irrigation system is one of the crucial components in home gardening (Tesfamariam et al., 2018). Majority of the households (72.8%; n=190) in the current study depended mainly on tap water as a source of irrigation. These findings are in line with the findings of Ngerava (2022) in Raymond Mhlaba Municipality where close to half of the households use community water taps, households tap and rainwater harvesting (49.5%, 23.4% and 14.2%, respectively) for their home gardens. The use of water taps for irrigation according to Roberts & Shackleton (2018) is due to minimal or no cost for water from communal taps supplied by the local municipalities.

As highlighted by Nkosi et al., (2014), food gardeners often produce surplus produce that is sold to generate income which can be used to buy other basic food stuff. Therefore, of those (6.1%; n=16) who were farming to generate income, most (4.6%; n=12) were getting an income of less than R500 per month with only just above 1% receiving an income of more than R1000 per month (1.1%; n=3). This was slightly lower than the average gross of R917 per month generated from food gardens in a study by Roberts & Shackleton (2018). The low

incomes generated from gardening were attributed to the small land sizes in a study by Sambo et al. (2021), with majority of the participants in their study having less than 3 hectares.

Garden produce in this study was mainly sold to other community members. De Cock et al., (2013) arrived at a similar conclusion revealing that most gardens sell their produce at local informal markets in a study that was done in Limpopo Province.

- vi. Distribution of food gardens according to activities carried out, applied inputs and challenges encountered.

The activities that were carried out by the gardeners included land preparation, ploughing, planting, weeding, application of fertilizer and manure, irrigation, ridging, spraying of pesticides running a nursery and harvest. Nearly half of the respondents in this study did not use fertilizer or manure. This could have adverse effect on the ultimate yields. Carney et al., (2012) found that only a small percentage (12.8%) of the food gardeners in the United States used fertilizer in their gardens. Contrary to this, Tesfamariam et al., (2018) revealed that almost two thirds of food garden participants in a study that was conducted in five different municipalities of the Gauteng province were using nitrogen fertilizer to enhance their production. The low usage of fertilizer in this study could be linked to low employment levels and incomes.

Lastly, spraying of pesticides and chemicals for diseases were performed by at least number of gardeners (6.9%; n=18). This trend was also noted by Carney et al., (2012) in the United State (US) where only 5.1% of food smallholders reported using pesticides in their gardens. While there is evidence of declining of soil fertility and crops becoming weaker due to climate change and extreme weather patterns thus making them more susceptible to pest damage, Andersson & Isgren (2021) in Uganda found that pesticide use in Tororo District remains low despite the alarming call of pest damage in the region. According to Nkemleke (2020) in M'muockngie South-Western Cameroon, pesticides use is vital in crop protection against various pest damage as well as diseases and weeds thus increasing farm productivity. Therefore, limited pesticide use means less protection against harmful pests and low crop productivity per hector (Ibid).

In terms of challenges experienced by gardeners; presence of pest and diseases was predominant (70.1%; n=183). This could be attributed to the low number of participants that were using pesticides in the study.

Water scarcity (65.1%; n=170) was recorded the second major challenge encountered by the food gardeners in the study area. Considering that they relied on communal tap to irrigate their

gardens, this could mean that water supply from those taps was not reliable. Similarly, Rybak et al., (2018) observed water scarcity as the main hindrance to food gardening in Dodoms and Morogoro Tanzania. Additionally, in India, water scarcity was also reported as the main issue in a study that was conducted in West Bengal region.

Contrary to the study by Roberts & Shackleton (2018), damage to crops by animals were only experienced the least number (0.8%; n=2) of participants. In the study conducted in peri-urban areas of eThekweni Municipality, Khumalo & Sibanda (2019) found that in peri-urban agricultural activities the proportion of livestock rearing is lower than that of crop farming, which explains why damage by animals was not significant in the current study.

5.4 REASONS FOR NOT PARTICIPATING IN FOOD GARDENING

When asked about the reason for not participating in food gardens, the non-food garden participating group attributed this to lack of information (34.4%; n=34), limited time (29.3%; n=29) and unavailability of land (27.3%; n=27). Some of these reasons were also noted by Warner et al., (2017) in Trinidad and Tobago and Hazell et al., (2015) in Cape Town. Warner et al., (2017) identified lack of information, lack of commitment and motivation and lack of interest. Hazell et al., (2015) concluded that lack of space was the main constraint deterring informal dwellers in Lavender Hill, Cape Town to engage in household food production.

The significance of reliable and up to date information in increasing agricultural production is well documented in the literature. Communities engaged in agricultural production often require information on crop husbandry, pest and disease control and agricultural market (Phiri, 2018). Kumar et al., (2019), goes on commenting that lack of market information discourages most vegetable farmers wanting to establish their agricultural production. Lack of information has been attributed to lack of extension services (Sharma et al., 2017).

About 9.1% (n=9) of the participants in this study showed no interest in food gardening. Similar observations were noted by Kaur & Sharma (2017), where lack of interest especially among youth in agriculture was identified in Punjab, India. In the current study, most of those participants who were not involved in food gardening was youth between 18-30 years of age. According to Kaur & Sharma (2017), the low participation of youth in food gardening is due to preferences in other professions over agriculture.

5.5 FACTORS ASSOCIATED WITH PARTICIPATION IN FOOD GARDENING

As mentioned in section 3.7.4 of data analysis, the factors associated with participation in food gardening were assessed with the use of a binary logistic regression model. The variables that were included in the model were the age of the participants, marital status, level of education, number of household members, number of employed household members, dwelling type, access to land and experience in agriculture. The findings revealed that out of these eight (8) chose independent variable, three (3) were statically significant at 5% ($p < 0.05$) (number of household members , access to land and agricultural experience) while two (2) (marital status and level of education) were marginally significant at 10% level of significance ($p < 0.10$).

Findings showed a positive relationship between the marital status of the household-head and participation in food gardening. Participants that are divorced were ($p = 0.097$: OR=9.552) likely to be involved in food gardening than those who were single. These results differ from the findings of Tshwene and Oladele (2016) in the North-West Province, South Africa. In their study, it was found that single participants were the majority (36.3%) of the food gardeners compared to only 4.4% that were divorced. According to Adeosun et al., (2020), this is because single headed households' major share of their time are not allocated to taking care of children and other home duties and therefore giving them more opportunity to partake in food gardening. However, according to a study that was conducted in Australia, divorced women were found to be more vulnerable to food insecurity than their single counterparts (Butcher et al., 2019). This could be the reason why divorced households in this study are resorting to home gardening. Food gardens have been linked to increased food supply and subsequent decline in food insecurity (David and Grobler, 2022). In support of this view, divorce was a strong determinant of home gardening in a study that was conducted in Sri Lanka (Mufeeth et al., 2021).

With regards to formal education, participants with tertiary education were more likely ($p = 0.070$: OR=6.599) to own food gardens than those with no education. This is contrary to the findings of Bahta & Owusu-Sekyeer (2018) and Tesfamariam et al., (2018) who discovered that a unit increase in education level will reduce the likelihood of households participating in home gardening. Meaning that more educated household heads are less likely to engage in food gardening. According to Gbedomon et al., (2015) this is because educated household head are often associated with more job opportunities and less time for to allocate to home gardening. However, the findings of this study may be attributed to the fact that people that

are less educated are less exposed to information on the benefits associated with owning a food garden (Mcata, 2019).

Concerning the number of household members, the results showed that the odds of households with 4-6 members and 7-9 members to own food gardens were 2.426 and 6.126 times higher than those consisting of 1-3 members respectively. This concurs with the findings of Bahta et al., (2018), who stated that the higher the number of households' members within the household who can assist in gardening, the higher the likelihood that the household will participate in food gardening.

Having access to land was highly significant at ($p < 0.001$: OR= 0.031). This means that those who had access to land had higher odds of owning food gardens than those without land. These results are corroborated with findings by Nontu & Taruvinga (2021), citing that inaccessible to land could be a barrier to home gardening and participation since households with access to arable land have high probability of participating in home gardening.

Agricultural experience was highly significant at ($p < 0.001$: OR=0.071). This implies that the participants with agricultural experience were more likely to be involved in home gardening. On the other hand, Muroyiwa & Ts'elisanga (2021) found experience in agriculture to be insignificant in food gardening. This means that with or without farming experience, households can improve their food security status by participating in home gardening.

5.6 CONTRIBUTION OF FOOD GARDENS TO FOOD SECURITY

Section 4.7 presented the results obtained from Household Food Insecurity Access Scale (HFIAS) and Household Dietary Diversity Score (HDDS) in order to assess the food security status of the participants. Results are then discussed below in reference to both food security measurement tools.

5.6.1 Food security status based on HFIAS.

HFIAS results are discussed according to the four indicators of food insecurity namely, Household Food Insecurity Access-related Conditions, Household Food Insecurity Access-related Domain, Household Food Insecurity Access Scale Score and Household Food Insecurity Access Prevalence.

i. Household Food Insecurity Access-related Conditions.

Over two thirds of the participants in this study worried about household not having enough food (70.6%; n=254), unable to eat preferred food (70.3%; n=253); ate limited variety of food (65.6%; n=236) and were unable to eat preferred food (65%; n=234) due to adequate resources. These results are somewhat comparable to those of the previous studies (Mota et al., 2019; Tesfamariam et al., 2018). For example, Mota et al., (2019) in their study that was conducted in Damot Gale Woreda, Walaita zone in Southern Ethiopia found that there were over 60% rural households who responded negatively on at least five HFIAS variables namely: worrying about inadequate food, inability to eat preferred food, eating limited variety, eating small quantities and meeting smaller meals per day. Similarly, in Tesfamariam et al., (2018), reported that over 60% respondents worried about inadequate food, unable to eat what they like, limited variety, eating small amount of food and missing meal per day. However, households in Sharpeville, Vaal region of Gauteng Province experienced these conditions at a minimal intensity level (below 50%) compared to households in this study (Oldewage-Theron & Egal, 2021). This may be attributed to age and source of income, as their study comprised of elderly people that are on their pensionable age and receive income (state pension) monthly compared the prevalence of unemployment and minimal income observed in this study.

The number of households reported that they went to sleep hungry or the whole day and night without food in this study was approximately 20%. These are high when considering that those that went to sleep hungry or spent a whole day and night without eating in the study conducted in the Eastern Cape, South Africa and Wolaita Sodo town, Southwest Ethiopia all below 5% (Tantu et al., 2017; Musemwa et al., 2015). However, Tesfamariam et al., (2018) reported higher number with over 40% households giving affirming responses on these HFIAS variables. The differences between different studies were attributed to age, education and marital status in a study by Sambo (2022). It is worth to mention that the last two HFIAS responses are associated with severity of the food security situation (Ruysenaar, 2012) therefore a decreased number of people reporting these is usually welcomed.

Similarly, to Safari et al., (2022) in Ngorongoro, Tanzania, the overall affirmative responses to the nine HFIAS questions decreased with the increasing severity of food insecurity conditions. With regards to the household food insecurity access related conditions between food gardens participants and non-participants in food gardens, the study revealed that participants with food gardens had more respondents that responded affirmative to all nine HFIAS questions than non-participants in food gardens.

ii. Household Food Insecurity Access-related Domain.

This indicator classifies the prevalence of households experiencing one or more behaviours into three domains. These are: the judgements of uncertainty and anxiety about food stocks, feeling that household's food are of insufficient quality and insufficient intake and its physical consequences. As indicated in the results, majority of households (70.8%; n=255) experienced insufficient food quality and food type preference while uncertainty about food stocks was experienced by 70.6% (n=254). Comparing with the other two domains, fewer respondents (59.1%; n=209) were categorised to be experiencing insufficient intake and its physical consequences in the current study. Safari et al., (2022) in Tanzania reported the similar findings with the first two domain experienced by over 70% respondents while insufficient food intake and its physical consequences domain was observed in 55.9% respondents. This also confirms with what was reported by Farhadian et al., (2015) in their study that was conducted in Malaysia, that anxiety and uncertainly domain is usually the most prevalent domain.

With regards to the differences between food garden participants and non-participants, findings revealed that food garden participants dominated in all three domains. This means that food gardens participants experienced more anxiety and uncertainty about food supply (27.7% more), insufficient food quality (29.4% more) and insufficient food intake and its physical consequences (28.5% more) than those not involved in food gardening.

iii. Household Food Insecurity Access Scale Score.

The mean dietary diversity score of the whole sample (n=360) was 8.5. This score was higher than the average score of 6.3 obtained by Tantu et al., (2017). As explained by Coates et al., (2007), the lower the score the less food insecurity a household experienced, alternatively the higher the score the more food insecurity and access the household experienced. Therefore, this suggest that food insecurity was severe this area. Additionally, the food garden participants recorded higher score of 9.4 when compared those that did not participate in food gardens. This implies that food garden participants were more food insecure than food garden participants in this study. Sambo (2022) found a score of 4.2 when he assessed the food security status amongst the beneficiaries of the agricultural program in Mpumalanga. This

implies that when supported food garden do have a potential to reduce the severity of food insecurity.

iv. Household Food Insecurity Access Prevalence.

While 28.6% (n=103) were food secure, results indicate that majority of the households (71.4%; n=271) were food insecure in the current study. This means there were at times unable to acquire enough food for all household members due to insufficient resources and money to procure food (Farhadian et al., 2015). Of the food insecure group, 40.3% (n=145) were moderately food insecure, while others were either severely food insecure (18.6%; n=67) or mildly food insecure (12.5%; n=45). Tuholske et al., (2020) observed similar results, noting that nearly 70% of households in Accra, Ghana were categorized as mildly to severely food insecure. Nour & Abdalla (2021) in Sudan found that more than three quarters of the households (77%) were food insecure. Oldewage-Theron & Egal (2021) associate food insecure group with low educational level in Sharperville, South Africa. According to literature households with educated household-head are less prone to food insecurity (Ningi, et al., 2022). This is because high education level is often associated with high level of income.

Most (49.5%; n=49) of the food secure households did not own food gardens and only 20.7 % (n=54) respondents with food gardens were classified as food secure. This indicates that non-food garden participants were more food secure than food garden participants. Furthermore, there were 4% more participants within the food garden participants than non-food garden participants that were severely food insecure. This is contrary to the findings of Yousaf et al., (2018) who found that that farming households were more food secure than non-farming households. Du Toit et al., (2022), came to the conclusion that home gardens fail to enhance food security when participants are not supported with resources, skills and knowledge.

5.6.2 Food security status based on HDDS.

As indicated in section 3.7.3, the Household Diversity Dietary Score (HDDS) examined the dietary diversity on the set of 12 food groups consumed by households in the last 24-hour recall period. Almost all the food groups; cereals, vegetables, fruits, eggs, tubers, legumes, milk, meat, oil, coffee and sugar were dominating the diets of respondents in this study. The

results are contradictory to those of Mkhize & Sibanda (2022) in the informal settlements of eThekweni Municipality. The latter study found that households only consumed cereals, tubers and foods made with oil or fats. The low consumption of the other food groups such as eggs, seafood, meats, fruits and dairy products was associated with local cultural practices and inability to purchase these food groups (Ibid). The contradictions between these studies are due to socio-economic differences. For example, in a study by Mkhize & Sibanda (2022) there nearly 40% households' heads who were without formal education as opposed to less than 10% in the current study.

Literature suggests that culture could also play a role in low consumption of certain foods. For example, in a study that was conducted in Maasia tribe in Ngorongoro District in Northern Tanzania foods such fish, chicken, eggs, vegetables and fruits were not considered as proper foods and thus labelled as culturally unacceptable despite of their nutritional value (Safari et al., 2022). Similarly, with the Indian society where the majority of people are vegetarians' thus consumption of food such as meat and fish is usually avoided (Sharma et al., 2011).

The high consumption of cereals was not surprising as they are the main staple food for most population groups in South Africa (Khumalo & Sibanda, 2019; Sambo et al., 2022). According to Khumalo & Sibanda (2019), this is because maize meal used for preparing pap and porridge is a popular cultural basic food in South Africa particularly in KwaZulu-Natal. Swanepoel & Van Niekerk (2018) arrived at a similar conclusion in yet another way, noting that households spend more on cereals than any other food in a study that was conducted in informal settlement of Cape Town Metropole, South Africa.

Vegetables dominated diets of the respondents in the current study. This is commendable as vegetables provide nutrients, vitamins and minerals (Jena et al., 2018). Previous studies have however reported low consumption of vegetables (Walsh et al., 2020; Mbwana et al., 2016). Walsh et al., (2020) reported that the percentage of households that consumed vegetables on a daily basis in Lesotho was low. Similarly, Mbwana et al., (2016) in Tanzania confirmed this, revealing that during lean season vegetable consumption is reduced due to unaffordability.

Sugar was highly consumed by 99.2% (n=357) households in the study. Similar results were obtained in Mopani District Municipality, Limpopo Province (Nengovhela et al., 2022). This may be attributed to high consumption of coffee, tea and cereals in the study. Mbwana et al., (2016) observed the similar trends in their study, where the high consumption of sugar was associated with frequency of tea and porridge consumption. However, the consumption of sugar in this study is contradicting with the findings by Sambo et al., (2022) in Nkomazi Local Municipality, South Africa. In their study they discovered that sugar was consumed by less than 50% households. This could be explained by the fact that the current study was

conducted in peri-urban area where access to markets is not a problem whereas the latter study was conducted in a rural area.

Although participants of food gardens participants consumed more tubers, vegetables, meat, eggs, legumes and sugar than their counterparts the differences between these groups were not significant. However, Swanepoel & Van Niekerk (2018) reported that food garden farming households may consume more vegetables, fruits and tubers because they produce them and are readily available from their food gardens. In agreement to this, Magaji et al., (2020) in Nigeria found that most of the participants in Panshekara, Kano State consumed more plant-based food groups (legumes, tuber, fruits and vegetables) than animal food sources.

Only fish was consumed by less than 50% participants in this study despite the study area being a coastal town. In concurrence to this, fish was consumed by a least number of households in Cape Town which is another coastal city (Crush et al., 2018). The low consumption of fish is attributed to unaffordability therefore generally regarded as preserved for high-income group (Crush et al., 2018). These findings were also confirmed by of Magaji et al., (2020) in Kano State, Nigeria. Seafood is costly therefore unaffordable for most low-income households (Mkhize & Sibanda, 2022; Crush et al., 2018).

i. HDDS based on dietary diversity levels.

The HDDS was categorical coded into three dietary diversity levels: low dietary diversity level (1-3 foods groups), medium dietary diversity (4-5 foods groups), and high dietary diversity (6-12 foods groups). As indicated in **Table 4.18**, the dietary diversity score of the households were generally high with most of the households falling into high dietary diversity level (99.4%; n=358). There were no households in this study area that were classified under low dietary diversity level and only a few were classified under medium dietary diversity.

The average HDDS for the population was 10.5, which shows that most households in the study consumed an average of almost 11 food groups in the past 24 hours. This was higher than the average HDDS score of 4.6 and 5.0 that was obtained in Maphumulo municipality and eThekweni municipality in KwaZulu-Natal respectively (Ngema et al., 2018; Khumalo & Sibanda, 2019). This HDDS was also higher than the national HDDS score of 4.2 and the provincial score of 3.7 (Shisana et al. 2014). What could have contributed to this is the season (summer) in which the data was collected. According to Devereux & Tavener-Smith (2019) on the study that was conducted in the Northern Cape Province, South Africa, spring and summer are associated with higher dietary diversity when compared to autumn and winter.

This is because summer months have seasonal employment opportunities, income and food (Ibid). These results were in harmony with the findings of Getaneh et al., (2022) who found that more than half (51.6%) of the households in North-Eastern rift valley of Ethiopia were food secure at high dietary diversity of greater than 6 food groups consumption.

CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

6.1 INTRODUCTION

This chapter presents the conclusions and recommendations based on the overall findings, objectives and the identified hypothesis. The main aim of this study was to assess the impact of small-scale food gardens on household food security in peri-urban areas of Ray Nkonyeni Local Municipality. Therefore, this chapter is structured according to the conclusion on demographics and socio-economics information of the participants and according to four explored (4) objectives of the study. The specific objectives were:

- i. To determine the extent of small-scale food gardening in Ray Nkonyeni Local Municipality
- ii. To investigate the reasons why some households cultivate food gardens and others do not in order to determine the perceived barriers in cultivation of food gardens in the study area
- iii. To investigate the factors associated with participation in food gardens
- iv. To determine the contribution of small-scale food gardens to household food security at Ray Nkonyeni Local Municipality. The chapter further gives recommendations based on the findings on this study.

Hypothesis

Hypothesis was stated as follows:

H_0 = There are no factors that are significantly associated with participation in food gardening in peri-urban areas

6.2 CONCLUSION ON SOCIO-DEMOGRAPHIC INFORMATION OF THE PARTICIPANTS

The study consisted mainly of Africans, middle-aged females. They were single with low educational levels and high unemployment. Household sizes were average with most respondents having low incomes.

An overwhelming majority of the participants owned formal structures and had access to arable land. A vast majority also had an experience in agriculture, meaning they were well informed of the farming techniques and management of agricultural production.

6.3 OBJECTIVE 1: THE EXTENT OF SMALL-SCALE FOOD GARDENING IN RAY NKONYENI LOCAL MUNICIPALITY

Small-scale food gardening was prevalent in the study area, with the number of food gardeners constituting to 72.5% (n=261). Of the food gardeners, the majority were involved in homestead gardening as compared to community gardening. Females were dominant within the food gardening group while males were dominant within the non-food gardening group. Most food garden participants were elderly participants between the ages of 41-60 years, while the age group that were not involved in food gardening were youth between the ages of 18-30. This shows that food gardening was practised most by elderly people compared to youth. More food gardeners had high school education whereas tertiary education was mainly observed amongst the non-food gardening group.

Most participants that were in full-time employment did not participate in food gardening while most unemployed participants were food garden owners. The income bracket of R1000-R2000 consisted of more participants who owned food gardens compared to non-food garden owners, and R2001-R3000 household income consisted of more participants who were non-food gardens owners compared to food garden owners. Results further revealed that non-food garden participants had a better household monthly income compared to their counterparts. There were more households with food gardens that were depending on social welfare grants than households without food gardens, and more households depending on wages within the non-food gardening participants compared to food garden participants. The number of household members within the food garden participating households was generally bigger. This implies that food garden participating households had larger households compared to households without food gardens.

Results further revealed that there were more households with no employed family members that were involved in food gardening. This shows that food gardens non-participants had more employed household members compared to their counterparts. In terms of number of sources of income, the majority of households with food gardens had 1 source of income while most of those without food gardens had 2 or more sources of income. Most households owning food gardens were living in formal structures, while most of those who were either renting or own an informal structure were not involved in food gardening. Majority of the households with food gardens had access to arable land and had an experience in agriculture.

The main reason for participating in food gardens for most households was to use the produce as a source of food as opposed to other reasons. Based on this, it can be concluded that households are not producing enough. The crops that were planted in a descending order of cultivation were the spinach, cabbage, taro roots, maize, bean, onion, beetroot, sweet potato, carrot, butternut, tomato, and banana. Despite food gardening households consisting larger household sizes, findings indicate fewer household members within the household were actively involved in gardening.

Regarding water source for irrigation, participants were largely dependent on tap water and rainwater tanks. Only few participants were selling their produce to nearby schools, pension pay-out and to other community members with an average income of less than R500 per month. Activities carried out by the gardeners included land clearing, planting, irrigation and harvesting, with some of the activities that were performed the least gardeners including weeding and running own nurseries. Fertilizer application was performed by half of the gardeners while manure was applied by less than half of the gardeners.

Presence of pests and diseases was the most predominant challenge encountered by gardeners. This indicates that the yields were negatively affected.

6.4 OBJECTIVE 2: THE REASONS WHY SOME HOUSEHOLDS CULTIVATE FOOD GARDENS AND OTHERS DO NOT IN ORDER TO DETERMINE THE PERCEIVED BARRIERS IN CULTIVATION OF FOOD GARDENS IN THE STUDY AREA

Lack of information was the most cited reason for not participating in food gardening. What attributed to that could be the age distribution and educational level of food garden non-participating households. Most participants that were not involved in food gardening were mostly youth between the ages of 18-30 years and had either high school or tertiary education,

meaning they were actively pursuing their careers outside of agriculture or farming. Lack of time was identified the second reason for not participation in gardening while lack of land was only identified by few participants.

6.5 OBJECTIVE 3: FACTORS ASSOCIATED WITH PARTICIPATION IN FOOD GARDENS IN PERI-URBAN AREAS OF RAY NKONYENI LOCAL MUNICIPALITY

A binary logistic regression model was fitted to identify factors associated with participation in food gardens. It was found that three (3) of the chosen independent variables were statistically significant (5% level) influence on participation in food garden in the study area. These variables are number of household members, access to land and agricultural experience. It was also found that two (2) independent variables (marital status and level of education) were marginally significant (10% level). Therefore, the study fails to reject the null hypothesis that there are no factors associated with participation in food gardens in peri-urban areas.

6.6 OBJECTIVE 4: THE CONTRIBUTION OF SMALL-SCALE FOOD GARDENS TO HOUSEHOLD FOOD SECURITY AT RAY NKONYENI LOCAL MUNICIPALITY

HFIAS and HDDS were used to assess the food security status of the participants in the study area. The HFIAS tool indicated that there were more than half of the participants that worried about food, unable to eat preferred food, eating limited variety of food, eating undesired food and eating smaller meals in the last 30 days. Fewer than 50% ate fewer meals in a day, experienced unavailability of food, went to sleep hungry and went a whole day and night without eating. Findings further revealed that there were more households with food gardens that experienced the mentioned conditions than households without food gardens.

The feeling of anxiety about food stocks in the household, feeling of insufficient food quality and food type preference were experienced by the majority of the participants while insufficient food intake and its physical consequences were experienced by least number of participants. However, all the three food domains were less experienced within the group that did not own food gardens.

The HFIAS score of the sample was 8.5. As indicated, the higher the score the more food insecurity and access the household experienced, therefore food gardens participants acquired HFIAS score of 9.4 meaning they were more food insecure than the food garden non-participating households (6.2). The study revealed that 28.6% (n=103) of the participants

in the study area were food secure while majority (71.1%; n=271) were food insecure. Of the food insecure group, the majority were moderately food insecure. The HFIAS further indicated that within the food secure households, the majority were non-food garden participants while the majority of food garden participants were moderately food insecure. It can then be concluded that food gardens alone are not enough to address food insecurity. Considering the socio-economic factors of these two groups, it is clear that income still plays major role in meeting food needs.

Based on HDDS, the findings revealed that over two third of the households in the last 24-hour recall period had consumed almost all the 12 food groups (cereals, tubers, vegetables, fruits, meat, eggs, legumes, milk, oil/fats, sugar, coffee/tea) except for fish. That was the case for households with food gardens and those without food gardens except that fish was consumed more in households without food gardens. The average HDDS for the population (n=360) was 10.5, meaning each household in the study consumed an average of 11 food groups. Therefore, households in the study had high HDDS. Therefore, this indicates that gardening together with other complementary strategies such as social grants do have a positive contribution in ensuring dietary diversity.

6.7 RECOMMENDATIONS

Based on the findings of this study, the following recommendations were made:

6.7.1 Policy recommendations

- The current study found low participation of the youth in home food gardening. Therefore, promotion of youth participation in food gardening is greatly encouraged through youth empowerment programmes and community meetings aimed at youth development. This can be done by promoting agricultural education at different educational levels in order to increase awareness on farming and subsequently influencing the intention of youth's participation in gardening (Geza et al., 2021). This has proved counterproductive in Nkomazi Municipality in the Mpumalanga province where youth that were exposed to agricultural studies at secondary and tertiary educational level had developed ambitions of venturing into agriculture (Magagula & Tsvakirai, 2020). Therefore, this will ensure sustainability of food gardens beyond the current generation and sustainable household food security.

- Educational level was acknowledged as a limiting factor in adoption of food gardening in the study. More educated household head were more likely to own food garden than those with no education. Therefore, there is a great need for promotion of education and adequate trainings and workshops regarding home food production and household dietary diversity in the study area. To realize this, promotion of agricultural extension programmes through formal organizations and Department of Agriculture Extension Advisory as a strategy to link farmers to information and services is necessary. According to Raidimi & Kabit (2019), agricultural extension primary goal is to effectively educate and facilitate learning amongst farmers. Previous studies in the Eastern Cape, Limpopo and KwaZulu-Natal has proved better utilization of sustainable practises in agriculture by smallholder farmers through access to local extension and advisory services (Bese et al., 2020; Maponya, 2021; Nkonki-Mandleni et al., 2022).
- Prominent challenge of pest and diseases faced by food gardeners could limit their growth and production, therefore government and stakeholder's support in providing them with farming inputs such as pesticides and herbicides and other garden tools would ensure efficiency and continuity in food gardening practice. In this regard, promotion of farmer support programmes such as the Presidential Employment Stimulus Initiative (PESI) by government aiming at supporting small scale farmers is crucial. This is by supplying them with input vouchers to purchase key farming inputs (fertilizer, herbicides and pesticides) and mechanisation services. Additionally, considering the socio-economic status, the use of natural pesticides is recommended. A study conducted in Middledrift and Ngqeleni, towns in South Africa and Chimanimani district in Zimbabwe reported a successful approach of growing insects' repellent plants to deter pests and adoption of crop diversification for pest control (Didarali & Gambiza, 2019). Adoption of this approach can aid in managing crop diseases and lowering pest density in the study area.
- The issue regarding lack of information as a barrier of adoption to food gardening is a limiting factor. Therefore, raising public awareness on the importance of food gardens and food products by agricultural development agencies is crucial. This will ensure knowledge transfer and optimization of available land in peri-urban communities. In Cape Town, formulation of local farmer associations and farmer-driven groups is considered as strategies that ensure knowledge transfer within the urban farmers and enabling sharing of ideas (Kanosvamhira, 2019). These farmer groups has ensured that smallholder famers in Maluti-a-Phofung municipality in the Free State province work together from buying of inputs, hiring of farming implements, marketing their

produce together and sharing skills and personal experiences (Myeni et al., 2021). Easy access to information through this initiative has motivated many community members in KwaZulu-Natal to participate in small-scale farming (Sinyolo & Mudhara, 2018). In that way adoption to food gardening becomes easier when information is distributed within the community.

- HFIAS found that food insecurity was more prevalent amongst households with food gardens. This is despite the reported increase of food security status and food intake through household food gardens in previous studies. This shows that food gardening as it in the study area was not enough. However, HDDS results classified the study participants as having high dietary diversity. However, considering that most respondents in this study did not generate any income from these garden produce, efforts to encourage households to expand gardening beyond subsistence is required. These could include agricultural programs such as urban food garden program reported in the study by Modibedi et al., (2021) which showed positive food security outcomes for the beneficiaries. Money generated from the sales can then be used for other household's needs.
- Furthermore, other income generating activities should be explored in the area. Previous studies have shown that households with diversified livelihood activities are unlikely to struggle with food insecurity (Mcata & Ajuruchukwu, 2015; Adem et al., 2018).

6.7.2 Recommendations for future research

This study focused on the impact of small-scale food gardens on household food security in peri-urban areas of Ray-Nkonyeni local municipality. Therefore, the researcher proposes further study on the following aspects:

- The study was limited to Ray-Nkonyeni local municipality, thus making the findings and recommendations more specific to the selected area. Therefore, the results cannot be generalized to other areas outside of Ray Nkonyeni municipality. It is recommended that the impacts of small-scale food gardens to be examined in other peri-urban settings of the province.
- The study only focused on measuring one pillar of food security which is food access. Food availability was observed from the perspective of cultivation and production of food

gardens. It is therefore recommended that food security be measured in depth by including all four pillars of food security namely: food availability, food access, food utilization and food stability.

- Since the study was cross-sectional in nature and cannot assess food security status over different seasons of the year, longitudinal study is recommended in order to detect any changes that might occur in household food security status over a period of time.

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ANNEXURE A: QUESTIONNAIRE

THE IMPACT OF SMALL-SCALE FOOD GARDENS ON HOUSEHOLD FOOD SECURITY IN PERI-URBAN AREAS OF RAY NKONYENI LOCAL MUNICIPALITY, KWAZULU-NATAL, SOUTH AFRICA.

Household Questionnaire Survey

Date of survey.....

Area.....

Section A: Household Socio-demographic characteristics

(Tick where appropriate or mark with X)

1. Household head race	Tick the relevant answer
0- African	
1- White	
2- Indian	
3- Coloured	
4- Other (Specify)	

2. Gender of the household head	Tick the relevant answer
0- Male	
1- Female	

3. Age of the household head	18-30	31-40	41-50	51-60	61-70	71-80	>81

4. Marital status	Tick the relevant answer
0- Single	
1- Married	
2- Divorced	
3- Widow	
4- Cohabiting	

5. Occupation	Tick the relevant answer
0- Unemployed	
1-- Employed part-time	
2- Employed full-time	

6. Highest grade passed	No Education	Primary level	High School level	Tertiary level

7. Number of the members of the household	Tick the relevant answer
0- 1-3 Members	
1- 4-6 Members	
2- 7-9 Members	
3- Over 9 Members	

8. How many members are employed	Tick the relevant answer
0- 0 Members	
1- 1-2 Members	
2- 3-4 Members	
3- 5-6 Members	
4- Over 6 Members	

9. Total household monthly income (R)	< R1000	R1000- R2000	R2001 - R3000	R3001 – R4000	R4001 – R5000	>R5001

10. Number of sources of income	Tick the relevant answer
0- 1 Income	
1- 2 Incomes	
2- 3 Incomes	
3- Over 3 Incomes	

11. Source of household income?	Tick the relevant answer
0- Wages	
1- Pension	
2- Family business	
3- Informal income	
4- Social welfare grants	
5- Remittances	
6- Other (Specify)	

12. Type of the household dwelling? Tick the relevant answer	
0- Formal (own)	
1- Informal (own)	

2- Renting the dwelling	
-------------------------	--

13. Do you have access to arable land? Tick the relevant answer	
0 – Yes	
1 – No	

14. Do you have previous experience to agricultural production? Tick the relevant answer	
0 – Yes	
1 – No	

15. Does the family practice food gardening	Tick the relevant answer
0 – Yes	
1 – No	

If Yes, Answer Section B

If No, Answer Section C

Section B: household with Food gardens

1. Type of food garden	Tick the relevant answer
0- Homestead food garden	
1- Community food garden	
2- Other (Specify)	

2. Sources of water for irrigation?	Tick the relevant answer
0 Tap	
1 Dam	
2 Rain water tanks	
3 Borehole	
4 Spring	
5 Do not irrigate	

3. Number of people active in food garden	Tick the relevant answer
0- 1-3 people	
1- 4-6 People	
2- 7-9 People	
3- >9 People	

4. What is the main reason behind participating in food gardens?	Tick the relevant answer
0- Source of food production	
1- Improve health and nutrition	
2- Income generation	

3- Other (specify)	
--------------------	--

6. Use of crops grown	Tick the relevant answer
0- Household consumption (Only) #(Skip 7 & 8)	
1- Sales for income (Only)	
2- Both	

7. If you do sell describe your Marketing place	Tick the relevant answer
0 - schools	
1 - community	
2 - tuck shops	
3 - retail stores	
4 -pension pay points	
5 -Clinics	
6 -other specify	

8. If you do sell some of the garden produce, on average how much do you make per month?	Tick the relevant answer
0- Not selling	
1- R0-R500	
2- R501-R1000	
3- Over R1000	

9. Types of crops cultivated	Tick the relevant answer
0 Spinach	
1 Cabbage	
2 Sweet potatoes	
3 Taro roots	
4 Maize	
5 Beetroot	
6 Beans	
7 tomatoes	
8 Carrot	
9 Butternut	
10 Onions	
11 Bananas	
12 Other (specify)	

10. Activities carried out	Tick the relevant answer
0 Land clearing	
1 ploughing	
2 Nursery	
3 Planting	
4 weeding	
5 fertilizer application	
6 manure Application	
7 irrigation	
8 ridging	
9 Spraying of pesticides	
10 Harvesting	

11 Other (Specify)	
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11. Types of inputs (Applying)	Tick the relevant answer
0 Fertiliser	
1 Manure	
2 Chemicals for pest and diseases	
3 Other (specify)	

12. Challenges encountered	Tick the relevant answer
0 Water scarcity	
1 Presence of pests and diseases	
2 Unfavourable weather conditions	
3 Costs of seeds and seedlings	
4 Unavailability of land	
5 Lack of gardening implements	
6 Infertile soil	
7 Cattles grazing on plants	
8 Other (Specify)	

Section C: Households without food gardens

1. Reasons for not having food garden	Tick the relevant answer
0 Unavailability of land / space	
1 Lack of resources (Equipment's/seeds)	
2 Don't have enough time for a garden	
3 Health conditions	
4 Lack of water	
5 Lack of information	
6 No interest in having a food garden	
7 Other (Specify)	

Section E: Household Dietary Diversity data instrument

Questions and filters	Coding categories
Food that you or anyone else in your household ate yesterday during the day and at night? (24 hour recall)	0 = No one in the household ate the food 1 = if anyone in the household ate the food
A. Any bread, rice, biscuit, sorghum, maize, wheat or any other food made from millet?	0 or 1 =
B. Any potatoes, cassava, amadumbe, sweet potatoes or any other food made from roots or tubers?	0 or 1 =.....
C. Any vegetables?	0 or 1
D. Any fruits?	0 or 1
E. Any beef, pork, lamb, goat, chicken, or other bird, liver, kidney, heart, or other organ meat?	0 or 1 =.....
F. Any eggs	0 or 1 =.....
G. Any fresh or dried fish or shellfish	0 or 1 =.....
H. Any foods made from beans, peas or nuts?	0 or 1 =.....
I. Any cheese, yogurt, milk or other milk products?	0 or 1 =.....
J. Any foods made from oil, fat, or butter?	0 or 1 =.....
K. Any sugar or honey	0 or 1 =.....
L. Any other foods, such as coffee, tea?	0 or 1 =.....

Adapted from (Swindale & Bilinsky, 2006)

Section D: Household Food Insecurity Access Scale (HFIAS) Measurement Tool

No.	Question	Response options	Code
1	In the past four weeks, did you worry that your household would not have enough food?	0= No (skip to Q2) 1=Yes	
1a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	
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?	0 = No (skip to Q3) 1=Yes	
2a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	
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?	0 = No (skip to Q4) 1 = Yes	
3a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	
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?	0 = No (skip to Q5) 1 = Yes	
4a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	
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?	0 = No (skip to Q6) 1 = Yes	
5a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	
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?	0 = No (skip to Q7) 1 = Yes	
6a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	
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?	0 = No (skip to Q8) 1 = Yes	
7a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	
8	In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food?	0 = No (skip to Q9) 1 = Yes	
8a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	
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?	0 = No (questionnaire is finished) 1 = Yes	
9a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	

ANNEXURE B: RESEARCH ETHICS CLEARANCE



CAES HEALTH RESEARCH ETHICS COMMITTEE

Date: 26/04/2019

Dear Mr Lembete

NHREC Registration # : REC-170616-051
REC Reference # : 2019/CAES/047
Name : Mr S Lembete
Student # : 59240326

**Decision: Ethics Approval from
01/05/2019 to 30/04/2020**

Researcher(s): Mr S Lembete
smisalex@gmail.com

Supervisor (s): Dr T Mbombo-Dweba
mbomtp@unisa.ac.za; 011-471-2264

Dr AO Agyepong
agyepao@unisa.ac.za; 011-471-2264

Working title of research:

The impact of small-scale food gardens on household food security in peri-urban areas of Ray Nkonyeni local municipality, Kwazulu-Natal, South Africa

Qualification: MSc Agriculture

Thank you for the application for research ethics clearance by the CAES Health Research Ethics Committee for the above mentioned research. Ethics approval is granted for a one-year period. After one year the researcher is required to submit a progress report, upon which the ethics clearance may be renewed for another year.

Due date for progress report: 30 April 2020

The low risk application was reviewed by the CAES Health Research Ethics Committee on 25 April 2019 in compliance with the Unisa Policy on Research Ethics and the Standard Operating Procedure on Research Ethics Risk Assessment.

The proposed research may now commence with the provisions that:

1. The researcher(s) will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.



University of South Africa
Pretorius 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

2. Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study should be communicated in writing to the Committee.
3. The researcher(s) will conduct the study according to the methods and procedures set out in the approved application.
4. Any changes that can affect the study-related risks for the research participants, particularly in terms of assurances made with regards to the protection of participants' privacy and the confidentiality of the data, should be reported to the Committee in writing, accompanied by a progress report.
5. The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study. Adherence to the following South African legislation is important, if applicable: Protection of Personal Information Act, no 4 of 2013; Children's act no 38 of 2005 and the National Health Act, no 61 of 2003.
6. Only de-identified research data may be used for secondary research purposes in future on condition that the research objectives are similar to those of the original research. Secondary use of identifiable human research data require additional ethics clearance.
7. No field work activities may continue after the expiry date. Submission of a completed research ethics progress report will constitute an application for renewal of Ethics Research Committee approval.

Note:

*The reference number **2019/CAES/047** should be clearly indicated on all forms of communication with the intended research participants, as well as with the Committee.*

Yours sincerely,



Prof EL Kempen
Chair of CAES Health REC
 E-mail: kempeel@unisa.ac.za
 Tel: (011) 471-2241



Prof MJ Linington
Executive Dean : CAES
 E-mail: llininj@unisa.ac.za
 Tel: (011) 471-3806

ANNEXURE C: PERMISSION LETTER

28 February 2019

Permission letter

RE: Letter of request for permission to conduct the research project at Ray-Nkonyeni local municipality peri-urban areas.

My name is Simiso Lembete, a student from University of South Africa (UNISA) registered for MSc in Agriculture. The title for my research proposal is "the impact of small-scale food gardens on household food security in peri-urban areas of Ray Nkonyeni local municipality, KwaZulu-Natal, South Africa". I hereby request permission to conduct the study in peri-urban areas of Ray-Nkonyeni local municipality.

The study seeks to sample the total of 364 Household participants from the total population of Ezingolweni, Murchison, Louisiana and Fairview. The research will be conducted through face-to-face interviews using structured questionnaires. After granting permission to this request will however not mean the research can be conducted without the participants concerns. Before conducting the research the participants will have to agree whether they want to participate in the research or not, as the study is completely voluntary. Together with the reseracher they will sign a consent letter informing the participants rights, nature, procedure, potential benefits and anticipated inconvenience of participation.

Your permission will be greatly appreciated.

Name: SIMISO LEMBETE

Sign: S. Lembete

Position: ReSearcher

Date: 28 / 02 / 19

I grant you permission to conduct the study at the above mentioned areas of Ray-Nkonyeni Local Municipality.

Name: SELVAN CHETTY

Sign: [Signature]

Position: CHIEF WHIP

Date: 03 - 2019

CERTIFIED A TRUE COPY
It is hereby certified that this is a true copy of the original and that
no charges and / or erasures have been effected.

SELVAN CHETTY
COMMISSIONER OF OATHS
COUNCILLOR
RAY NKONYENI MUNICIPALITY, 10 CONNOR STREET
PORT SHEPSTONE 4240
DATE: 1-03-2019

ANNEXURE D: PARTICIPANT INFORMATION SHEET

Ethics clearance reference number: **2017/CAES/000**

Research permission reference number:

28 February 2019

Title: **The impact of small scale food gardens on household food security in peri-urban areas of Ray Nkonyeni Local Municipality, KwaZulu-Natal, South Africa**

Dear Prospective Participant

My name Simiso Lembete and I am doing research with Dr T.P Mbombo-Dweba , a lecturer in the Department of Agriculture and Animal Health towards a Master of Science degree at the University of South Africa. We are inviting you to participate in a study entitled "*The impact of small scale food gardens on household food security in peri-urban areas of Ray Nkonyeni Local Municipality, KwaZulu-Natal, South Africa*"

WHAT IS THE PURPOSE OF THE STUDY?

The purpose of this study is to assess the impact that small-scale food gardens have on household food security amongst peri-urban areas of Ray-Nkonyeni Local Municipality. This will help to identify benefits, constraints and potential development of small scale food gardens to tackle the high perceived household food insecurity in these communities.

WHY AM I BEING INVITED TO PARTICIPATE?

The study focuses on peri-urban areas of the Ray-Nkonyeni Local Municipality as a place of interest. Therefore this particular place was identified by the spatial development framework (2017) as one of the notable peri-urban areas within the municipality. A total number of 364 households sample from the total household population was indentified for sampling to partake in the study. Choosing this household was further motivated by a sampling technique called systematic random sampling, sampling households at a certain interval basis.

WHAT IS THE NATURE OF MY PARTICIPATION IN THIS STUDY?

The study requires your participation in the following manner:-

1. Total of 364 voluntary households who will be recruited from different study areas.
2. An individual consent form is requested from each participant.
3. Structured questionnaire will be used to collect data.
4. Basic socio-demographic information will be required from you such as age, educational level, occupation, household income, sources of income, type of the dwelling, access to land, participation in food gardens and assessment of food security status.
5. Feedback sessions will be arranged in a form of a meeting in all study areas. Respondents will be informed of such a meeting through pamphlets that will be distributed in the community .
6. The questionnaire is expected to take approximately ± 45 minutes to finish

CAN I WITHDRAW FROM THIS STUDY EVEN AFTER HAVING AGREED TO PARTICIPATE?

Participating in this study is completely voluntary and you are under no obligation to consent to participation and so there is no penalty or loss of benefit for non-participation. If you do decide to take part, you will be given this information sheet to keep and be asked to sign a written consent form. You are free to withdraw at any time and without giving a reason. However once the questionnaire is submitted for analysis you are no longer able to withdraw.

WHAT ARE THE POTENTIAL BENEFITS OF TAKING PART IN THIS STUDY?

There is no direct payment when participating in the study, however new information acquired could be used to inform policy makers and programs focusing on development and improving small-scale food gardens in the community. Final data will also reveal variety of information and different ways people do things that can be shared amongst others.

ARE THERE ANY NEGATIVE CONSEQUENCES FOR ME IF I PARTICIPATE IN THE RESEARCH PROJECT?

A discomfort may rise when answering some household food security access questions. Since these tools ask about household food structure, consumption and scarcity some may find it uncomfortable to answer freely on this. Since the study is anonymous therefore no one except the researcher will know of any struggles or challenges that may be noted during the survey.

WILL THE INFORMATION THAT I CONVEY TO THE RESEARCHER AND MY IDENTITY BE KEPT CONFIDENTIAL?

To keep the participants information confidential, your identifying information such as name will not appear on recording questionnaire but only on this consent form and no one will be able to connect you to the answers you give. The questions will not be asked in a way that links the participants with identifying information.

Your answers may be reviewed by people responsible for making sure that research is done properly, including the transcriber, data analyst, and members of the Research Ethics Review Committee. Otherwise, records that identify you will be available only to people working on the study, unless you give permission for other people to see the records.

At the moment data collected from the study will be used for this research study purposes. However your anonymous data may be used for other purposes, such as a research report, journal articles and/or conference proceedings. Even in this case individual participants will not be identifiable in such report.

HOW WILL THE RESEARCHER(S) PROTECT THE SECURITY OF DATA?

Hard copies of your answers will be stored by the researcher for a period of five years in a locked safety drawer of the researcher's room in Port Shepstone where the researcher resides. At the moment there are no plans for the re-use of data or using data for any other purposes however for future research or academic purposes; electronic information will be stored on a password protected personal computer. Future use of the stored data will be subject to further Research Ethics Review and approval if applicable. But at the moment, data collected will only be used for the purpose of this study. After the specified period hardcopies of the questionnaires will be burnt and electronic data will be permanently deleted from the hard drive of the computer.

WILL I RECEIVE PAYMENT OR ANY INCENTIVES FOR PARTICIPATING IN THIS STUDY?

There will be no direct payments when participating in this study.

HAS THE STUDY RECEIVED ETHICS APPROVAL

This study has received written approval from the Research Ethics Review Committee of the College of Agriculture and Environmental Sciences, Unisa. A copy of the approval letter can be obtained from the researcher if you so wish.

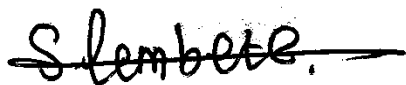
HOW WILL I BE INFORMED OF THE FINDINGS/RESULTS OF THE RESEARCH?

The findings of the study will be communicated back to the community. The researcher will schedule for 4 consecutive meetings for each peri-urban area surveyed once research has been completed. You will be kept informed of the dates, time and venues. Should you require any further information or want to contact the researcher about any aspect of this study, feel free to contact Simiso Lembete on 0721281883 or alternatively email smisalex@gmail.com.

Should you have concerns about the way in which the research has been conducted, you may contact Dr T.P Mbombo-Dweba on 011 471 2264 /Mbombtp@unisa.ac.za or Dr A.O Agyepong on 011 471 2264 /Agyepao@unisa.ac.za. Contact the research ethics chairperson of the CAES General Ethics Review Committee, Prof EL Kempen on 011-471-2241 or kempeel@unisa.ac.za if you have any ethical concerns.

Thank you for taking time to read this information sheet and for participating in this study.

Thank you.

A handwritten signature in black ink that reads "S. Lembete" with a long horizontal stroke extending to the right.

Simiso Lembete

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.....

ANNEXURE E: PUBLICATION SUBMISSION ACKNOWLEDGEMENT

2/7/23, 4:37 PM

Mail - simiso lembete - Outlook

[jard] Submission Acknowledgement

Ewa Kiryluk-Dryjska <kiryluk-dryjska@up.poznan.pl>

Mon 2023/02/06 11:38

To: simiso lembete <59240326@mylife.unisa.ac.za>; Adelaide Owusu Agyepong, Dr.
<nanaagyepong7@gmail.com>

Hello,

Tulisiwe Pilisiwe Mbombo-Dweba, Dr has submitted the manuscript, "ASSESSING THE EXTENT OF FOOD GARDENS IN PERI-URBAN AREAS: A CASE STUDY OF RAY NKONYENI LOCAL MUNICIPALITY" to Journal of Agribusiness and Rural Development.

If you have any questions, please contact me. Thank you for considering this journal as a venue for your work.

Ewa Kiryluk-Dryjska

[Journal of Agribusiness and Rural Development](#)

ANNEXURE F: TURN IT IN DIGITAL RECEIPT



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.

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Assignment title: AAH 2023
Submission title: MSc Agriculture dissertation
File name: Final_Dissertation.docx
File size: 2.1M
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