

**ASSESSMENT AND DETERMINANTS OF HOUSEHOLD FOOD
SECURITY STATUS IN THE UMZUMBE LOCAL
MUNICIPALITY, KWAZULU-NATAL**

by

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LIST OF ACRONYMS

DAFF	Department of Agriculture, Forestry and Fisheries
DARD	Department of Agriculture and Rural Development
FANTA	Food and Nutrition Technical Assistance
FAO	Food and Agriculture Organisation
G4AW	Geodata for Agriculture and Water
HDDS	Household Dietary Diversity Score
HFIAS	Household Food Insecurity Access Scale
HSRC	Human Sciences Research Council
IDA	International Development Association
IDP	Integrated Development Plan
IFAD	International Fund for Agricultural Development
IPCC	Intergovernmental Panel on Climate Change
KZN	KwaZulu-Natal
KZNDARD	KwaZulu-Natal Department of Agriculture and Rural Development
KZNPG	KwaZulu-Natal Provincial Government
NDoH	National Department of Health
RIGA	Rural Income Generating Activities
SSA	Sub-Saharan Africa
Stats SA	Statistics South Africa
U.S	United States
UNDP	United Nations Development Programme

USAID United States Agency for International Development

WFP World Food Programme

WIA Women in Agriculture

ABSTRACT

Although South Africa is a nationally food-secure country, this is not the case at household and individual levels, where food insecurity is unacceptably high, particularly in rural areas, where many households struggle to meet their own food needs. In order to address the food insecurity and poverty challenges in the rural areas of South Africa, the Department of Agriculture has been promoting home and community garden programmes to increase the food production of poor and vulnerable rural households. This study aimed to assess the level of participation of households in the food garden programmes and the factors affecting their access to them. In addition, the study evaluated the effect of these two programmes on the household's food security status and their determinants in the uMzumbe Local Municipality. As home and community garden programmes have been widely implemented in all the municipality wards, this study applied a simple random sampling method, in order to give all the wards a chance of being selected. The purposive sampling method was used to select the village samples from the wards, in which both the home and community garden programmes have been implemented. In order to collect data, a structured questionnaire was administered directly to 223 household respondents out of 1792 households within three sampled wards. The results of the study showed that the level of participation of the households in the food gardens implemented was very low (23.8%). About 13%, 10.3% and 0.45% of respondents participated in home garden, community garden, and a combination of community and home garden programmes, respectively. The Logistic model results indicated that factors, such as livestock ownership ($p=0.067$) and extension services ($p=0.001$), positively influenced the participation of households in the community garden programme, while the farm size ($p=0.008$), the purpose of farming ($p=0.068$) and the total income negatively affected their participation. In contrast, the farm size ($p=0.026$), the purpose of farming ($p=0.091$) and the extension services ($p=0.001$) positively affected the participation of farmers in home garden programme. The results revealed that both programmes were ineffective for improving the food security status of households in the uMzumbe area. Their food security status was positively impacted by the total income ($p=0.001$), extension services ($p=0.04$), credit access ($p=0.067$), age, farm size ($p=0.024$) and education level ($p=0.091$), whereas it was negatively influenced by the household size ($p=0.001$), as well as the size of the home gardens ($p=0.046$) and community gardens ($p=0.032$).

The study indicated that the implementation of the home and community garden programmes was not enough, in and of itself, for improving the food security status of those living in the uMzumbe area. Therefore, it is recommended that factors, such as income generation, credit access, educational and extension services, should be considered for improving the participation in, and effectiveness of, the home and community garden programmes, and for improving the food security status of residents in the uMzumbe Local Municipality.

Key words: home garden, community garden, uMzumbe Municipality and food security

CHAPTER ONE: INTRODUCTION

1.1 Background to the Study

Due to widespread of food insecurity in Sub-Saharan Africa, food security is currently among the main preoccupations of the international community (Francesco *et al.*, 2016). It is directly linked to the physical, economic and social access to adequate, nutritious and safe food, by all people, at all times, and to meet their dietary needs and food requirements for maintaining a healthy and active life (Food and Agriculture Organisation, 2013). A recent report published by the Food and Agriculture Organisation (FAO) in 2019 indicates that more than 820 million of the global population are likely to be vulnerable to chronic hunger, by not having sufficient food to lead a healthy life (FAO *et al.*, 2019). The majority of the global population that is vulnerable to food insecurity is to be found in Sub-Saharan African countries, where the rate of undernourished people is extremely high (FAO, 2010). According to Rademacher (2012), the failure of local agriculture, poverty, extreme weather events, conflicts and the inability of local governments to act, have been the major reasons why governments in developing countries are not providing sufficient food for their populations.

South Africa has made many efforts to increase the quality and quantity of its food production, in order to solve its national food insecurity and poverty problems. However, despite successive strategies and programmes that have been implemented to secure the country's food supply on a national level, food and nutrition insecurity remain unacceptably high, at both the household and individual level (Blench and Ingawa, 2003; Statistics South Africa, 2017b), particularly in the rural areas (Hendriks, 2012). In 2014, Statistics South Africa (Stats SA) revealed that South Africa was one of the countries with the highest rates of income and poverty inequality in the world; therefore, accessibility to adequate and nutritious food is constrained for a large portion of the population. About 20% of South African households are vulnerable to chronic hunger due to their inaccessibility to food, and about 56% of the country's population live in poverty, with 28% living below the food poverty line (Stats SA, 2017a). Chakoma and Shackleton (2019) also found that many South Africans are severely food insecure, owing to food inaccessibility, which is directly related to their income. Stats-SA (2021) revealed that this situation was exacerbated by the Covid-

19 pandemic, during which about 23.6% and 14.9% of the population in 2020 were moderately and severely food insecure, respectively, compared to 17.3% and 7% in 2019.

Stats SA (2012) indicated that the transformation of the South African economy has led to most households becoming consumers of purchased food, rather than producers of food. In addition, unlike other Sub-Saharan African countries, there is less interest in subsistence food production in South Africa, with only about 16.9% of the population being engaged in farming activities. Therefore, food insecurity has increased in the rural and poor communities, due to their dependence on purchased foods and their failure to produce their own (Stats SA, 2015).

The KwaZulu-Natal Province has a high potential for agricultural activities, mainly owing to its environmental conditions (climate, soils and access to water). According to the KwaZulu-Natal Department of Agriculture and Rural Development (KZNDARD) (2015), about 17% of the land surface is arable, of which 7.5% is potentially suitable for farming activities. However, despite its high agricultural potential, and the involvement of rural households in agriculture, poverty, food insecurity and hunger still present significant challenges for many of them (Faber *et al.*, 2011; KZNDARD, 2015), with about 31% of all households facing great challenges in accessing adequate food (Shisana *et al.*, 2013). According to Stats-SA (2014), about 21% of the households struggled to meet their dietary requirements, and nearly 34% experienced hunger in 2013. Stats-SA (2017a) revealed that the KwaZulu-Natal Province is predominantly rural, with high levels of poverty; even among the communities that benefit from the government food security interventions, food insecurity still presents challenges (D'Haese *et al.*, 2013). Furthermore, the KwaZulu-Natal Provincial Government (KZNPG) found that, of the 14.3 million people nationally, who are struggling to access adequate and safe food, KZN accounted for nearly 3.5 million (34%) (KZNPG, 2017). The highest cases of malnutrition, hunger and poverty are reported in the province, and most households that are vulnerable to food insecurity are unable to generate an income and produce their own food (KZNDARD, 2015). Stats-SA (2021) also revealed that, aggravated by the Covid-19 pandemic, about 26.4% and 16.4% of the KZN population were moderately and severely food insecure in 2020, whereas only 18% and 5.4% of the population were moderately and severely food insecure, respectively, in 2019 (Stats SA, 2021).

To address the food insecurity challenges within the marginalized communities in the country, the South African government has prioritized an increased focus on establishing and allocating

adequate funds to social programmes in all spheres of the government (Hendriks, 2014). The programmes include school feeding schemes; Social grants - child support, pensions, disability, Free health services for children between 0-6 years and expectant and breastfeeding mothers; Public works programmes; Social Relief of Distress Grants (SRDG), etc. (Hendriks, 2014; Boatemaa *et al.*, 2018). Due to the unsatisfactory outcomes of some of the aforementioned programmes and the low involvement of the households in farming activities (Stats SA, 2012); to enhance the eradication of the food insecurity challenges in the country, the Department of Agriculture, Forestry and Fisheries developed and promoted several agricultural interventions, which including home and community food garden programmes. These are aimed at boosting sustainable agricultural production to eradicate hunger and food insecurity in the country, particularly in rural areas where a large number of households are still struggling to meet their dietary requirements (DAFF, 2013). The particularity of community and home garden programmes was to provide inputs such as crop seeds, fertilizer packs, as well as open land spaces to vulnerable households (KZNPG, 2012; 2018) for improving their subsistence food production, and income generation by marketing the surplus production to local markets (DAFF, 2013).

1.2 Research Problem

The production of subsistence food in gardens by rural communities is vital, as it reduces their vulnerability to food insecurity, improves their nutritional status and reduces the prevalence of hunger in households (Galhena *et al.*, 2013). Apart from improving their food security status, these food gardens are crucial for generating an income (Kristen *et al.*, 2003; Chitja and Botha, 2020). Thus far, the KZN government has assisted more than 650 000 households through this home garden programme. Approximately 30% of the most vulnerable smallholder farmers have received more than 34 000 starter-packs in the form of fertilizer, vegetables, beans and maize seeds (KZNPG, 2012). In 1991, the Province started approximately 1 049 community food gardens to assist households and to improve their food security status. Eight years later, the number of community food gardens increased to 2 635 and reached more than 51 700 beneficiaries in the province (Brooks and Friedman, 1991; FAO, 2000b, cited by Mkhize, 2011). In addition, DAFF (2016) indicated that about 11 264 subsistence and smallholder farmers were supported with agricultural inputs and 1553 ha of land were ploughed and planted in 2016, while in 2017, the provincial Department of Agriculture established about 170 and 1370 community and home

garden programmes, respectively, which reached nearly 39 417 households (KZNPG, 2018). According to the provincial budget reports, for the effectiveness of these programmes, the department of agriculture has been allocating adequate funds for them to yield the expected outcomes. For example, in 2015 and 2018, about R 140 655 million was spent on food gardens, revitalization of irrigation schemes, and livestock purchasing in KwaZulu-Natal (KZNPG, 2015; 2018).

However, despite the widespread existence of home and community food garden programmes and the huge investment allocated, there is still limited information regarding their impact on the food security status of households. For example, Statistics SA has provided general data on the agricultural activities, but there is no information available in the literature that compares the home and community food gardens (Stats SA, 2019). The existing literature indicates that participation in homestead food gardens is very low in some areas in South Africa and it continues to decline nationally (Philander and Karriem, 2016; Stats SA, 2019). Chitja and Botha (2020) noted that only a few studies in the country explicitly demonstrate how the community food gardens sustain the livelihoods of South African communities. Therefore, by using the case of uMzumbe Municipality, this study aims to assess which of the two programmes is more effective for improving the food security status of households, and what the determinants of the households' food security status are. Providing information on their effects will be vital and helpful for policymakers and organisations that work in the food security field, and it will help to identify the opportunities and constraints and to determine appropriate interventions for the area in the future.

1.3 Research Objectives

This study assessed the impacts of home and community food garden programmes on the food security status of households in the uMzumbe Municipality of KwaZulu-Natal, as well as the determinants of food security.

The specific objectives of the research are as follows:

- (a) to determine the participation of households in the two food garden programmes and the factors affecting their access to them; and
- (b) to determine the effects of each of the two food garden programmes on the food security and the determinants of household's food security status in the uMzumbe Municipality.

1.4 Hypotheses

- (a) There is a low participation of households in the food garden programmes, and no factors motivating their access into them.
- (b) There is no significant difference in food security status of programme participants and non-participants.

1.5 Research Questions

The main research question is as follows: What are the impacts of the home and community food garden programmes on the food security status of the households and what are the determinants of food security in the households in the uMzumbe Municipality? This question is supported by the sub-research questions, which are stated below:

- (a) What is the participation level of the households in the home and community food garden programmes and what are the factors affecting their access?
- (b) What effects do the home and community food garden programmes have on the food security and the determinants of household's food security status in the uMzumbe area?

1.6 Definition of Key Terms

Households: a household is defined as a group of people who share a dwelling and financial resources. According to Stats SA (2008), the size of a household is not defined; it depends on the number of members who live within it for at least four nights a week and who eat from the same pot and share its resources.

Food security: This is directly related to the physical, economic and social access to adequate, nutritious and safe food at all times, by all people, in order to meet their end-needs and food requirements for maintaining a healthy and active life (FAO, 2013).

Home and community garden programmes: These are interventions provided by the South African government to alleviate hunger and food insecurity in poor and rural households. These programmes encompass household gardens (one home, one garden) and community or public food gardens (DAFF, 2019).

Community and home gardening: Home gardens are small plots of land at home that are principally used for subsistence food production, whereas community gardens are pieces of land that are offered by local authorities to a group of smallholder farmers for subsistence and commercial food production purposes (Holland, 2004).

1.7 Importance of the Study

Since the implementation of home and community food garden programmes in South Africa, many studies have evaluated their effectiveness in eradicating food insecurity, hunger and poverty within households. However, despite the intensive focus of the abovementioned studies on the impact of these programmes on the food security status of households, there is still limited data on which of the two programmes is more effective in improving their food security status. In addition, research is scarce on the participation level of particularly the households in the uMzumbe Local Municipality, the factors influencing their participation and the determinants of their food security status. Therefore, it will be vital to provide data on their impact and it will be helpful for policymakers and organisations who work in the food security field to identify the opportunities and constraints and to determine appropriate future interventions in South Africa, particularly in the uMzumbe Local Municipality.

1.8 Organisation of the Thesis

The study consists of six chapters. These include the introduction chapter, which deals with the background to the study, the problem statement, its objectives, the research questions and the hypotheses. Chapter Two presents a review of the relevant literature, Chapter Three discusses the methodology, Chapter Four presents the results and discussion, while Chapter Five deals with the conclusion, recommendations, delimitations of the study and areas for further research.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This literature review discusses the information related to food security in South Africa and KwaZulu-Natal; it includes the major causes of food insecurity in rural areas, the definition and concepts of food security, as well as the impact of home and community food gardens in combating food insecurity. In addition, this Chapter investigates the factors that influence the participation of households in agricultural projects, the effectiveness of these home and community food garden interventions and the empirical determinants of food security. It ends by discussing the relevant ways that are used in this study to measure the food security of households, namely, the Household Food Insecurity Access Scale (HFIAS) and the Household Dietary Diversity Score (HDDS).

2.1 Food Security in South Africa and KwaZulu-Natal

Although the nation of South Africa is considered to be a food-secure country, food insecurity still presents significant challenges at a household level (Altman *et al.*, 2009). Despite job-creation and food production interventions in the country, the unavailability and unaffordability of food are reported as being the main causes of food insecurity in the local communities (DAFF, 2013b). According to the National Food Consumption Survey in 2005, about 50% of South African households experienced hunger, 28.2% were at risk of hunger and only 20.2% were found to be food secure. In rural settlements, approximately 58% of households were reported to be experiencing hunger and food insecurity, compared to urban settlements (42%) (Stats SA, 2019). Government reports revealed that the prevalence of hunger in South Africa was most severe in the Eastern Cape, Northern Cape and Limpopo, with 66.7%, 65.3% and 63.2%, respectively, whereas the Western Cape presented the lowest percentage, with 29.3% (DAFF, 2013a; Stats SA, 2019). It was also found that, in the country's provinces that are most involved in agricultural activities, namely Limpopo, KwaZulu-Natal and the Eastern Cape, only Limpopo presented the lowest number of people experiencing hunger (Stats SA, 2019).

De Klerk *et al.* (2004) estimated that nearly 35% or more than 14 million of South African population are vulnerable to food insecurity and about 1.5 million children under the age of six years have been reported to be stunted and malnourished. According to the National Department

of Health (NDoH) in 2016, approximately 27%, 3%, 6% and 13% of South African children under five years of age were stunted, wasted, underweight and overweight, respectively (NDoH *et al.*, 2019), and that the prevalence of wasted children nationally was as high as 6.5% and 6.3% in the Gauteng and KwaZulu-Natal Provinces, respectively. Rural areas have been found to have the highest rate of stunted children (24.5%), compared to 18.5% in urban areas (DAFF, 2013a).

Apart from hunger, poverty also constitutes a great challenge for many poor and vulnerable South African households, which hinders their access to adequate, safe and nutritious food (Stats SA, 2012). Nearly 80% of South African households were unable to afford a food basket that costs R262 per person a month (Labadarios *et al.*, 2008). Food insecurity is higher in the rural areas, as 85% of the households cannot afford even the average dietary energy costs, and between 2006 and 2015, approximately 25.2% lived below the poverty line (Stats SA, 2019).

Studies by the Department of Agriculture and Rural Development (DARD) have reported that KwaZulu-Natal has the second-highest agricultural potential in the country, when compared to the other provinces (DARD, 2015). About 20% of the households are involved in agricultural activities as their main source of food and income (DARD, 2019). However, their social conditions are getting worse, due to their increasing hunger, poverty and unemployment. Approximately 3.5 million people in the province struggle to access nutritious food; therefore, they are vulnerable to several forms of food insecurity (DARD, 2015). Many households rely on government social grants to access adequate, safe and nutritious food; even though they may be employed, many of them earn an income that ranges between zero and R3 185 per month, which is not sufficient for their household requirements (Kateneksza *et al.*, 2012). KwaZulu-Natal is reputed to have the highest rate of inadequate access to food, which increased slightly from 23.4% to 24.5% in 2017 and 2018, respectively, compared to the country's record of 20.2% (DARD, 2020). Households are unable to generate an income and produce their own food; therefore, they borrow money from their neighbors and relatives as a strategy to cope with their hunger and food insecurity, during stress periods (D'Haese, 2013).

2.3 Causes of Food Insecurity in Rural Areas

Despite the fact that food insecurity challenges are recorded globally, the vulnerability of those living in rural areas is higher than for those living in urban and cities. Rural residents experience

extreme food insecurity since their procurement of food is uncertain (Bashir *et al.*, 2012). Based on the results of a study mapping the vulnerability of mountain people to food insecurity of developing countries, about 39% of households were found to be food insecure. If one excludes the urban areas, the number of food-insecure people in rural areas is extremely alarming, as they face hunger, malnutrition and poverty (FAO, 2015a).

A study conducted by the FAO (2000) in the Horn of Africa found that several factors contribute to rural food insecurity, including the fragility and degradation of natural resources and the low rate of rural agricultural productivity. Due to their poverty and the inaccessibility to new technology and the markets, the majority of rural households are unable to improve their food security status, which may have severe consequences; for example, they spend a lot of money on inputs and purchasing food, and sell their agricultural produce at lower prices. Pinstrup-Andersen and Pandya-Lorch (1994) found that inaccessibility to natural resources, such as land, water and climate change, are the major factors that are linked to food insecurity in rural areas. Therefore, the main causes of rural food insecurity are discussed in the sections below:

2.3.1 Poverty

Overall, poor and food-insecure rural people are characterized by having limited economic resources, which prevents them from expanding their income. It is a great challenge for them to rely mainly on agriculture, and it increases their vulnerability to external shocks (FAO, 2000). In addition, the high dominance of casual and informal work among the working-class limits their access to social protection, while poverty and rural working conditions constitute major challenges for them, with respect to improving their food security and sustaining their livelihoods. According to an analysis conducted by Rural Income-Generating Activities (RIGA), among the rural households practicing non-farm activities, only 20-25% and 10-20% of Asian and Latin American, and sub-Saharan African households, respectively, earn more than 75% from their activities (FAO *et al.*, 2012). The majority of rural residents are often smallholders, who only have a few assets and engage in low-paid and low-quality jobs. Poor people own small plots of land, and those with larger households are unable to feed their entire family (FAO *et al.*, 2012).

Although many rural households in South Africa are engaged in agricultural activities, they do not generate more than 4% of their household incomes (Human Sciences Research Council (HSRC),

2004). Many households rely on social assistance from the government as their source of income for accessing food (Alexandra, 2011). The high unemployment rate and low wages hinder a large number of South African households from accessing adequate and nutritious food, which increases their vulnerability to hunger and malnutrition, as they spend nearly 47% of their income on food (Teka *et al.*, 2014). Food insecurity is higher in the rural areas of South Africa than in the urban areas, since about 85% of households cannot afford even the average dietary energy costs. For the poorest households, 38% to 71% of their income is allocated to food expenditure (Jacobs, 2009). The country recorded an increase of 28.4% to 33.5% of the people living below the food poverty line from 2006 to 2009, respectively, and between 2011 and 2015, this number increased to 21.4% to 25.2%, respectively (Stats SA, 2019).

2.3.2 Market access

Whether it is for rural producers or consumers, market access is significantly important for rural residents. It enables households to purchase agricultural inputs and sell their agricultural outcomes. According to the International Fund for Agricultural Development (IFAD), market access also permits them to buy food and non-food commodities at affordable prices, in order to sustain their livelihoods and to improve their food security status (IFAD, 2013).

Farmers in rural areas struggle to access agricultural inputs at a right time, such as fertilizer or hired labour, due to market inaccessibility. As a result, the amount of cultivated land is reduced, agricultural production is decreased and, in some cases, smallholder farmers produce lower-value produce that can only be consumed at home (Edward *et al.*, 2009). Rapsomanikis (2015) found that many rural smallholders in developing countries are marginalized, due to poor market access. The majority of them only sell a small part of their agricultural production. In Ethiopia and Kenya, less than 25% of their production is purchased and 75% is allocated to home consumption. In Vietnam, Bangladesh and Nepal, smallholder farmers only sell 38%, 23% and 12% of their entire production, respectively, due to market inaccessibility in Nepal, market access is limited due to the bad road infrastructure and smallholder farmers earn only about 5% from the sale of their agricultural produce (Rapsomanikis, 2015). According to Obi *et al.* (2012), smallholder farmers in the Nkonkobe Municipality, in South Africa, face challenges in delivering their agricultural produce to the markets, where they could earn considerable income to improve their food security,

due to the bad road infrastructure; they only deliver a small quantity of their agricultural products to different formal and informal sellers.

2.3.3 Land access

Generally, access to land depends on the types of tenure that are implemented, which include community-based and conventional tenure. In rural areas, and particularly for poor households, access to land is always insecure (FAO, 2018). According to a study conducted in the Horn of Africa, for the majority of poor and food-insecure people access to natural resources is limited in many areas. Many poor households are located in semi-arid, arid and marginal land, which is characterised by the depletion of soil fertility (FAO, 2000; Rapsomanikis, 2015). Due to land and market inaccessibility, many rural households are unable to depend only on agricultural activities to improve their food security situation, and they are forced to seek opportunities in the non-agricultural sector, which permits them to find some relief from their poverty (FAO *et al.*, 2012).

In rural settlements, smallholder farmers own significantly small pieces of land of less than two hectares, and they are generally marginalised. In Bangladesh and Vietnam, smallholder farmers own about 0.24 and 0.32 hectares, respectively, while in Kenya and Ethiopia, the average land size of such farmers is nearly 0.47 and 0.9 hectares, respectively (Rapsomanikis, 2015). Although nearly 75% of rural households in Pakistan rely on agricultural activities, access to land presents a great challenge and the majority of smallholder farmers own less than two hectares of land and they have limited access to services and resources. Therefore, they experience a reduction in crop productivity which increases their vulnerability to food insecurity and poverty (Abid *et al.*, 2011).

Only about 11% to 16% of the rural areas in South Africa are suitable for agricultural purposes, which leads to land tenure insecurity (Aliber and Hart, 2009). According to HSRC (2004), most rural land is owned by traditional leaders, and access to private land is only permitted if it is authorised by the traditional chief. Smallholder farmers only own small pieces of land for subsistence food production in the former homelands (Aliber and Hart, 2009).

2.3.4 Low agricultural production

According to the United Nations Development Programme (UNDP), since most rural residents are poor and rely on agricultural activities as their main source of food and income, agriculture should

be considered as one of the world's economic growth sectors for poverty and food insecurity eradication (UNDP, 2012); however, it is unable to reduce poverty in the majority of developing countries, due to the low outcomes (International Development Association (IDA), 2009). Thus, smallholder farm activities require specific and priority attention by governments and private organisations, in order to reduce poverty and food insecurity in rural areas (Garvelink *et al.*, 2012).

Although most of consumed food in developing countries is produced by smallholder farmers, their agricultural productivity is generally decreasing (Rapsomanikis, 2015). The FAO (2000) found that in the majority of the rural areas in the Horn of Africa, agricultural activities have been characterised by low inputs and outputs. Agricultural technologies are fundamental and have been found to be the lowest productive per hectare in the world. In agricultural areas that have high potential, the lack of skills and knowledge, as well as the lack of finances and limited market access, present great constraints for improving agricultural productivity. In addition, due to the lack of technologies, including improved harvesting machinery, water control and drought-resistant varieties, rural agricultural production has decreased significantly and has led to the deterioration of millions of rural livelihoods (FAO, 2000).

Due to lack of agricultural inputs in South Africa, such as fertilizers, veterinary inputs and agricultural skills and technologies, rural agricultural activity is less productive and only generates about 4% of the total household income (HSRC, 2004). Therefore, the majority of households have abandoned their agricultural activities and they become net consumers, rather than producers; and now they rely on non-farm activities to meet their household food requirements (HSRC, 2004).

2.3.5 Climate change

According to the Intergovernmental Panel on Climate Change (IPCC) (2014), rural households remain vulnerable to poverty and hunger due to climate change, since they rely largely on the natural resources and a subsistence economy for sustaining their livelihoods. Many people in developing countries live in places that are vulnerable to climate change, the regions that are hot and dry and the farmers have a low adaptive capacity to climate change. For centuries, people in the Horn of Africa have developed several strategies and mechanisms for sustaining their livelihoods, in order to cope with the negative impacts of climate change. Smallholder farmers shift their crops or cultivate different crops during different periods to cope with late rainfall or the

shortage of rainfall in the mid-seasons, and they resort to gathering and hunting in the severely stressful periods. For pastoralists, farmers travel long distances with their herds to seek green pastures and places to forage (FAO, 2000).

Like other Sub-Saharan African (SSA) countries, South Africa has been severely affected by climate change, which has led to an increase in temperatures and a decrease in rainfall and which has hampered the strategies for poverty and hunger alleviation (Calzadilla *et al.*, 2014). Which has resulted in a decrease in agricultural production, in turn, results in the scarcity of food and the deterioration of livelihoods that depend on agriculture (Maponya and Mpandeli, 2012). Due to the severe droughts in 1991/1992, millions of people were put under severe stress, which significantly increased their vulnerability to hunger, malnutrition and disease and increased the mortality rate in the country. Agricultural production dropped drastically, there was a significant increase in the food prices and a decrease in employment opportunities (Thompson, 1993). Due to climate change, agricultural production decreased by about 2.8% in 2016, compared to 2015 (DAFF, 2017). Therefore, many livelihoods and incomes were severely affected and households were pushed to depend increasingly on external assistance (Thompson, 1993).

2.4 Definition and Concepts in Food Security

Due to the complexity of the food security domain, many definitions of the concept have been provided by different organisations. According to Hodinott (2001), about 200 definitions of food security have been provided in the literature. However, the most common and widely-used definition today has been provided by the Food and Agriculture Organisation (FAO), which defines it as “when all people, at all times, have access to adequate, nutritious and safe food and water to meet their dietary requirements and food preferences, for maintaining a healthy life” (FAO, 2009). According to Turyahabwe *et al.* (2013), “food insecurity is defined as the inability of people or households to meet their daily food requirements for maintaining a healthy and active life and when there is anxiety about how to access and produce food in the future”. The FAO (2009) found that food security can be observed globally, nationally, at household and individual level, and that the global or national food security situation might not always address the food security issues of households.

From the above definitions of food security, four dimensions, or components, are emphasised to constitute the concept of food security, and these include food availability, food accessibility, food utilisation and food stability.

2.4.1 Food availability

The availability of food refers to an adequate quantity of food that is accessible to people, to meet their food needs and preferences. Food supply and production should be performed through the international market or domestic production, and a country should have an adequate quantity of food, both nationally and at a household level, to sustain the needs of its population (FAO, 2006). According to Kannan (2000), food availability is significantly important and governments should not rely entirely on an international food supply, as any decrease in the availability of food could lead to severe consequences for a population.

Recent reports have indicated that, on a global level, food production is sufficient to feed the population; however, on an individual level, millions of people struggle to access adequate and nutritious food, and they consume less than the recommended 2100 Kcal food energy per day (FAO, 2013). Challenges, including wars, riots, political issues, transportation challenges and the ineffective structure of the markets, are linked to the insufficient supply and production of food (Benson, 2004). DAFF (2012) has indicated that data of food availability, globally, regionally, sub-regionally and nationally, can be provided by creating a food balance sheet, a food market survey of the agricultural production for the entire planet.

2.4.2 Food access

Food access refers to the ability of a nation, household or individual to physically and economically access adequate, safe and nutritious food for sustaining life. Physical access implies that households obtain food where it is available or produced, whereas economical access refers to their ability to access food financially (Staatz *et al.*, 2009). Food access is closely linked to poverty, as poor and food insecure people always lack adequate resources to access sufficient food (Labo, 2001). In rural settlements, accessibility to adequate, safe and nutritious food presents significant challenges, since households live long distances away from food sources, such as supermarkets, and the transportation costs are high (Nord *et al.*, 2009). A study conducted by Food and Nutrition Technical Assistance (FANTA) (2006) suggests that everyone should have adequate access to food

resources to meet their needs and preferences, and that they could obtain these from their own production, getting it from neighbors, etc. Webb and Thorne-Lynman (2005) stated that hunger and malnutrition are not necessarily always caused by food scarcity, but by poverty, as access to food is determined by the assets of a household, such as its income, land and employment, since they rely on their financial ability to buy food, or natural resources, such as land, on which to produce food (FAO, 2012). Households with adequate resources are able to meet their own food needs and overcome food shortage challenges (Garrett and Ruel, 2000).

2.4.3 Food utilisation and stability

Food utilisation refers to the adequate, safe, nutritious and quality of food intake that provides sufficient essential nutrients and energy for an active and healthy life (World Food Programme (WFP), 2007). This involves the food preparation process, safe and clear water, as well as healthcare, to ensure that the individual's receive sufficient essential nutrients (Richardson, 2010). According to FANTA (2006), food utilisation also encompasses food storage techniques, sufficient knowledge and nutrition and child care services. Yin *et al.* (2008) indicated that there are a number of factors that limit people's utilisation of food, including poor food care, insufficient sanitation and the loss of essential and sufficient nutrients during the food preparation process, which could have a severe negative impact on the health status of households.

The stability of food implies the ability of an individual to access adequate, safe and nutritious food all times. The FAO (2000) found that this is influenced by many factors, including the fluctuation of market food prices, political instability, weather changes, market instability, as well as their income and their ability to produce food, which can lead to the transitory and chronic food insecurity of households. Food instability can also be caused by the loss of adequate resources, owing to economic shocks and inadequate reserves (Schmidhuber and Tubiello, 2007).

2.5 Impacts of Home and Community Food Gardens on Food Insecurity Eradication

Based on the historical agro-potential of African rural areas to produce subsistence food, diverse forms of smallholder farming, such as community and home gardening, have been practised in order to improve the food security status of rural households (Galhena *et al.*, 2013). Whether it is a home or community food garden, a food garden is defined as a plot of land that can measure about 150 square meters, and that is used particularly for subsistence production of fruits,

vegetables, chickens and domestic animals; in cases where surplus is produced, it can be marketed (Nell *et al.*, 2000). Food gardens are crucial for mitigating the vulnerability of rural households to food insecurity, as they enable them to access to a diversity of nutritious and adequate food, and they help to generate an income for the household (Faber *et al.*, 2011; Jowell, 2011).

2.5.1 Home gardens

Home gardens are plots of land that occupy a surface of less than 0.5 ha and that are managed by using family labour within a household compound. Home gardens in rural communities have several advantages, such as a reduction in the wastage of natural resources by foraging wild animals, which enables women to generate an income, while performing their household activities, etc. (Landon-Lane, 2016). It has also been found that if home gardens are well-sustained and managed, it permits rural households to access adequate nutritious and healthy food throughout the year, and it reduces their vulnerability to food insecurity (Musotsi *et al.*, 2008).

Although home gardens in Jaffna, Sri Lanka, have faced many constraints, the findings of Galhena (2012) revealed that the food security of households participating in home gardens has improved. About 29 species of plants were reported in their gardens, which provided an additional source of fresh, nutrient-rich foods. These home gardens generated an income for households in the northern region of Sri Lanka and improved their livelihoods. Similarly, from the results of an evaluation of the implemented home garden programme in Asia (Bangladesh, Cambodia, Nepal and Philippines) in order to improve the food security and nutrition of households and to empower women; it showed that home gardens enhanced the availability and consumption of vegetables, fruits and livestock products, such as eggs. The programme resulted in a decrease in anaemia in children between 6 and 59 months old, and households managed to increase and generate their incomes with the sale of agricultural produce from their homesteads. Furthermore, it improved the involvement of women in household decision-making (Hellen Keller International (HKI), 2010).

Faber *et al.* (2002a) showed that there was a significant increase in their serum retinol concentration in those South African households participating in the home garden programmes, while there was a decrease of the same in the control households. The children of the participating households were fed more with yellow and dark-green leafy vegetables, compared to their counterparts. Besides the increase in serum retinol, their Vitamin A intake also increased; it was

found to be significantly higher in children, aged between 2 and 5 years from the home garden projects, compared to their counterparts (Faber *et al.*, 2002b).

2.5.2 Community gardens

Community gardens are pieces of land that are offered by local authorities to a group of smallholder farmers for subsistence food production purposes, as well as for commercial purposes, when there is a surplus in production. Gardeners provide mutual support for each other and share common challenges, benefits and skills (Holland, 2004). In community gardens, food growers have supreme control over the outcome of the gardens. They have access to land, as well as inputs like transplants and improved seeds (Pearsall *et al.*, 2017), easy access to water sources and agricultural tools, and several technical tools facilitate them in the improvement of soil fertility, such as composting, etc. (Darke and Lawson, 2015; Petrovic *et al.*, 2019). In addition, a fencing infrastructure is provided for the community gardens, which provides protection for the cultivated crops or vegetables against any external predators, such as wild animals, theft, etc. (Manning, 2021). In areas where the community gardens are managed cooperatively by the local population, the outcome of the gardens is significantly good and helps the members to overcome various challenges and constraints (Manning, 2021). According to Mashinini (2001), the success and sustainability of community gardens depends on the ability of its members to manage the available resources and their willingness to share the risks and problems that are linked to these gardens.

Community gardens offer various advantages to the household participants; for example, they are able to generate a significant increase in their agricultural food production, in order to generate an income for the household (Gittleman *et al.*, 2012). In a study by Ngobese (2014), which assessed the potential of the Thuthukani community garden programme, it was found that participating farmers increased the diversity of their crops. More than 10 vegetables were grown throughout the year, even though there was a lack of adequate resources and skills to increase their productivity. A crop like potatoes showed a great harvest, which reached 5 to 15 tones/ha and generated a gross production margin of nearly R500 to R1500. In Guelph, Ontario, it was found that the average agricultural produce of 50 community gardens was estimated at 1.43 kg a meter square, or nearly 197 000 kg of vegetables produced on a land surface of 13.76 ha, which would be able to meet the vegetable requirements of about 2 900 persons, or 2% of the population in the area (Codyre *et al.*, 2012). A study conducted in Baltimore revealed that the community garden project successfully

yielded good results. Gardeners increased the variety of the crops planted, they improved their agricultural skills and knowledge, and there was an increase in the frequency of their vegetable consumption (Brown-Fraser *et al.*, 2015). In San Jose, community gardeners doubled their vegetable intake, which led households to meet the United States (U.S) daily nutritional guideline requirements (Algert, 2016). Furthermore, Alaimo *et al.* (2008) reported that community garden participants in urban areas multiplied their daily consumption of fruits and vegetables 1.4 times more than their non-participant counterparts. In the U.S, about 88%, 72% and 76% African Americans participating in community gardens reported consuming more fruits and vegetables, less fast food, and they allocated less money on food purchases, respectively, compared to their counterparts (Barnidge *et al.*, 2013).

2.6 Factors influencing Participation in Agricultural Projects

Participation in agricultural projects depends on several factors, and it differs from one project to another. However, several studies throughout the world have found that there are many factors that influence household participation in agricultural projects or programmes. Some of these factors are discussed below:

2.6.1 The gender of the household head

Many researchers demonstrated that gender has a significant influence on the participation of households in agricultural projects. In a study conducted by Etwire *et al.* (2013), males were found to be significantly more interested in participating in agricultural projects than females. This could be explained by the fact that women often lack the resources that could enable them to participate on any innovative platforms. These findings are in agreement with those of Nontu and Taruvinga (2021), which found that the probability of participating in home garden of a household being headed by a male is 1.8 times higher than a household being headed by a female. Similarly, Gyulgyulyan and Bobojonov (2019) found that when a household in Armenia was headed by a male, the probability of participating in agricultural cooperatives was 2.5 times higher than when it was headed by a female. However, Yakubu *et al.* (2019) found that the gender variable was negatively significant. Meaning that when the cassava production is managed by females, the participation in Survival Farming Intervention Programme decreased by two in Kogi State of Nigeria.

However, in a study conducted by Belachew *et al.* (2020) in north-west Ethiopia, it was found that when households are headed by males, the probability of them participating in soil and water conservation practices decreases by one. This could be because females are significantly more skilled and have more knowledge about the selection of appropriate and good quality seeds for growing crops, and they are able to improve the household nutrition consumption. Nxumalo and Oladele (2013) also found that females are more socially connected than males, and therefore, there is a much higher probability that they will participate in agricultural programmes.

2.6.2 Age of the household head

Age is a variable that is reported to significantly influence a household's adoption of, or participation in, agricultural projects. According to Nxumalo and Oladele (2013), young farmers are often more innovative and more willing to acquire new skills and to take risks. Thus, if households are managed by young people, their participation in agricultural projects is likely to increase. In a study assessing the factors influencing the farmers' participation in agricultural projects, Etwire *et al.* (2013) found that, in contrast to the non-participants, the programme participants were younger, with an average age of 39 years. This implies that they are at a productive age and can work for another 20 years. In addition, Tologbonse *et al.* (2013) found a positive relationship between age and participation in a Women in Agriculture (WIA) project. Women participants were found to be younger, at an average age of about 39 years, against the non-participants, who were, on average, 45.9 years old.

Martey *et al.* (2014) also found that, with the increase in age, participation in the projects decreased by 7.6%, which implies that as the household heads get older, they are less likely to participate in the projects. This could be due to the fact that older people are usually experienced in agricultural activities and may possess adequate resources for improving their farming activities; therefore, they will be less interested in joining these programmes. In addition, due to the decline in the willingness of the older household heads to adopt new skills and innovations, their participation in platform might have decreased. This leads us to conclude that as the household heads gets older, the less interested they are in acquiring new skills and innovations, which implies that, at some point, the probability of them participating in agricultural projects, or any platforms, decreases.

2.6.3 Size of the household

Studies have found that the household size is expected to influence its participation in agricultural projects. According to Martey *et al.* (2013), the higher the number of family members, the more willing they are to be used as a labour force, in order to complement and help the household head with the farm activities. Having more family members permits the household head to share certain responsibilities and to focus on the necessary duties. Therefore, the households participate in any platforms or activities that will enable them to cope with their economic constraints and to acquire more resources, in order to sustain their livelihoods. The findings of Martey *et al.* (2014) also indicate that the household size had a positive impact on the willingness of women to adopt the platform. With the addition of one household member, their participation in the platform increased by 3.3%.

In contrast, Oladejo *et al.* (2011) found that the household size had a negative influence of households in participating in agricultural production in Egbedore in Nigeria. The results revealed that the household size was negatively significant at 5%, the participating households had small size, compared to their counterparts. This could mean that younger household members did not actively participate in agricultural production, because they belong to the new and modern generation who might want white-collar jobs. Similarly, the findings of Jamilu *et al.* (2015) indicated that an increase of one family member in the Katsina State in Nigeria decreased the household participation in the IFAD projects by 0.041%.

2.6.4 Marital status of the household head

It has been found that a person's marital status has a significant impact on the participation of households in agricultural programmes. Those who are married are more likely to participate in these projects, compared to single household heads (Nnadi and Akwiwu, 2008) because they are interested in increasing their household resources, in order to sustain their livelihoods and improve their food security status. In addition, compared to those who are single, married household heads are often encouraged and advised by their spouses to participate in these platforms, in order to ensure the well-being of their family members, as they have many overall responsibilities (Martey *et al.*, 2013). These results were confirmed by Yakubu *et al.* (2019), who indicated that most women who participated in the Survival Farming Intervention Programme that was implemented

in Kogi State in Nigeria were married, rather than being single. The likelihood to participate in the programmes of households being headed by married was 2.466 times greater than their counterparts.

2.6.5 The educational status of the household head

It has been found that educational status has a positive impact on a household's decision to participate in any agricultural projects or platforms, because, based on the knowledge acquired from the school or institution, their education enables individuals to assess the advantages of a project and to make the decision to participate. Therefore, an educated head enhances the probability of a household participating in these projects (Enete and Igbokwe, 2009). This was confirmed by Yakubu *et al.* (2019), who found that, with an increase of one year in the household head's education, the household participation in the programme increased by 2.53%. Similarly, Belachew *et al.* (2020) found that extending the schooling of the household head by one year, increased the adoption of stone bund and strip cropping by 0.72 and 0.34, respectively.

However, according to Tologbonse *et al.* (2013), a Nigerian study found that an increase of one year in a woman's education level in the area, decreased her participation in agricultural projects by 0.064%. This could be because the more years the household head has spent at school, the more likely it is that he/she will find better employment and will become more interested in political and non-agricultural activities, which provide secure jobs, thus decreasing the probability of them participating in agricultural projects. Khan *et al.* (2012) revealed that the majority of the women who participated in agricultural activities were illiterate. The results of a t-test revealed that an increase in the schooling of women household heads by one year, decreased their participation in agricultural activities by 0.032%. Similarly, a study conducted by Jamilu *et al.* (2015) found that with an increase in the educational status of the household head, the probability of him/her participating in IFAD projects decreased by 0.309%.

2.6.6 Access to extension services

Extension services are expected to have a positive influence on the farmers' participation in agricultural projects. According to Etwire *et al.* (2013), the majority of farmers who participated in agricultural projects accessed extension services in 2012. The regression model results revealed that the probability of farmers who participated in agricultural projects by accessing extension

services was 14 times higher than the probability of their counterparts doing so. This could be explained by the fact that access to extension services enabled farmers to improve their knowledge and their perceptions regarding the importance of agricultural programmes, etc., and therefore, the probability of their participation in the projects increased. The above studies confirm the results of Jamilu *et al.* (2015), who found that the probability of these households accessing extension services was 28.3 times higher than that of their counterparts.

2.7 The Effectiveness of the Home and Community Food Garden Programmes implemented in South Africa

Several studies have been conducted on the implementation of home and community food garden interventions in South Africa, to assess their effectiveness for improving the food security status of households, and for eradicating hunger and food insecurity. A study conducted by Ogundiran (2014) in the Nkonkobe Municipality found that the home garden programme intervention improved the income of participants from the sale of their food garden produce by an annual mean of R 473.39, as against a standard deviation of R 170. A similar study by Bahta and Owusu-Sekyeer (2018) on the impact of homestead food garden interventions and land distribution policies on the income of South African smallholder farmers revealed that participating in the programme has increased their household incomes by 5.21%. Despite only 37% of the population participating in the food garden programme, their food security status improved. Compared to the non-participant households, who were found to be moderately and severely food insecure, with 29% and 23%, respectively, food garden participants were moderately and severely food insecure, with 14% and 12%, respectively (Asangha, 2015). In addition, Bahta *et al.* (2018) found that, in net returns, the maize yield of 500 smallholder maize producers increased by 22.01% and 43.37%, respectively, for food garden participants, and that participants with more than one hectare of land increased their outcomes, compared to their counterparts. In a study in the Amathole District, participants and non-participants in the homestead garden programme were compared; significant growth and improvement was observed in the number of vegetables grown by, and in the food diversity of, the programme participants, compared to their counterparts. Most programme participants improved their income from the sale of their agricultural produce (Kubheka, 2015). A study conducted in Mpophomeni found that although only 4%, 22%, 39% and 35% of home gardeners were food

secure, mildly, moderately and severely food insecure, respectively, the programme was effective in improving their household food security status (Baiyegunhi and Makwangudze, 2013).

Although the community garden programme has faced several challenges, including droughts, insects and theft, household participants in the programme have improved their food security status. Fresh food production has permitted participants to improve the food availability for their household and it has improved their income, compared to that of their counterparts (Mudzinganyama, 2012). In Emfuleni, community gardeners reported an increased availability of fresh vegetables from their gardens throughout the year (Modibedi *et al.*, 2021). In a study assessing the potential of the Thuthukani community garden programme in KwaZulu-Natal, it was found that participating farmers increased the diversity of the crops planted, with more than 10 vegetables being grown throughout the year, despite a lack of adequate resources and skills to increase their productivity. A crop, like potatoes, showed a great harvest by reaching 5 to 15 tons/ha and it generated a gross production margin of nearly R500 to R1 500 (Ngobese, 2014).

However, despite the success of home and community food garden interventions for improving the food security of rural households, as indicated above, in a study by Nontu and Taruvinga (2021) of 200 rural households, the participation in the home garden programme was significantly low. Their participation was influenced by major factors, including their accessibility to arable land, to extension services, to a household income and education. Khanyisile (2011) also indicated that, although the home garden programme was implemented in the study area, it had not been sustainable, because the poverty of the rural households had not been addressed. The campaign was unable to provide all their garden needs, such as access to water or organic plants and seeds, and as a result, the improvement of food security of these rural household was hindered. Factors, such as soil sterility, the lack of access to land or only having small plots of land, the unavailability of water, as well as the lack of finance to purchase agricultural inputs, were the major constraints related to the sustainability and success of the implemented community garden programme in the area (Mpanza, 2008).

From the above analysis of the effectiveness of home and community food garden interventions in South Africa, it can therefore be concluded that, despite their failure to yield the expected outcomes in certain areas, the programmes are effective, overall. This calls for a deep analysis of the major causes of the problems, prior to undertaking any interventions. If all the factors linked

to the problem area had been appropriately addressed, the sustainability of the interventions could have not been hindered. This review has revealed that factors like access to land and water, poverty, the lack of skills and new technologies, as well as the inaccessibility to agricultural inputs (fertilizers, varieties, etc.), are the major constraints preventing the sustainability of the implemented interventions.

2.8 Empirical Determinants of Food Security

Studies have been conducted throughout the world to identify the factors that determine the food security status of households. They have revealed that many factors have a significant impact on the food security of households, and some of the major factors will be discussed below:

2.8.1 The gender of the household head

Many studies have demonstrated that the gender variable has a significant impact on the food security of a household. Thus, according to a study conducted by Kassie *et al.* (2012), households headed by males are likely to be more food secure, compared to those headed by females. Based on the results, households headed by males were found to be 13% more likely to be food secure than their female counterparts, which could be explained by the differences and inequalities in asset ownership, particularly in the rural areas. Access to natural and reproductive resources for women always presents a great challenge, which has a significantly negative impact on the food security of their households. In addition, their limited access to reproductive assets hinders them from improving their food security and sustaining their livelihoods, and therefore, their vulnerability increases. These results are in agreement with research conducted by Ndobo (2013), who used the Household Food Insecurity Access Scale (HFIAS) tool and found that there was a significant relationship between the HFIAS score and gender. The results revealed that households headed by males were 57.10%, 7.70%, 10.90% and 24.30% food secure, mildly, moderately and severely food insecure, respectively, compared to their counterparts, who presented HFIAS scores of 37.70%, 11.60%, 10.10% and 40.60%, respectively, for the same levels. According to the correlation analysis results, the likelihood of the household being food secure increased by 0.179 when it is headed by a male. In a similar study by Tibesigwa and Visser (2016) on the rural and urban areas of South Africa, households managed by females were found to be more food insecure in rural areas, compared to those headed by males.

In contrast, research conducted by Lutomia *et al.* (2019) found that households headed by females are likely to be more food secure, compared to those headed by males. Using the HFIAS score tool, the results revealed that households headed by females were 46%, 12%, 16%, and 26% food secure, mildly, moderately and severely food insecure, respectively, in 2015, compared to their counterparts, who were 41%, 14%, 20%, and 25% food secure, mildly, moderately and severely food insecure, respectively. This could be due to the fact that female household heads provide more opportunities for improving the food security of households and for the fight against food shortages, compared to male heads. These results confirm the Geodata results for Agriculture and Water (G4AW) *et al.* (2017), which revealed that an increase of 10\$ in the income of female household heads, achieves a similar improvement in the welfare of children and households, compared to the 110\$ of their counterparts.

2.8.2 Age of household head

A study conducted by Alpízar *et al.* (2020) on the determinants of food insecurity in Central America found that the age of household heads was significantly related to household food insecurity. According to the data analysis, households headed by older people were less likely to suffer from hunger and malnutrition, compared to those headed by their younger counterparts. The results of the Probit model revealed that an increase of one year on the age of the household head decreased the household's vulnerability of being food insecure by 0.009. This could be explained by the fact that households headed by older farmers are less likely to experience food insecurity challenges than households managed by younger farmers, because they are more experienced in farming and food supply management. Therefore, they can plan and use resilient strategies to cope with food insecurity issues during difficult and hazardous periods. In addition, compared to the younger household heads, older farmers can acquire adequate reproductive resources, which enables them to improve and sustain the food security and livelihoods of their households. These results agree with those of Arene *et al.* (2010) in the Nsukka Metropolis, in which the statistical data analysis revealed that each additional year in the age of the household head, increased the household's food security situation by 0.01. Abdullah *et al.* (2019) also found that households headed by older people were more food secure, compared to those headed by younger people.

However, the above results concur with a study conducted in Addis Ababa by Girma (2012), which found that the age of the household head had a positive relationship with the household's food insecurity. The results revealed that households headed by younger people were more likely to be food secure, compared to those headed by older people. According to the data analysis results, an increase of one year in the age of the household head, directly increases the household's vulnerability of becoming food insecure by 0.6. This could be explained by the fact that an increase in age probably decreases the productivity of the household heads, so that they cannot sustain the livelihood of their households. It implies that the older the household head gets, the less he/she contributes to the welfare of the household; therefore, at a certain age, the household head can no longer sustain the household livelihood due to her/his contribution decrease

2.8.3 Household size

Many studies have found that the household size is significantly related to food security; for example, a study by Eneyew and Bekele (2012) assessed the causes of household food insecurity in Wolayta and found that the household size was positively related to its food insecurity status. The statistical analysis revealed that by maintaining other variables as constant and equal, an increase of one household member increased the likelihood of the household becoming food insecure by a factor of 6. This could be explained by the fact that an increase of one family member increases the number of mouths to feed and the demand for food, which means that the family will need to increase its food expenditure and resources to meet the food needs of the household. In addition, the greater the number of family members, the less likely it is that all the nutritional requirements of the household will be met; it will decrease because of the nutritional competition among the family members. This research is similar to that of Aragie and Genanu (2017), who found that the household size negatively affected the food security situation, at a 5% level of probability. The findings revealed that smaller households were less likely to become food insecure, compared to larger households. The statistical analysis revealed that an additional one family member directly increased the household's vulnerability to become food insecure by 1.3.

However, according to a study that assessed the determinants of food security in Kwakwatsi, in the Orange Free State Province, the family size had a positive influence on its food security status. Using the HFIAS scores, households with eight members were found to be severely food insecure

with 11%, compared to households with two to four members, who were 30% severely food insecure. The statistical analysis indicated that an increase of one family member, increased the probability of the household being food secure by 0.03 (Ndobo, 2013). This could be explained by the fact that, to a certain extent, family members could be considered as 'labour force'. Therefore, the more members that a household has, the higher the chance of it generating a higher income, which could improve its food security status.

2.8.4 The educational status of the household head

Several studies found that the education level of the household head was positively related to the food security status of the household. Research conducted by Lutomia *et al.* (2019) revealed that the educational level of a female household head was negatively significant with the food insecurity status of households in the western and eastern regions of Kenya. The results of the Probit model indicated that with a one-year increase in the schooling of the household heads, the likelihood of the household becoming food insecure decreases by 0.02. This could be explained by the fact that the education level possibly increases their knowledge, awareness and innovativeness, which could enhance the probability of them accessing better and more secure jobs and reproductive resources which, in turn, would directly or indirectly improve the food security status and sustain the livelihoods of households. It is also assumed that educated family members may have a good understanding and a better knowledge, which could enable them to manage their resources well and to improve the food security and income of their households. These results are similar to those of a study by Yousaf *et al.* (2018) in Punjab, Pakistan, who found that the education level of the household head positively impacted the household's food security. A statistical analysis of the findings revealed that an additional year of schooling increased the probability of the household being food secure by 10%. Furthermore, a study conducted by Mutisya *et al.* (2016) in Kenya confirmed the above findings, by revealing that the majority of food-secure households are headed by educated members who attended school for an average of 8.3 years, which is almost equal to a primary education. Based on the Probit results, it was found that, with any one-year increase in the average schooling of the household head, the probability of the household becoming food secure increases by 0.02

2.8.5 Household income

The household income is defined as the total income per month from all the household's sources. Many studies have found that income is positively associated with the food security status of a household. According to a study conducted by Jacob (2009), households with a low income are highly vulnerable to food insecurity, compared to wealthier and middle-income households. Based on the regression model results of a study conducted in Pakistan, there was a positive relationship between household food security and income. An increase of 1000 rupees in the average household income was found to increase the probability of the household becoming food secure by 10.5% (Bashir *et al.*, 2012). This could be explained by the fact that the higher the household income, the easier it is for the household to access adequate, safe and nutritious food, as well as other basic household needs. When a household earns a sufficient and considerable income, it covers all its possible food and health needs, and it provides more expenditure for improving the food security of the household. In a similar study that assessed the determinants of household food security in Ethiopia, Hussein and Janekarnkij (2013) showed that income had a positive impact on a household's food security. The data analysis found that an increase of Birr on the total household income, directly improved the food security of a household by 0.12. Furthermore, in a study conducted in South Africa, Ndobu (2013) confirmed that the household income was strongly and positively related to the food security of a household. Using the HFIAS score, the findings revealed that 64.7% of households with an income ranging between R4 001 to R6 000 a month were found to be food secure, compared to their counterparts who earned R2 000 and less, with 37.7% and 37.5%, respectively. This implies that if the household earns a higher income, the HFIAS score of the household is lower.

2.8.6 Extension services

Many studies have found that extension services are positively and significantly related to the food security status of the households. According to a study conducted in Ethiopia by Hussein and Janekarnkij (2013), the accessibility of extension services to farmers has a positive effect on the food security of their households. Based on the statistical analysis results, access to extension services by households directly increased the probability of them becoming food secure by 46%. Because it enables farmers to improve their knowledge, it allows them to have access to agricultural training, as well as inputs, such as fertilizers, seeds and agricultural materials, which

will increase their agricultural production and improve the food security of their households and give them sustainable livelihoods. These results are in conformity with a study conducted by Alia and Erenstein (2017) in Pakistan who found a positive relationship between access to extension services and household food security. According to the findings, the probability of these households becoming food secure, by giving them access to extension services, increased by 1%, compared to households that did not have access to extension services.

2.9 The Measurement of Food Security

Due to the complexity and multi-dimensionality of the concept of food security, its measurement has presented great challenges for researchers. To date, the majority of food access measurements at a household level, such as income and adequate caloric intake, have presented great technical challenges to collect due to the lack of specific and single food security measurements (Coates *et al.*, 2007). The measurement of food security is crucial at a household level, as it provides a general view of its food security status and how the household reacts in food-insecure circumstances (Qureshi, 2007). At a household level, the measurement can assess food security in terms of energy intake, the available staple food and its consumption (Faridi and Wadood, 2010). In addition, the food security situation can be measured by assessing the ability of a household to access adequate, safe and nutritious food and to fulfil the nutritional requirements of its members (Swindale and Bilinsky, 2006; Coates *et al.*, 2007). The different common household food security measurements are discussed below:

2.9.1 The Household Food Insecurity Access Scale (HFIAS)

This measurement has been designed by the United States Agency for International Development's (USAID's) Food and Nutrition Technical Assistance (FANTA) project and has been widely applied in international food security surveys. The tool focuses on the thought that food insecurity (access) can cause predictable and quantifiable outcomes and can be captured by means of a survey and summarised on a scale (Coates *et al.*, 2007). The tool is designed to have nine questions that have been developed to address the three conditions (or domains) of food insecurity. They include the following: Q1 (Anxiety and uncertainty about the household food supply), Q2-Q4 (Insufficient Quality, including the varieties and food type preferences), and Q5-Q9 (Insufficient food intake and its physical consequences) (Coates *et al.*, 2007). Each question asks if the situation happened

in the past four weeks, or 30 days. The respondent is asked to answer Yes (1) or No (0), depending on whether the situation occurred or not. If the situation happened, the respondent is required to provide the frequency with which it occurred (Coates *et al.*, 2007).

2.9.2 The Household Dietary Diversity Score (HDDS)

The Household Dietary Diversity Score (HDDS) is a simple indicator that determines the number of different food groups consumed by a household; this number is calculated, in order to reflect the good quality of the diet. For example, a household that consumes an average of four different food groups reflects that the diet provides a diversity of micro- and macro-nutrients. According to Azadbakht *et al.* (2005), the determination of household food security status requires a deep analysis of the dietary diversity of the household, because most food-insecure households rely mainly on starchy staples, and they exclude proteins and micronutrients. Thus, for the determination of HDDS in this study, 12 groups of food were used, as indicated below. According to Swindale and Bilinsky (2006), the HDDS ranges between '0' as the lowest, and '12', as the highest score. To collect information on the food consumption of a household, the Household Dietary Diversity Score should be used over a recall period of 24 hours. Therefore, the twelve questions constitute the baseline of the following food types used in this study: Cereals, Root and tubers, Vegetables, Fruits, Meat and poultry, Eggs, Fish and seafood, Pulses/legumes/nuts, Milk and milk products, Oil/fats and offal, Sugar/honey and Miscellaneous (Swindale *et al.*, 2006).

2.10 Summary

This literature review has discussed the impact of home and community food gardens on the alleviation of food insecurity in households and the determinants of their food security status. This chapter highlighted the general information on food security in KwaZulu-Natal, South Africa, as well as the major causes of food insecurity in rural areas, including poverty, the access to markets and land, low agricultural production and climate change. In addition, it reviewed information on the definition and concept of food security, as well as the impact of home and community food gardens on the eradication of food insecurity. The literature revealed that despite the food gardens are less considered at a national food production point of view, they contribute significantly to the eradication of poverty and food insecurity, particularly in poor and vulnerable communities.

Furthermore, this chapter explored the factors that influence the participation of households in agricultural projects, the effectiveness of home and community food garden interventions implemented in South Africa and the empirical determinants of food security. The following factors were deemed to have a major and significant influence on the participation of households in agricultural projects: gender, age, marital status, the educational level of the household head, the household size and access to extension services. Despite the interventions being implemented in South Africa, they did not yield the expected results in certain areas, due to some constraints; for example, the sterility of the soil, the lack of land, water scarcity and the lack of finance to purchase agricultural inputs. Overall, the review found that home and community food gardens were effective in the country. Factors such as gender, age, the educational status of the household heads, the household income and access to extension services were found to significantly impact the food security of households. The chapter ended by discussing the relevant measurements of household food security that were used in the study, which included the Household Food Insecurity Access Scale (HFIAS) and the Household Dietary Diversity Score (HDDS).

CHAPTER THREE: METHODOLOGY

The chapter discusses the methodological approach that was used to assess the impacts of home and community food garden programmes on the food security status of households and the determinants of their food security status in the uMzumbe Local Municipality. It covers the characteristics of the uMzumbe Municipality, the research design, the sampling method and the appropriate data analysis method that are used to attain the research objectives.

3.1 Characteristics of the uMzumbe Local Municipality

3.1.1 Its location and description

Figure 3.2 shows that the uMzumbe Local Municipality is located in the Ugu District of the KwaZulu-Natal Province in South Africa. It runs along a short strip of the coastline between Mthwalume and Hibberdene, and then it balloons out into the hinterland for approximately 60 km. Based on the land surface of the municipality, it is ranked the second-largest municipality in the district. It is predominantly rural, covering about 1 260 square kilometers, and it is composed of 20 municipal wards (Figure 3.1) (uMzumbe IDP, 2020/2021). According to community survey that was completed in 2016, the total registered households within the uMzumbe Municipality is estimated to be 10 088, which are shared amongst 20 wards. As it is not a township settlement, the uMzumbe Municipality has a vast backlog of basic services, a high level of poverty and a very small economic base, and about 60% of the total land area is natural and undeveloped (uMzumbe IDP, 2012/2013).

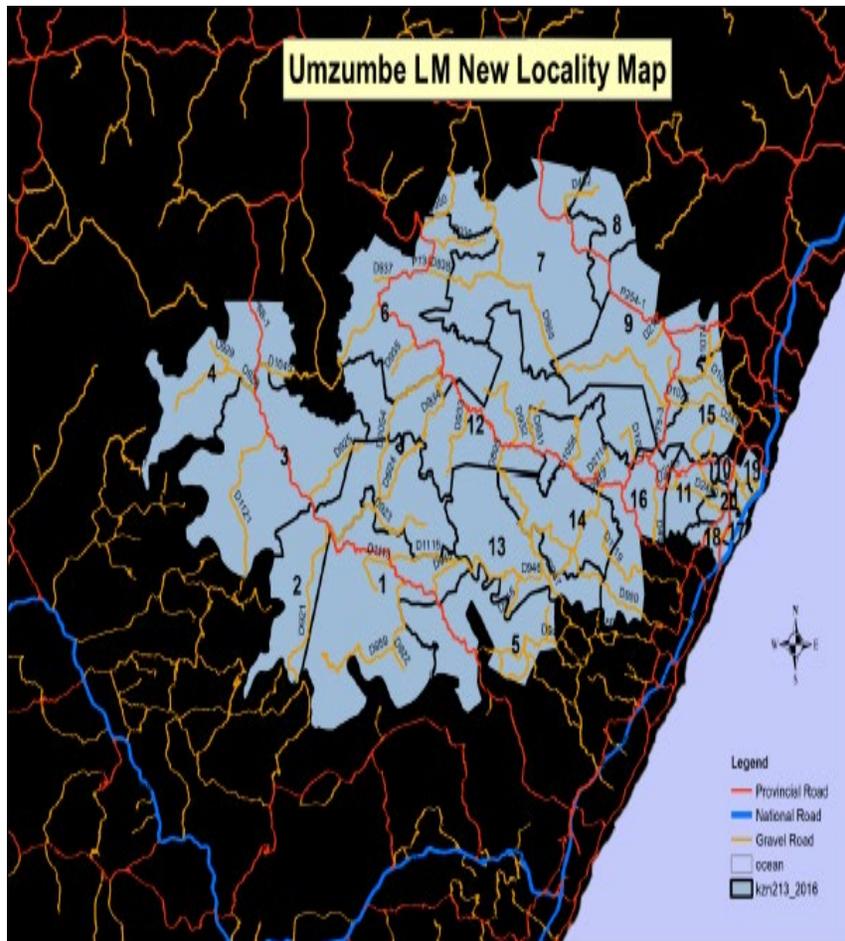


Figure 3.1 Ward delimitations of uMzumbe

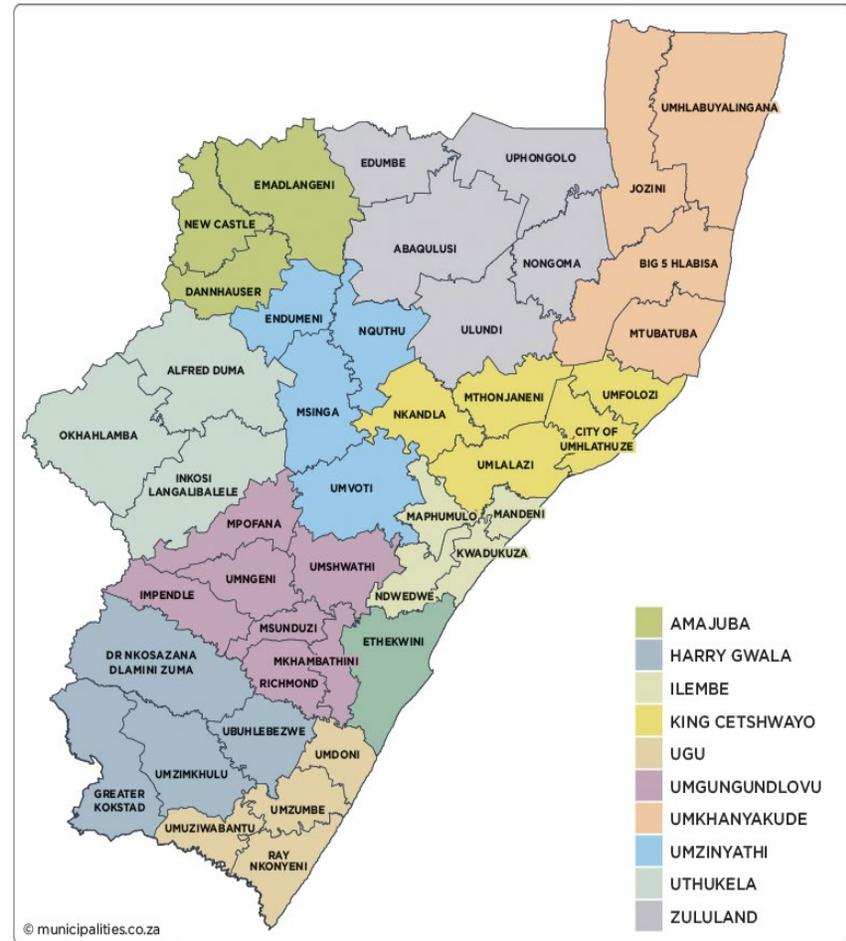


Figure 3.2 Location of uMzumbe in KZN (www.municipalities.co.za)

3.1.2 Agriculture

The municipality is characterised by land with a high agricultural potential and biodiversity. In the area, the agriculture sector is mostly composed of smallholder subsistence farmers, and what they produce is regarded as the main source of food and income for a large number of households. The subsistence food production in the Municipality encompasses livestock, the production of vegetables and dryland crops (uMzumbe IDP, 2019/2020). Apart from the bulk of the subsistence farming activities, a small portion of the Municipality is involved in commercial and developed farming, with the Department of Agriculture constantly making starter-packs available to the community, in form of equipment, irrigation tools and crop seeds (uMzumbe IDP, 2016/2017). According to the municipality reports, sugarcane, smallholder farming and small business communities are considered to be the most important sources of its economy (uMzumbe IDP, 2020/2021).

3.1.3 Poverty and employment

The uMzumbe Municipality is most affected by the extreme poverty in the Ugu District. The area is dominated by poor people who struggle to meet the dietary requirements of their families (uMzumbe IDP, 2017/2018). According to government reports, about 72% of the uMzumbe population are unemployed and almost 60% of the households have an income of less than R500 per month (Stats SA, 2007; uMzumbe IDP, 2012/2013). Another study found that the intensity of poverty in uMzumbe is as high as 43% and that the income level of the households is very low, which reflects a situation of impoverishment. Households rely on their pensions and other welfare grants, migrant remittances, informal earnings and casual employment wages (Stats SA, 2016). Among the residents who were eligible for work, only 14% of the uMzumbe population were employed in the years 2011 and 2016. In addition, according to a 2016 government survey, only a quarter of its population earned an income of between R9 601 and R19 600 per month (Stats SA, 2016).

3.1.4 Food security

The reports of the uMzumbe Municipality have revealed that the major challenges facing the communities living in the area include hunger and food insecurity, mainly due to a lack of financial resources (uMzumbe IDP, 2012/2013). To address these challenges, several programmes have

been implemented within the communities in the area, including poultry farming and home and community gardens (uMzumbe IDP, 2016/2017).

3.1.5 The educational level of the uMzumbe population

According to the uMzumbe IDP (2019/2020), 18% of the uMzumbe population are illiterate, with 38%, 40.6% and 0.1% having a primary, secondary and tertiary level of education, respectively. In addition, 1% had reached the TVT level, while 0.3% had reached other unspecified levels.

3.1.6 Gender

Based on a community survey conducted in 2016, the uMzumbe Municipality accounts for a larger number of females than males, namely 52.2% and 47.8%, respectively. This could be due to the men leaving to seek job opportunities in the towns and cities, in order to sustain the livelihoods of their households, while the women remain at home to take care of the children (uMzumbe IDP, 2019/2020).

3.1.7 Age group

The uMzumbe Municipality reports that the majority of the population in the area is composed of about 42% and 36% of children between 0 to 14 years old and 15-34 year-olds, respectively. People between the ages of 35-54 and over 65 years old constitute the minority of its population, with 15% and 7%, respectively (uMzumbe IDP, 2019/2020).

3.2 Research Design

The study applied a quantitative research method, which is reputed to be crucial for enabling the measurement of the variables and for the testing of the hypothesis of the study, as it focuses on numerical data and statistics (Kothari, 2004). According to Babbie (2010), the quantitative research method has the advantage of predicting, explaining and confirming the findings.

3.3 Sampling Method

Since the home and community food garden programmes have been widely implemented in the uMzumbe Municipality, simple random sampling was applied to select the wards in the

Municipality, and all the wards had an equal chance of being selected. Thus, three wards including 3, 6 and 14 were selected and constituted the sample size of the study.

At a ward level, the study applied the purposive method to select the village samples; which were selected from the villages in which both home and community food garden programmes were implemented. Therefore, only two villages were selected per ward that include Phongolo and Dunuse; Phembukhanye and Ngwenda; and Ndelu Tribal Court and Mabhutela from Wards 3, 6 and 14, respectively. The selection of the household samples within the villages was done by using a systematic sampling method, based on the household sample size, which is explained below.

According to the statistics that were released in 2016, the number of registered households in the uMzumbe Local Municipality was 10088 distributed in 20 municipal wards, in which 382, 602 and 808 for Wards 3, 6 and 14, respectively. The report indicated that the area is mostly composed of subsistence farmers who rely on agriculture as their source of food and income (uMzumbe IDP, 2019/2020). Thus, using the Raosoft method, which has a 90% rate of confidentiality, the research targeted 236 out of 1792 households, and it included 50, 80 and 106 households from Wards 3, 6 and 14, respectively. However, due to the incomplete information in certain questionnaires, the study ended up with 223 household samples. The main criterion for selecting the household samples was their possession of a food garden, whether they participate in the programmes or not. All the household respondents, including programme participants and non-participants were picked up on the ground along the selection process out of the study population for allowing the study to assess the level of participation in the programmes.

3.3.1 Systematic sampling technique at a village level

As has been previously mentioned, each selected ward was considered as a stratum on its own, to determine the household sample size at a ward level. Below is the systematic method that was used for selecting the household sample. The calculation of the sampling interval was performed by dividing the total population of the selected ward over the number of desired households in the ward, as follows:

$$K = \frac{N}{n}$$

Where: K: Sampling interval required (households)

N: Total population of the selected ward (households)

n: Sample size (households desired).

Thus, Ward 3: $K = \frac{382}{50} = 7.6$ sampling intervals,

Ward 6: $K = \frac{602}{80} = 7.5$ sampling intervals, and

Ward 14: $K = \frac{808}{106} = 7.6$ sampling intervals.

3.4 Data Tools

To attain the objectives of the study, both primary and secondary data were collected. The collection of primary data was done by using a structured questionnaire, which was administered directly to each sampled household, whereas the secondary data were collected from literature reviews from other studies.

3.4.1 Structured questionnaire

To attain the objectives of this study, the survey questionnaire was used as the primary data collection tool and was directly administered to the households. The questionnaire consisted of close-ended, Likert scale and multiple-choice questions and was divided into the following three sections: their socio-demographic and economic characteristics, their participation in the home and community food garden programmes, and their measurement of food security. The questionnaire sections on their socio-demographic and economic characteristics collected information that was related to the household size, the gender of the household head, the age of household head, the marital status and educational level of the household head, as well as their ownership of livestock, crop production farming, the main source of income for the household, land ownership, the farm size, the use of inputs, time spent in the garden, the purpose of farming, the total income of the household, their access to credit, as well as the market and extension services. The second section explored the information related to the participation of households that were not in a home and community food garden programme. The last, and final, section explored information relating to the Household Food Insecurity Access Scale (HFIAS) and the Household Dietary Diversity Score (HDDS).

3.5 Data Analysis

The data collected from the field were captured and transferred into the Statistical Package for Social Science (SPSS Version 27) and STATA Version 17, for a computer-aided analysis. To attain the objectives of the study, the data were subjected to the t-test, a Chi-square test, as well as the Logistic and Tobit regression models.

3.5.1 Factors influencing the participation of households in the home and community food garden programmes

To determine the factors that influence the participation of households in these programmes, the logistic regression model was used. This model determines the impact of multiple independent variables that are defined simultaneously, to estimate the existence of one dependent variable (Menard, 2010). According to Baddeley and Barrowclough (2009), the logistic model is used when the dependent variable is binary, rather than continuous. Thus, the fact that the variables for participating in the home and community food garden programmes have two outcomes, the logistic regression model was appropriate for determining the factors that influenced the households' participation in the two programmes. The independent variables were chosen, based on previous research (Kassie *et al.*, 2012; Ngema *et al.*, 2018; Mota *et al.*, 2019; Nontu and Taruvinga, 2021). The form of the logistic model is represented by Equation 3.1 below:

$$\text{Log}(P_i) = \ln(P_i/1 - P_i) = \alpha + \beta_k X_i + \dots \dots \dots u \quad (3.1)$$

Where: $\text{Log}(P_i) = (P_i/1 - P_i)$ = logit of the households' participation in the programmes

P_i = Probability of households participating in the programmes ($Y = 1$),

$1 - P_i$ = Probability of households not participating in the programmes ($Y = 0$),

α = intercept term,

β_k = model parameters,

X_i = independent variables, and

u = error term.

a. Variables used in the Logistic model that influence participation in community gardens

To determine the factors influencing participation of the households in the community food garden programme, the following independent variables were used and their expected outcomes are described in Table 3.1 below:

Table 3.1 Description of the independent variables used for community garden

Variable name	Definition and measurement	Expected signs
Dependent variable		
Community garden programme	If a household participates in the programmes or not: 1=Yes and 0=No (categorical-dummy)	N/A
Independent variables		
Marital status	The marital status of the household head: 1=Married, 0=Otherwise	+
Livestock ownership	If a household practices livestock: 1=Yes, 0=No	+
Purpose of farming	The household farming purpose: 1=Home consumption, 0=Home and market	+
Farm size	Land size in hectares (continuous)	-
Total income	Money (Rand) - household earnings per month (non-farm): 1= R1-1000, 2= R1001-2000, 3= R2001-3000, 4=R3001-4000, 5= R4001-5000 and 6= >5000	+
Access to extension services	If a household accesses extension services: 1=Yes, 0=No	+
Education level	Number of years spent at school by the household head	-

Several global studies have demonstrated that the abovementioned independent variables significantly influence a household's participation in agricultural projects. Thus, below is an explanation and description regarding their participation in the community food garden programme in the uMzombe Local Municipality.

Marital status of the household head: According to Nnadi and Akwiwu (2008), married household heads are more likely to participate in projects, compared to those that are single. This could be explained by the fact that, unlike single household heads, those who are married receive

encouragement, advice and support from their spouses to participate in any platforms that will sustain their livelihoods, as they often have a lot of responsibilities (Martey *et al.*, 2013). Thus, participating in the programmes enables them acquire knowledge and resources for improving the food security and meeting the food and nutritional requirements of their households. Therefore, it was anticipated that the dummy marital status variable would positively influence their participation in the community food garden programme.

Livestock ownership: This variable is a dummy, and as a farming activity, was expected to positively affect the households' participation in the community food garden programme. Households that practice livestock farming are highly likely to participate in community garden programmes, as it will ensure that they have enough resources, such as an income, manure, etc., to meet the programme requirements and to cope with any challenges that may arise.

Purpose of farming: The purpose of farming variable was defined as if the household farms only for home consumption, or for home consumption and market supply. The variable is a dummy and is expected to positively influence the participation of the households in the community garden programme. According to KZNPG (2018), this programme aims to make available the necessary production inputs, such as seeds and fertilizer packs, to the poor and vulnerable rural communities, in order to increase their subsistence food production and to market their surplus produce. Thus, it is expected that households who only farm for home consumption are more likely to participate in the programme, as they are vulnerable, with very low production and resources, which could enable them to supply the market (Edward *et al.*, 2009). They will need to increase their production to sustain their food consumption.

Farm size: The farm size is a continuous variable and is defined as the portion of land, in hectares, that is owned by a household. Community gardens are pieces of land that are offered by the local authorities to a group of vulnerable smallholder farmers who do own or not significantly small pieces of land, for subsistence food production purposes and for producing surplus, for commercial purposes, to improve the food security status of their households (DAFF, 2019). This implies that the probability is high that households with significantly small pieces of land will participate in the community garden programme, in order to extend their agricultural activities, because the land surface that is offered to them is unlimited and will enable them to increase their production and

improve of their food security. Therefore, the farm size variable in this study was expected to negatively impact their participation in the community garden programme.

Total income: This variable is categorical and is defined as the earned income per month, in Rands, from all non-farm activities of the household. The variable was expected to positively impact their adoption of the community food garden programme. Nontu and Taruvinga (2021) found that, when compared to low-income households, there is a higher probability that households earning more income would participate in agricultural projects, as they would meet the project basic requirements, such as the purchase of fertilizers, pesticides and agricultural materials, and the funds will help them to cope with agricultural constraints that may arise.

Access to extension services: This variable is a dummy and is about whether farmers have access to extension services, or not. The expectations from this variable on the participation of households in community food garden programme were positive. Access to extension services enables farmers to improve their knowledge, it enhances their access to agricultural training, inputs, etc., and it improves their household food security and the sustainability of their livelihoods (Etwire *et al.*, 2013). Therefore, households that access extension services are highly likely to adopt agricultural projects, as the training and knowledge that they receive from the extension officers will enhance their perception of the benefits of agricultural projects for improving their food security status and livelihoods, compared to that of their counterparts.

The educational level of the household head: The educational level variable is defined as the number of years that the household head has spent at school. In this study, the variable was continuous and was expected to negatively influence the household's participation in the community food garden programme. According to Tologbonse *et al.* (2013), the more years the household head has spent at school, the more likely he/she is to find better employment; therefore, is a tendency for him/her to get interested in political and non-agricultural activities that provide more secure jobs. Therefore, the participation in community garden programmes by households that are headed by educated people is likely to decrease, as they tend to seek opportunities in non-agricultural activities that pay better.

b. Variables used in the Logistic model that influence participation in home gardens

The following independent variables were used to determine the factors that influence the participation of households in the home garden programme, and their expected outcomes are described in Table 3.2 below:

Table 3.2 Description of the independent variables used for home garden

Variable name	Definition and measurement	Expected signs
Dependent variable		
Home garden programme	If a household participates in the programmes or not: 1=Yes and 0=No	N/A
Independent variables		
Gender	If the household head is: Male=1, Female=0	+/-
Farm size	Surface of land in hectare	+
Purpose of farming	What is the household's farming purpose: 1=Home consumption, 0=Home and market	+
Total income	Money (Rand) - household earnings per month: 1=R1-1000, 2=R1001-2000, 3=R2001-3000, 4=R3001-4000, 5=R4001-5000 and 6=>5000	+
Access to extension services	If a household accesses extension services: 1=Yes, 0=No	+
Education level	Number of years spent at school by the household head.	-

Many studies found that the abovementioned independent variables had a significant impact on the adoption of agricultural programmes by households. An explanation and a description of their participation in home garden programme in uMzombe Local Municipality is given below:

The gender of the household head: Gender is a dummy variable and is defined as whether the household head is male or female. The variable was expected to have both a positive and negative impact on the household's participation in the home garden programme. Etwire *et al.* (2013) found that, compared to females, males are significantly more interested in participating in agricultural projects, which could be explained by the fact that women often lack the resources that could enable them to participate on any innovative platforms. However, in a study to assess the factors that influence the farmers' participation in agricultural programmes in Zululand, Nxumalo and Oladele (2013) found that females are more likely to participate, compared to males, as they are

more socially connected. Thus, the more households that are headed by females, the higher the probability of them participating in agricultural projects.

Farm size: The farm size is a continuous variable and is defined as the portion of land, in hectares, that is owned by a household. According to Jamilu *et al.* (2015), there is a high probability that households who own large pieces of land will participate in agricultural programmes. Compared to small land size owners, owning a large piece of land increases the probability of the households participating in agricultural projects, as they tend to intensify their agricultural activities, in order to change from subsistence production to commercial production. Thus, the farm size variable was expected to positively influence the farmers' participation in the home garden programme.

Purpose of farming: The purpose of farming variable depends on whether the household farms are used only for home consumption or for home consumption and market supply. The variable is expected to positively influence the households' participation in the home gardens. According to KZNPG (2018), the home garden programme aims to make the necessary production inputs, such as seeds and fertilizer packs, available to the poor and vulnerable rural communities for increasing their subsistence food production, as well as for sending their surplus production to the market. Thus, those households that farm for home consumption are more likely to participate in the programme, as they are vulnerable, with low agricultural production and natural resources, therefore (Edward *et al.*, 2009), will need to increase their production to sustain the food consumption of their households.

Total income: This variable is categorical and is defined as the earned income per month, in Rands, from all non-farm activities of the households. The variable was expected to positively impact the adoption of the home garden programme by households. Nontu and Taruvinga (2021) found that, compared to low-income households, there was a higher probability that households earning a higher income would participate in agricultural projects, as they could meet the costs of project's basic requirements, such as the purchase of fertilizers, pesticides and agricultural materials, and may then be able to cope with agricultural constraints that may arise, as they have the financial resources.

Access to extension services: This variable is a dummy and is about whether farmers have access to extension services or not. It is expected that this variable will have a positive influence on the households' participation in the home garden programme. Having access to extension services

enables farmers to improve their knowledge, and it enhances their access to agricultural training, inputs, etc. for improving the food security and for sustaining the livelihoods of their households (Etwire *et al.*, 2013). Therefore, households that access extension services are highly likely to adopt agricultural projects, as the training and knowledge that they receive from extension officers enhance their perception of the benefits of agricultural projects for improving their food security status and the livelihoods of their households, compared to that of their counterparts.

Educational level: The educational level variable is defined as the number of years that the household head has spent at school. The variable is continuous and was expected to negatively influence the households' participation in the home garden programme. According to Tologbonse *et al.* (2013), the more years a household head has spent at school, the more likely he/she is to get better employment, and there is a tendency for them to get interested in political and non-agricultural activities that provide more secure jobs. Therefore, the participation in the home garden programme by households headed by educated people is likely to decrease, as they tend to seek opportunities in non-agricultural activities.

3.5.2 Measurement of household food security

Owing to the complexity and multi-dimensionality of food security, no single measurement has been developed. Based on the objectives of this study, the Household Food Insecurity Access Scale (HFIAS) and the Household Dietary Diversity Score (HDDS) (Coates *et al.*, 2007) were used to determine the food security of households in the uMzumbe Local Municipality. These measures have been designed by the United States Agency for International Development (USAID)'s Food and Nutrition Technical Assistance (FANTA) project, and have been widely applied in international food security surveys.

3.5.2.1 The Household Food Insecurity Access Scale (HFIAS)

The HFIAS was used to investigate if the households had experienced difficulties in accessing food within the past 30 days, or four weeks. The indicator consists of nine (9) questions that ask about any changes made in diet or food consumption patterns of the households, due to a lack of sufficient resources to purchase food. If the condition occurred, the respondent was asked to answer 'Yes = 1' and mention how often the condition happened. These options included: 'Rarely' = 1, 'Sometimes' = 2, and 'Often' = 3; and if none of the above applied, the respondent was asked

to answer 'No' = 0. Therefore, when summing up all the scores for each sampled household, the lowest score is 0 and the highest is 27. The higher the HFIAS score, the higher the household being vulnerable to food insecurity (Coates *et al.*, 2007). The HFIAS score is continuous, and it is captured by calculating the sum of the frequency of the nine conditions related to food insecurity that occurred within the last 30 days. HFIAS score (0-27) = Sum frequency code (Q1+Q2+Q3+Q4+Q5+Q6+Q7+Q8+Q9).

This study used the Household Food Security Access Prevalence (HFIAP) to determine the household food security status. According to Coates *et al.* (2007), the status of the respondents was classified into four categories, which included food secure, mildly food insecure, moderately food insecure, and severely food insecure households. Food secure households were classified in the HFIAS category = 1 if [(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]. These households did not experience any of the food insecurity conditions, or they just worried about food, but 'rarely'. Mildly food insecure households were classified in the HFIAS category = 2 if [(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]. These respondents were worried about not having sufficient food and not being able to eat their preferred foods, or about eating a monotonous diet, or less preferred food. Moderately food insecure households were classified in the HFIAS category = 3 if [(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]. They often eat a monotonous diet, 'sometimes' or 'often' less preferred food, and/or started reducing the quantity or number of meals 'rarely' or 'sometimes'. The severely food insecure households were classified in the HFIAS category = 4 if [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]. This category encompassed households that had 'often' cut the number and size of their meals, and/or experienced any of the following severe conditions: going the whole day without eating, going to sleep hungry, or running out of food, even as often as 'rarely'.

3.5.2.2 The Household Dietary Diversity Score (HDDS)

The Household Dietary Diversity Score (HDDS) is a simple indicator that determines the different types of food that are consumed by a household. It reflects the good quality of the diet, and calculates the number of different food groups consumed. For example, a household that consumes

an average of four different food groups reflects a diet that provides a diversity of micro- and macro-nutrients. According to Azadbakht *et al.* (2005), the determination of the household food security status requires a deeper analysis of the dietary diversity of the household, because most food-insecure households rely mainly on starchy staples, at the expense of proteins and other dietary nutrients. This study used 12 groups of food to determine the HDDS, as indicated below, and each food type was given a nutritional value of '1'. If a household consumed one of the listed type of foods, it was required to answer 'Yes = 1' and if not, then 'No = 0'. According to Swindale and Bilinsky (2006), the Household Dietary Diversity Score varies in the range between '0' as the lowest, and '12' as the highest score. When summing up all the scores for each sampled household, the lower is the Household Dietary Diversity Score, the more food insecure is the household. In addition, Swindale and Bilinsky (2006) indicated that the data that are collected by using the Household Diversity Dietary Score should use a recall period of 24 hours, it should collect household food consumption information, and it should have twelve questions, which constitute the question baseline, as categorised below, based on the following types of food: A - Cereals; B - Roots and tubers; C - Vegetables; D - Fruits; E – Meat and poultry; F – Eggs; G - Fish and seafood; H - Pulses/legumes/nuts; I - Milk and milk products; J - Oils/fats and offal; K - Sugar/honey; and L - Miscellaneous.

HDDS indicator tabulation: $HDDS (0-12) = \text{Sum} (A+B+C+D+E+F+G+H+I+J+K+L)$

3.5.3 The determinants of the households' food security

The Tobit regression model was used to identify the determinants of the households' food security status.

3.5.3.1 Tobit regression model

This is an econometric model that is used to describe the relationship between a dependent variable non-negative Y_i and one or multi-independent variables X_i . In the model, the dependent variable is censored, because all negative values are not observed. It assumes that there is a latent non-observable variable Y^* , which depends linearly on the independent variables X_i through a vector of the coefficients (β_i) determining their relationships. Y_i , the dependent variable, is defined as zero or above (Osgood *et al.*, 2002). According to Anderson (2017), the Tobit regression model is used specifically when the outcomes of the dependent variables are continuous and it allows the

researcher to determine the specific threshold (lower or upper) to censor the regression, while keeping the linear assumptions that are required for the model. Below is the form of the model:

$$Y_i = \{Y^* \text{ if } Y^* > 0, 0 \text{ if } Y^* \leq 0\}, \text{ With } Y^* = X_i\beta + U_i$$

Where: Y_i = HFIAS score dependent variable that will vary between '0' and '27',

U_i = error term,

i = number of observations,

β_k = a vector of unknown coefficient, and

X_i = a vector of independent variables.

Therefore, the fact that the Household Food Insecurity Access Scale score, as the dependent variable (proxy of food security), is a continuous variable ranging between '0' and '27', the Tobit regression model was suitable for identifying the determinants of the households' food security status in this study.

3.5.3.2 The description and explanatory variables used in the Tobit regression model

To determine the determinants of the households' food security status in this study, nine independent variables fitted into the Tobit regression model. These independent variables and their expected outcomes are summarised in Table 3.3 below. The independent variables used in the Tobit model have been demonstrated by several studies to have a significant impact on a household's food security status. Thus, below is a description and explanation of the above variables:

Total income: The total income is defined as the income per month that is earned from all non-farm activities of households. Bashir *et al.* (2012) found that the household income had a significantly positive effect on the households' food security status. Households with a low income earning were highly vulnerable to food insecurity, compared to the wealthier and middle-income households (Jacob, 2009). This implies that when a household earns sufficient and has a considerable income, it covers all the possible food, health, and other household needs, and it is likely to cope better with the economic issues for improving its food security status, compared to

its counterparts. Therefore, it is anticipated that this variable negatively impacts the food insecurity of households.

Table 3.3 Description and explanatory variables used in the Tobit regression model

Variable name	Definition and measurement	Expected signs
Dependent variable		
Food security	Food security score (Minimum=0, Maximum=27)	N/A
Independent variables		
Total income	Money (Rand) - household earnings per month (non-farm): 1=R1-1000, 2=R1001-2000, 3=R2001-3000, 4=R3001-4000, 5=R4001-5000 and 6=>5000	-
Access to extension services	If a household accesses extension services, 1=Yes, 0=No	-
Home garden	If a household participates in one home one garden, 1=Yes, 0=No	-
Community garden	If a household participates in community garden, 1=Yes, 0=No	-
Credit access	If a household accesses credit, 1=Yes, 0=No	-
Age of household head	Age in years: 1=1-40, 2=41-50, 3=51-60, 4=>60	-
Household size	Number of household members (continuous)	+
Farm size	Surface of farm land in hectare: 1=0-0.25, 2=0.26-0.5, 3=0.51-0.75, 4=0.76-1, 5=>1	-
Educational level	Number of years of schooling: 1=1-3, 2=4-6, 3=7-9, 4=10-12, 5=>12	-

Access to extension services: Many studies have found that extension services positively impact the food security status of households. According to Hussein and Janekarnkij (2013), households that access extension services are less likely to suffer from food insecurity, as extension services enable farmers to improve their knowledge and their access to agricultural training and inputs to increase their agricultural production. The variable is a dummy and is defined as whether the household has access to extension services or not, and the expectation is that it will positively impact the food security of households.

Home garden: This variable is a dummy and is defined as whether or not the household participates in the home food garden programme. Based on an evaluation of a home garden programme that was implemented in Asia to improve the food security and nutrition of households and to empower women, it was reported that the availability and consumption of vegetables, fruits and livestock products, such as eggs, improved the lives of the household participants in the programme. It also resulted in a decrease in the cases of anaemia in children between 6 to 59 months, and the households managed to generate an increased income from the sale of their agricultural produce. Furthermore, the programme improved the involvement of women in household decision-making (HKI, 2010). Therefore, the home garden programme was expected to have a negative impact on the food insecurity of households in this study.

Community garden: This variable is a dummy and defines whether the household participates in the community garden programme or not. According to Pearsall *et al.* (2017), it improved the access of community gardeners to land and other inputs, such as transplants and improved seeds, while Darke and Lawson (2015) and Petrovic *et al.* (2019) found that it increased their access to water sources and agricultural tools and facilitated their access to technical equipment for improving soil fertility, such as composting, etc., which are all considered to be the main factors that are required for improving agricultural production. In addition, a study conducted in Baltimore revealed that the community garden project successfully yielded good results. Gardeners increased the variety of their planted crops, there was an improvement in their agricultural skills and knowledge and an increased frequency in their vegetable consumption (Brown-Fraser *et al.*, 2015). Participants in community gardens could significantly increase their agricultural food production to generate an income for the household (Gittleman *et al.*, 2012). Therefore, the expectation from this variable is that it will positively improve the food security of households.

Credit access: The variable credit access is a dummy and defines whether the household head accesses credit from private or government services for supporting either its agricultural production or household consumption (Kuwornu *et al.*, 2013). Since credit is considered as another source of finance, households that have access to credit are highly likely to improve their food security status. Because having access to credit may enable them to purchase agricultural equipment and inputs, and it may enhance the adaptive capacity of smallholder farmers to cope with agricultural constraints to improve their agricultural production, which will improve the food

security status of their households (Nokuphiwa *et al.*, 2014). According to Babatunde *et al.* (2007), besides being used for farming activities, credit can be obtained for household consumption purposes, which might increase the food consumption basket and improve the food security status of households. Therefore, the hypothesis of this study is that this variable will have a positive impact on the food security of households.

Age of the household head: This variable is categorical and is defined as the number of years that the household head has lived. According to Alpizar *et al.* (2020), households headed by older people are less likely to suffer from hunger and malnutrition, compared to their counterparts, because older farmers are more experienced in farming and food supply management. In addition, it is assumed that older farmers acquire adequate reproductive resources, which enables them to improve and sustain the food security and livelihoods of their households. Therefore, the expectation from this variable is that age can negatively influence the food insecurity of a household.

Household size: The household size variable is defined as the number of members living in a household. According to Eneyew and Bekele (2012), the higher the number of members in a household, the higher the probability of it becoming food insecure, compared to its counterparts. This implies that a household with more members increases the number of mouths to feed and, therefore, the food demand, which means that the family will need to increase its food expenditure and resources to meet its food requirements. Therefore, the probability of the household meeting all nutritional requirements decreases, due to the competition for nutrition among the household members, which may increase the likelihood of it becoming food insecure. Thus, this variable is continuous and it is anticipated that it will positively influence the food insecurity status of a household.

Farm size: This variable is categorical and is defined as the number of hectares of land that the household owns for its farming activities. As land remains the major resource for agricultural production, Najafi (2003) found that, by increasing the land surface, agricultural production can be extensively increased, which could improve the food security situation of households. Therefore, it is expected that households with a larger cultivated land surface are more likely to be food secure than their counterparts, as they will intensify and increase their agricultural production, which may improve the food security situation of the household.

The educational level of the household head: Lutomia *et al.* (2019) found that the educational level of the household head was negatively significant with females' perception of food insecurity in the western and eastern regions of Kenya. It was less likely that household heads who spent more years at school would suffer from food insecurity challenges. This is because the higher level of education attained by the household head might increase his/her knowledge, awareness and innovativeness, which will enhance the probability of them accessing better and more secure jobs and reproductive resources. Therefore, it is anticipated that this variable will negatively influence the households' food insecurity in this study.

3.6 Summary

The chapter has discussed the methodological approach that was used to attain the objectives of this study. It covered the characteristics of the uMzumbe Municipality, namely, the location and description of the study area, as well as the agriculture, poverty and employment, food security, education level, gender and age groups of the population. This chapter also presented the research design, sampling method, data tools, and data analysis method that was used to attain the research objectives.

CHAPTER FOUR: RESULTS AND DISCUSSION

This chapter presents the findings and a discussion of the data that were collected in the uMzambe Local Municipality. The results of this study present an analysis of the socio-economic factors, the participation level of the households in home garden and community garden programmes, and the factors affecting their participation. In addition, this study assessed the effects of these programmes on the food security status of the participants, and it investigated the determinants of food security of smallholder farmers in the uMzambe Local Municipality.

4.1 Continuous Variables

Due to the similarities in the home and community food gardens in the study area (cultivated in small plots of land, mainly for home consumption, with very low input costs and fundamental agricultural technology, meaning that hand tools are the main agricultural materials used), for the purposes of analysing the socio-economic characteristics of the respondents, these two programmes were mixed and considered to be ‘one’ food garden programme. Thus, a t-test analysis was used to compare the continuous variables to determine the statistical differences between the beneficiaries and non-beneficiaries of the programme.

4.1.1 Age of the household head

The results in Table 4.1 reveal that the mean age of the respondents in the study area was 64.16 years, while the average age of programme beneficiaries and non-beneficiaries was 66.40 and 63.58 years, respectively.

Table 4.1 Descriptive analysis of continuous variables

Variables	All population		Participants		Non-participants		S-level
	Mean	Stddev	Mean	Stddev	Mean	Stddev	
Age (years)	64.16	11.90	66.40	11.65	63.58	11.95	ns
Education level (years)	4.44	3.85	4.11	3.70	4.54	3.89	ns
Hours in gardens/ week	20.98	11.01	23.64	12.87	20.16	10.26	**
Farm size (ha)	0.21	0.30	0.29	0.35	0.19	0.28	**

S-level (level of statistical significance): ***, ** and * = 1%; 5% and 10%, respectively; ns = non-significant; Stddev = Standard deviation

However, according to the t-test analysis, no significant statistical difference was found between the ages of the programme beneficiaries and non-beneficiaries in this study. According to Alpízar *et al.* (2020), the mean age of the respondents has a positive impact on the food security status of households in the uMzumbe Municipality. The study suggests that the older the household head is, the less probability there is of the household suffering from food insecurity issues, as the older heads are assumed to be more experienced in agricultural production and food supply.

Therefore, the older heads can plan and put resilience strategies in place to cope with food insecurity issues during difficult and hazard periods. Furthermore, it is assumed that older farmers acquire adequate reproductive resources, which enables them to improve and sustain the food security and livelihoods of their households.

4.1.2 Education level of the household head

Table 4.1 shows that the average number of years spent at school by the respondents in the uMzumbe Municipality was 4.44 years. However, no significant statistical differences were revealed between the two groups. This implies that education presents a challenge in uMzumbe, as the majority of the population had not attained at least a Primary School certificate (Grade 6).

These results are very similar to those of the uMzumbe Integrated Development Plan report, in which only 38% and 40.6% of the population had attained a primary and secondary school level of education, respectively (uMzumbe IDP, 2019/2020).

4.1.3 Hours in gardens

The variable refers to the number of hours a household spends in the garden per week for agricultural activities. According to the t-test, a statistically-significant difference was found between the participants and non-participants in the programme ($p < 0.05$). The results showed that programme beneficiaries and non-beneficiaries spent 23.64 and 20.16 hours in the garden, respectively, each week. By spending more time in their gardens, these gardeners show their courage, passion and willingness to improve their production to sustain their livelihoods. Thus, households that spend more time in their gardens will probably participate more in agricultural

programmes, and they will need their energy, courage and time to use all necessary and available resources that are offered by the programmes more efficiently, in order to increase and expand their agricultural production and activities. These results are similar to those of the FAO (2015) in Ethiopia, where the average time spent by women in crop production activities was recorded as 20.65 hours weekly, which was enough to improve their crop production and to improve the food security status of their households.

4.1.4 Farm size

Table 4.1 reveals that there is a statistically-significant difference between the programme beneficiaries and non-beneficiaries regarding the farm size ($p < 0.05$). The mean farm size of the beneficiaries and non-beneficiaries was 0.29 ha and 0.19 ha, respectively. According to Jamilu *et al.* (2015), households with large farms had a higher probability of participating in agricultural programmes, compared to those with smaller farms. This is because they tend to intensify their agricultural activities, in order to move from subsistence production to commercial production. These results agree with those of Tologbonse *et al.* (2013), who found a statistically-significant difference between programme participants and non-participants, with regard to land size. According to the results, programme participants had a mean land size of 1.4 ha, while the land size of their counterparts was 0.9 ha.

The mean farm size of the respondents in the study area (0.217 ha) suggests that food insecurity challenges could present a great challenge in the uMzumbe Local Municipality, as they are too small. According to Rapsomanikis (2015), many rural residents are unable to improve their food security status through agricultural activities because of their inaccessibility to land. Thus, they are forced to seek opportunities in the non-agricultural sector (FAO *et al.*, 2012). In Kenya and Ethiopia, the average land size of small farmers is only 0.47 and 0.9 hectares, respectively (Rapsomanikis, 2015).

4.2 Discrete Variables

As with the continuous variables, the two programmes were mixed into one food garden programme for the purpose of analysing the discrete variables. Among the discrete variables that were analysed to determine the statistical difference between the programme beneficiaries and non-beneficiaries, only six of them presented a statistically-significant difference.

4.2.1 Household size

The results in Table 4.2 show a statistically-significant difference ($p=0.098$) in the household size of the programme beneficiaries and non-beneficiaries. The Chi-square analysis revealed that the majority (41.5%) of the programme beneficiaries had a household size that ranged between four to six members, while 38.2% of the non-beneficiaries had the same household size range. According to Martey *et al.* (2013), a household with more family members permits the household head to share his/her responsibilities. Thus, it allows the households to participate in any platforms or activities that will enable them to cope with economic constraints, as they might need more resources to sustain the livelihoods and improve the food security status of their households. These results are in agreement with those of Martey *et al.* (2014), who indicated that the more household members there are, the more likely it is that they will participate in agricultural programmes.

Aragie and Genanu (2017) noted that this could lead to food insecurity challenges. The study revealed that households with more members, are high likely to be food insecure, than those with fewer members.

4.2.2 The purpose of farming

The results showed that there was a statistically-significant difference ($p=0.001$), with regard to the purpose of farming, between households that were programme beneficiaries and those that were not beneficiaries (Table 4.2). The majority (60.4%) of programme beneficiaries were farming for their own home consumption and for supplying the market, while 64% of the non-beneficiaries were producing only for home consumption. According to DAFF (2016) and KZNPG (2018), the home and community garden programmes aim to make available the necessary production inputs, such as seeds and fertilizer packs, to the rural communities for increasing their subsistence food production and for improving the competition between smallholder and commercial farmers in the marketplace. Thus, smallholder farmers who produce for home consumption and market supply will participate more in the programmes, as they need to produce more, in order to sustain their household food consumption, as well as to supply the market, to generate an income. Participating in the programmes will afford them easy and cheap of inputs and agricultural technologies, and it will improve their knowledge and skills, so as to increase their agricultural production, the quality of their products and to improve their competition in the market.

Table 4.2 Description of the respondents' discrete socio-economic characteristics

Variables	Participants (n=53)	Non-participants (n=170)	X ² p-level
	%	%	
Household size			
0-3	15	30	
4-6	41.5	38.2	
7-9	34	19.4	0.098
10-12	7.5	8.2	
>12	2	4.2	
Purpose of farming			
Consumption	39.6	64	0.001
Consumption and market	60.4	36	
Input uses			
No	1.8	22.3	0.001
Yes	98.2	77.7	
Market access			
No	0	27	
Buy inputs only	39.6	38.3	0.000
Sell and buy outputs and inputs	60.4	34.7	
Main source of income			
Non-farm	98.2	99.4	0.381
Farm	1.8	0.6	
Total income			
1-1000	3.8	1.2	
1001-2000	5.7	33	
2001-3000	26.5	31.7	0.000
3001-4000	34	20	
4001-5000	15	8.3	
>5000	15	5.8	

Extension services access			
No	7.5	97	0.000
Yes	92.5	3	

This implies that the agricultural production in the uMzumbe area is still significantly low, as the majority of respondents are unable to produce enough for both home consumption and to supply the market. These results are in accordance with the literature, which found that the majority of rural areas have the lowest agricultural productivity per hectare in the world, and agricultural technologies are fundamental. The lack of skills and knowledge, as well as the lack of finances and market access limitations, puts great constraints on the improvement of agricultural productivity (FAO, 2000; Rapsomanikis, 2015). In South Africa, due to a lack of agricultural inputs, such as fertilizers, veterinary inputs, agricultural skills and technologies, rural agricultural activity is less productive and only generates about 4% of their total household income (HSRC, 2004). Therefore, these results imply that food insecurity could present great challenges, as the majority of agricultural production is only subsistence farming, which does not permit households to produce goods for the markets, and thereby, to generate more income.

4.2.3 The use of inputs

The results revealed a statistically-significant difference ($p=0.001$) between programme beneficiaries and non-beneficiaries in the use of inputs (Table 4.2). The majority (98.2%) of the programme beneficiaries use the inputs, compared to 77.7% of the non-beneficiaries. According to DAFF (2016), the implemented agricultural programmes aim to make the necessary production inputs, such as seeds and fertilizer packs, available to communities for increasing their subsistence food production and improving the competition of commercial farmers in the marketplace. Thus, households that use these inputs are likely to participate in home and community garden programmes, as they can expect to receive more inputs and training on their application as well as easy access to cheap sources of these inputs, in order to improve their agricultural production. These results imply that the use of these inputs is not a challenge in their farming activities, which could lead to the improvement of food security in this area. According to Magrini and Viganì (2016), the application of fertilizer has a positive impact on land productivity, as it provides the essential micro- and macronutrients to increase agricultural production per land unit. In addition,

improved seeds can also produce more, even under stressful circumstances such as droughts and floods, and they can even be resistant to pests and diseases (Lipton, 2005; Magrini and Vigani, 2016). Furthermore, Brown (2004) pointed out that the expectations, when using these inputs in any farming activities, is to increase agricultural production, and thereby, to improve the food security status of households.

4.2.4 Market access

The results revealed a statistically-significant difference ($p=0.000$) regarding the market access between the programme beneficiaries and non-beneficiaries (Table 4.2). They showed that 60.4% of the programme beneficiaries access the market to sell and buy agricultural outputs, whereas only 34.7% of the non-beneficiaries sell and buy agricultural outputs and inputs. The literature indicates that market access is important for rural residents, as it enables them to purchase agricultural inputs and to sell their agricultural outcomes. In addition, market access permits them to buy food and non-food commodities at affordable prices to sustain their livelihoods and to improve their food security status (IFAD, 2013). Thus, this implies that farmers who access the market in order to both sell and buy their agricultural outputs and inputs produce adequate produce. Therefore, they most likely participate in the programmes, as they will improve the quality of their agricultural produce, which will improve their supply to the markets and, therefore, the competition.

Based on the literature, these results could lead the households to food insecurity challenges, as the majority of farmers cannot sell their outputs to generate an income for sustaining their livelihoods and improving their food security due to their insignificant food production. The literature suggests that due low agricultural technology, lack of skills and knowledge, the lack of finances, water control and drought resistant varieties, rural agricultural production has decreased significantly and has led to the deterioration of millions of rural livelihoods (FAO, 2000). In South Africa, due to lack of agricultural inputs, such as fertilizers, veterinary inputs and agricultural skills and technologies, rural agricultural activity is less productive and only generates about 4% of the total household income. Therefore, the majority of the households have abandoned their agricultural activities and they become net consumers, relying on non-farm activities to meet their household food requirements (HSRC, 2004).

4.2.5 Main source of income

Table 4.2 revealed that the majority of programme beneficiaries and non-beneficiaries, 98.2% and 99.4% respectively earn their income from non-farm activities (social grants, remittance, etc.). Whereas only 1.2% and 0.4% of programme participants and non-participants, respectively generate their income from farming. However, according to Chi-square analysis, there is no significant statistical difference between the two groups. These results indicate that despite the household involvement in the agricultural activity in the area, this insignificantly contributes to the household income as almost all the respondents rely on non-farm income. These confirm those of HSRC (2004), which suggests that due to a lack of agricultural inputs, such as fertilizers, veterinary inputs, agricultural skills, and technologies, rural agricultural activity in South Africa is less productive and only generates about 4% of their total household income.

4.2.6 Total income

The results in Table 4.2 revealed a statistically-significant difference ($p=0.000$) between the total income of the household beneficiaries and non-beneficiaries of the programme. The analysis shows that the majority of programme beneficiaries (34%) have a total income of R3 001-R4 000, compared to 20% of the non-beneficiaries who are in the same total income range. According to Nontu and Taruvinga (2021), the likelihood of participating in agricultural programmes by households earning more income is higher compared to low-income households. Households earning a higher income can meet the basic requirements of the projects, such as the purchase of fertilizers, pesticides and agricultural materials, and they can cope better with agricultural constraints.

These results could lead to food insecurity challenges for households in the uMzembe Municipality, as the ability of the majority of the households to meet their food needs and other expenses is low, because their earning is so little. According a study conducted by Jacob (2009), households with a low income are highly vulnerable to food insecurity, compared to wealthier and middle-income households. This could be explained by the fact that the higher the household income, the easier it is for the household to access adequate, safe and nutritious food, as well as other basic household needs. When a household earns a sufficient and considerable income, it covers all its possible food and health needs, and it provides more expenditure for improving the

food security of the household (Bashir *et al.*, 2012). These results agree with those of the uMzumbe IDP (2012/2013), which indicate that food insecurity constitutes the main challenge in the municipality, as the area is characterized by marginalised and poor people, with low earning. About 60% of the uMzumbe households have an income of less than R500 per month. In addition, Statistics SA (2016) has indicated that only a quarter of the uMzumbe population earned higher incomes of between R9 601 and R19 600 a month. Previous studies have also found that the KwaZulu-Natal Province is predominantly rural, with high levels of poverty, even among the communities that benefit from the government food security interventions (Marijke *et al.*, 2013; D'Haese *et al.*, 2013).

4.2.7 Access to extension services

The results show that the majority of the programme beneficiaries (92.5%) have access to extension services, compared to 3% of the non-beneficiaries (Table 4.2). However, according to the Chi-square analysis, there is a statistically-significant difference ($p=0.000$) between the programme participants and non-participants. This could be explained by the fact that access to extension services assists farmers to set goals and to evaluate their opportunities, and that it educates them in the process of decision-making, which promotes sustainable agricultural development. In addition, extension services enable them to improve their knowledge and perceptions of the importance and advantages of agricultural programmes; this results in an increasing probability of them participating in the projects (Msuya *et al.*, 2017). Furthermore, extension services permit farmers to make decisions regarding the appropriate crops that they could grow or the livestock that they could adopt based on the available resources and climate circumstances (Waha *et al.*, 2018). These findings agree with those of Etwire *et al.* (2013), who found that the majority of farmers who participated in the agricultural projects had accessed the extension services in 2012.

According to the literature, these study results could lead to food insecurity challenges for households in the uMzumbe Municipality. The literature indicates that extension services permit farmers to improve their agricultural production and their income, which, in turn, improves the food security of their households and reduces poverty. By obtaining the knowledge, skills and training from the extension officers, farmers can increase the quality of their agricultural produce, they can have easy access to cheap input sources, and they can increase their access to market

information. Therefore, the likelihood of them improving the food security status of their households is higher than it is for farmers who do not access the extension services (Conceição *et al.*, 2016).

4.3 The Households' Participation Level in the Programmes

The study results show that the majority of the respondents (76.2%) did not participate in the agricultural programmes, compared to 23.8% of them who did, and that 10.3%, 13% and 0.45% of those that participated, did so in the community garden, the home garden and in the combination of community and home garden programmes, respectively. These results confirm the hypothesis of this study that participation in the food garden programmes is low in the uMzumbe Municipality, which could be due to the respondents' socio-economic situation. The study analysis shows that the mean age of the respondents in the uMzumbe Municipality is 64.16 years which, according to the literature, may have negatively impacted their participation in the programmes. According to the literature, the majority of the population in the study area do not fall within the agriculturally-productive age, and therefore, their willingness to participate and acquire new skills and technologies decreases (FAO, 1997; Martey *et al.*, 2014). In addition, in line with Nontu and Taruvinga (2021), their household income could also be one of the factors that constrains them from participating in agricultural programmes in the study area. This study found that the majority of the respondents in uMzumbe receive a low income, which does not permit them to meet the needs of their households and purchase the agricultural requirements for the project, such as the inputs, agricultural materials and other unforeseen things that may arise.

Many studies have found that access to extension services is one of the engines for positively influencing the participation of households in agricultural programmes, as they increase the farmers' perceptions of the advantages and importance of agricultural programmes (Etwire *et al.*, 2013; Msuya *et al.*, 2017). Thus, their inaccessibility to extension services (24.3%) in the study area, has hindered their participation in the implemented food programmes. These results are in agreement with those of Nontu and Taruvinga (2021), who found that the participation level of households in the food garden programmes that were implemented in the Ingquza Hill Local Municipality was very low, while Asangha (2015) found that only 37% of the Embo community participated in the food garden programme. However, the above results are in opposition with

those of Baiyegunhi and Makwangudze (2013), who found that almost 70% of the Mpophomeni respondents participated in the food garden programmes that were launched in the area.

Based on the respondents' participation level in the food garden programmes, this study rejects the hypothesis that a larger percentage of the population participated in community garden programme than in the home garden programme. These could be explained by the fact that the community gardens are plots of land that are offered to a group of vulnerable or smallholder farmers for subsistence food production and for marketing their surplus produce, in order to improve the food security status of their households (Holland, 2004). The implementation of these community gardens requires the sustainable availability of natural resources, such as water and enough fertile land, and a place that is accessible to the population in the area (Darke and Lawson, 2015; Petrovic *et al.*, 2019). The fact that rural areas are generally marginalised and found on sterile land, with only a few natural resources, etc. (Rapsomanikis, 2015), and, based on the requirements for the community garden, only a few areas of land fit to be used. Therefore, only households who live close to these places might participate in the community gardens and it excludes those who live further away; the distance from other households might therefore negatively impact their participation in community gardens.

Furthermore, according to the FAO (2004), home gardens are plots of land that are managed by family labour within a household compound. They have several advantages, such as enabling the women to generate an income while performing their household activities. Thus, the advantage of having a home garden in their own yards, might have led to their higher participation in the home gardens than in the community gardens, because the members will be able to permanently, and easily, manage and take good care of the gardens in the compound of their household.

4.4 Factors Influencing the Participation of Households' in the Agricultural Programmes

4.4.1 The community food garden programme

Table 4.3 provides the results of the logistic model, which assessed the likelihood of households participating in the community food garden programme. Seven independent variables were used in this model. The sign of the coefficients and their level of statistical significance permitted the identification of how these variables influence the participation of these households in the

programme. Of the seven independent variable, only livestock ownership, the purpose of farming, the farm size, the total income and access to extension services were found to have a statistically-significant influence on the households' participation in the community garden programme.

a. Livestock ownership:

Livestock ownership had a positive and statistically-significant ($p=0.067$) relationship with the participation of households in the community garden programme (Table 4.3). This positive sign of the variable implies that, when all other independent variables are constant, the odds of farmers participating in this programme increases by 12.25 times when the household owns livestock, compared to when it does not. This suggests that households owning livestock have a higher probability of participating in community gardens than their counterparts. According to Little *et al.* (2006), a possible reason behind this could be that smallholder farmers also use them for many other purposes e.g. they provide manure to improve the fertility of the soil, and they perform other agricultural activities to increase production which, in turn, improves the food security status of their households. These households also sell their livestock to enable them to meet the community garden programme requirements, such as the purchase of inputs and agricultural materials. Nxumalo and Oladele (2013) also found that owning livestock led to a 2.4 times increase in the odds of farmers participating in the agricultural programme in Zululand. However, Sithole *et al.* (2014) found that there was no relationship between livestock ownership and the farmers' participation in irrigation schemes in the Nfonleni rural area.

Table 4.3 The Logistic regression model of the socio-economic factors influencing participation in community gardens

Variables	Odds ratio	Std. Err.	Z	p-significance level
Marital status	2.132821	1.699968	0.95	0.342 ns
Livestock ownership	12.24945	16.77948	1.83	0.067*
Purpose of farming	0.2645781	0.1925099	-1.83	0.068*
Farm size	0.0072119	0.0135106	-2.63	0.008***
Total income ^a :				
1001-2000	0.0302688	0.0494025	-2.14	0.032**
2001-3000	0.0337793	0.0517411	-2.21	0.027**

3001-4000	0.044259	0.0691948	-1.99	0.046**
4001-5000	0.0076482	0.014347	-2.60	0.009***
>5000	0.0151114	0.0264062	-2.40	0.016**
Extension services access	74.64391	63.73608	5.05	0.000***
Education level	0.8869696	0.0872467	-1.22	0.223 ns
Constant	0.2184423	0.4151983	-0.80	0.424 ns

Log likelihood = -38.312118, LR $X^2(11) = 71.41$, Prob > $X^2 = 0.0001$, Pseudo $R^2 = 0.4824$.

Notes: ***, **, * and ns; significant 1%, 5%, 10% and non-significant, respectively.

^aBase income: R1-1000

b. Purpose of farming:

The results revealed that the farmers' purpose for farming had a negative influence on their participation in the community garden programme. The variable was statistically-significant at a 10% level. The study results are in agreement with the study expectations. The negative sign of the variable in the model indicates that when households farm for home consumption and market supply, it leads to a 0.26 times decrease in the odds of them participating in the community garden programme. According to KZNPG (2018), community and home garden programmes aim to increase the subsistence food production of vulnerable smallholders and to supply the market with any surplus produce. This could imply that households who produce for home consumption and to supply the market, might have a large enough and adequate land space for producing enough agricultural produce, and as a result, they are less motivated to participate in the community gardens.

c. Farm size:

The farm size variable negatively impacted the households' participation in the community garden programme. According to the logistic regression model results, the farm size variable is statistically significant ($p=0.008$), which complies with the hypothesis of this study. The regression model results show a 0.007 times decrease in the odds of farmers participating in community garden programme with every increase in the land unit size of the households. The findings suggest that there is a low probability of farmers with a large land size participating in community gardens. According to DAFF (2019), community gardens are pieces of land that are offered by the local authorities to a group of vulnerable smallholder farmers who own, or do not own, significantly

small pieces of lands, for subsistence food production and for the commercial production of the surplus, to improve the food security status of their households. This implies that there is a high probability that households with significantly small pieces of land might participate in the community garden programme, as their land size does not permit them to increase their agricultural production or to improve the food security status of their households. Therefore, they willingly participate in the programme, as they are offered free and unlimited plots of land, with enough natural resources, such as water and fertility, which will increase their production and which, in turn, will help them to improve the food security of their households.

However, the above results contradict those of Jamilu *et al.* (2015), who found that with any increase in the farm size unit, the odds of farmers participating in the IFAD-Community Based Agricultural and Rural Development Project in the Katsina State increased by 2.227. Similarly, Sithole *et al.* (2014) found that the likelihood of farmers participating in irrigation schemes in the Ntfonjeni rural area increased by 3.8% with every increase of one unit in the farm size. Furthermore, Tologbonse *et al.* (2013) and Yakubu *et al.* (2019) found that there was no relationship between the farm size and the farmers' participation in the Women in Agriculture programme of Kaduna and the Survival Farming Intervention Programme in the Kogi State in Nigeria, respectively.

d. Total income:

The results of this study revealed that total income variable negatively affected a household's participation in the community garden programme, which disagreed with the *priori* expectation of the study. The model revealed that, compared to households earning R1-1000, the odds of farmers participating in the community garden programme decreases for households earning more than R1 000 monthly. However, the likelihood that they will participate in the community garden programme highly decreases for households with total incomes ranging between R4 001-R5 000, and more than R5 000, compared to those of their counterparts. A possible explanation for the above results could be that the community garden programme was designed to improve the food security status of vulnerable and poor rural households (DAFF, 2019), and therefore, the likelihood of those households who earn a sufficient and considerable income participating in the community garden, might decrease. This is because, when compared to the vulnerable and poor households, rich and medium-income households might be able to cover all their food needs, as well as

expenditure on their health and other things, and they are likely to cope with any financial issues that might arise; therefore, their willingness to participate in the community garden programme might decrease. These results are in agreement with those of Nxumalo and Oladele (2013), who assessed the factors influencing the participation of farmers in an agricultural programme in Zululand. The study found that with every increase of one Rand in the household's income, the odds of farmers participating in the programme decreased by 2.46.

However, the above results contradict those of Nontu and Taruvinga (2021), who assessed the factors determining the participation of farmers in the home garden programme in the Ingquza Hill Local Municipality. They found that the farmers' income had a positive relationship with their participation in the programme. According to the Logistic model results, the farmers' chances of participating increased with every increase in household income.

e. Access to extension services:

The variable access to extension services had a positive effect on the participation of households in the community garden programme. The logistic regression model suggests that the variable is statistically significant ($p = 0.000$) and complies with the prior expectations. According to the model results, any access to extension services leads to a 74.64 times increase in the odds of households participating in community gardens. According to the literature, access to extension services enables farmers to improve their knowledge, it enhances their access to agricultural training and inputs, and it improves the food security and sustainable livelihood of their households (Etwire *et al.*, 2013). The training and skills that they learned from extension officers enhanced their perception of the advantages, and importance, of the agricultural programmes. These results comply with a study conducted by Tologbonse *et al.* (2013), which found that the likelihood of farmers participating in a women's' agricultural programme increased by 1.225 because of them having access to extension services. Similarly, Yakubu *et al.* (2019) also found that any visit by extension services led to a 1.15 times increase in the odds of farmers participating in the Survival Farming Intervention programme in the Kogi State. In the same vein, Jamuli *et al.* (2015) also indicated that chances of farmers in Katsine State participating in the IFAD-Community Based Agricultural and Rural Development Project increased by 1.791 with any access to extension services. Furthermore, Nontu and Taruvinga (2021) found that extension services were one of the main pillars affecting the participation of farmers in the home garden programme in the Ingquza

Hill area. The regression model results revealed that any access to extension services led to a 1.78 times increase in the odds of the households participating in the programme. Therefore, the above literature implies that an improvement in the access to extension services plays a significant and major role in the participation of farmers in any agricultural programme that is designed to improve the food security status of vulnerable and poor rural households.

4.4.2 The home garden programme

The model applied the following six independent variables (which can be seen in Table 4.4) to determine the factors affecting the participation of farmers in the home garden programme. Of these six independent variables, only three affected the participation of households in home garden programme, namely, the farm size, the farming purpose and access to extension services.

a. Farm size:

Table 4.4 reveals that the farm size had a statistically-positive influence ($p=0.026$) on the participation of households in the home garden programme, which complies with the study expectation. The regression model results indicate that a unit increase in the farm size leads to a 7.43 times increase in the odds of farmers participating in the home garden programme. A possible reason for this could be that, in contrast to farmers who own small pieces of land, farmers who own large pieces of land are likely to participate in agricultural programmes, as they tend to intensify their agricultural activities, in order to move from subsistence farming to commercial production.

Table 4.4 The Logistic regression model of the socio-economic factors influencing participation in home gardens

Variables	Odds ratio	Std. err.	Z	p-significance level
Gender	0.899173	0.571607	-0.17	0.867 ns
Farm size	7.431767	6.714641	2.22	0.026**
Purpose of farming	3.114029	2.0936	1.69	0.091*
Total income	1.372572	0.3055701	1.42	0.155 ns
Extension services access	247.686	285.4648	4.78	0.000***
Education level	1.0529	0.844685	0.64	0.521 ns
Constant	0.0003766	.0006557	-4.53	0.000***

Log likelihood = -39.528775, LR X^2 (6) = 93.31, Prob > X^2 = 0.0001, Pseudo R^2 = 0.5413,

Notes: ***, **, * and ns; significant 1%, 5%, 10% and non-significant, respectively.

These results agree with those of Jamilu *et al.* (2015), who found that any increase in land size unit led to a 2.23 times increase in the odds of farmers participating in the IFAD-Community Based Agricultural and Rural Development Project in the Katsina State. This was confirmed by Sithole *et al.* (2014), who found that the participation of farmers in irrigation schemes in the Ntfonjeni rural area increased by 3.8% with every increase in the unit size of the farms. However, Tologbonse *et al.* (2013) and Yakubu *et al.* (2019) found that there was no relationship between the farm size and the farmers' participation in Women in Agriculture programme of Kaduna and the Survival Farming Intervention Programme in the Kogi State of Nigeria, respectively.

b. The purpose of farming:

The logistic regression model results showed that the purpose of the farming variable presents a positive influence on the farmers' participation in the home garden programme, which complies with the expectations. The study results were statistically significant ($p=0.091$). According to the model, with farming for home consumption leads to a 3.11 times increase in the odds of farmers participating in the home garden programme. This could be due to the fact that farmers producing for home consumption are often poor, with very low resources for agricultural production, which cannot permit them to sustain the food consumption of their households and also to supply the market. Therefore, participating in a home garden might be highly interesting and optional, as they will need to increase the food production and improve the food security of their households.

c. Access to extension services:

The results of the logistic regression model show that the extension services variable had a positive influence on the participation of households in the home garden programme. Statistically, the variable was significant ($p=0.000$), which agreed with the prior expectations. According to these results, any access to extension services leads to a 247.69 times increase in the odds of the households participating in the home garden programme. According to Etwire *et al.* (2013), this access enables farmers to improve their knowledge, it enhances their access to agricultural training, inputs, etc., and it improves the food security and sustain livelihood of their households. In addition, the training and skills that are shared by extension officers, enhances their perception of

the advantages and importance of the agricultural programmes which, in turn, increases their participation in these programmes. Compared to non-participants, the regression model results revealed that there was a 14 times higher probability that farmers who accessed extension services to participate more in agricultural projects than their counterparts. These findings are in alignment with those of Yakubu *et al.* (2019), who found that with any visit to extension services increased the odds of farmers participating in the Survival Farming Intervention programme in the Kogi State by 1.15 times. Similarly, Nontu and Taruvinga (2021) found that the odds of households in Ingquza Hill participating in the home garden programme increased by 1.375, when they had access to extension services.

4.5 Households' Food Security Status in the uMzumbe Local Municipality

The study used the HDDS in a recall period of 24 hours to deepen the understanding of the different food groups that are consumed by the respondents. Based on the number of food groups that were consumed by the respondents, their household food security status was also grouped into four categories. The households consuming three or less food groups were classified into the severely food insecure category. Households consuming four to six food groups were deemed to be moderately food insecure. The mildly food insecure category included households who consuming seven to nine food groups, and those consuming more than nine food groups were considered to be food secure.

The results in Table 4.5 indicate that when using the HFIAP, 64.1%, 23.3%, 3.7% and 8.9% of respondents are severely food insecure, moderately food insecure, mildly food insecure, and food secure, respectively, while when using the HDDS, 18.8%, 63.2%, 15.2% and 2.8% of the respondents were severely food insecure, moderately insecure, mildly food insecure, and food secure, respectively. This implies that the food insecurity situation in the uMzumbe Municipality presents great challenges, as the majority of the respondents are food insecure. The study also reveals that, apart from facing great challenges in accessing food, the accessibility to different varieties of food in uMzumbe Municipality is critical. According to Azadbakht *et al.* (2005), for the majority of households that face significant issues in accessing food, the probability of accessing different varieties of food is greatly hindered, as they rely principally on starchy staples, at the expense of proteins and other dietary nutrients. This level of food insecurity is higher than the food insecurity situation found in KwaZulu-Natal Province in 2020, when about 16.4% and

26.4% of the households were severely and moderately food insecure, respectively (Stats SA, 2021).

Table 4.5 Household food security status in the uMzumbe Municipality

Categories	HFIAP (%)	HDDS (%)
Food secure	8.9	2.8
Mildly food insecure	3.7	15.2
Moderately food insecure	23.3	63.2
Severely food insecure	64.1	18.8
Total	100	100

Source: survey outcome 2022

As previously mentioned, based on the socio-economic characteristics of the respondents, the improvement of the food security of households in this study area is hindered. The study results indicate that the majority of uMzumbe residents are poor, with a low income, which does not enable them to improve their food security situation. These results are in line with those of the uMzumbe IDP (2012/2013), which revealed that hunger and food insecurity have severely devastated the communities living in the area, due to their lack of financial resources. Similar studies have found that, due to the high level of poverty in the rural areas of KwaZulu-Natal, food insecurity still presents great challenges, even among the communities that benefit from the government food security interventions (Marijke *et al.*, 2013; D’Haese *et al.*, 2013). The findings of Jacob (2009) agreed with the above results, and revealed that, compared to wealthier and middle-income earning households, low-income earning households were highly vulnerable to food insecurity. Research conducted by Ndobu (2013) found that the households’ income had a positive relationship with their food security status. Compared to households earning R2 000 and less, nearly 64.7% of households with an income of R4 001 to R6 000 a month were found to be food secure, compared to their counterparts, who were 37.70% and 37.50% food secure respectively.

Furthermore, the results revealed that the average number of years spent at school by the respondents in uMzumbe was very low (4.44 years), which, according to the literature, may have negatively impacted the food security status of households and prevented them from improving their livelihood in the area. The literature suggests that the education level possibly increases the farmer’s knowledge, awareness and innovativeness, which enhances the probability of accessing

better and secure jobs and reproductive resources and, in turn, it directly or indirectly improves the food security status of these households (Lutomia *et al.*, 2019). These results are in line with KZNDARD (2015), which indicate that despite the high agricultural potential of the KwaZulu-Natal Province and the involvement of rural households in agriculture, food insecurity and hunger still present significant challenges for many rural households. With 14.3 million of the national population struggling to access adequate and safe food, the KZN province accounts for nearly 3.5 million (34%) of the total population (KZNPG, 2017).

4.6 The Effect of the Agricultural Programmes on the Food Security Status of Households

This section discusses the link between the implemented home and community food garden programmes and the household food security status.

4.6.1 The effect of the community food garden programme on food security

Table 4.6 shows that the participating community gardeners are 8.7%, 0%, 26% and 65.3% food secure, mildly food insecure, moderately food insecure and severely food insecure, respectively, compared to the non-participants, who are 9%, 4%, 23% and 64%, respectively.

However, according to the Chi-square analysis, no statistically-significant difference between the two groups was found. This means that there is no correlation between participating in the community garden programme and their households' food security status. This could be due to the fact that, according to farmers, for community gardeners like home gardeners, despite their participation in the food garden programmes, due to agricultural challenges in the area, the effectiveness of the programmes implemented towards the household food security improvement has been hindered. These challenges include drought, animal damage, lack of substantial supports from the department of agriculture, which led the programmes to yield insignificant agricultural produce that could only be used for home consumption and not marketable for income generation.

Table 4.6 The effect of the community gardens on household food security status HFIAP

Categories	Community gardeners (%)	Non-participants (%)	X ² p-level
Food secure	8.7	9	0.798

Mildly food insecure	0	4
Moderately food insecure	26	23
Severely food insecure	65.3	64
Total	100	100

Source: survey outcome 2022

4.6.2 The effect of the home garden programme on food security

According to Table 4.7, about 10.3%, 3.5%, 27.6% and 58.6% of the home gardeners are food secure, mildly food insecure, moderately food insecure and severely food insecure, respectively, compared to 8.7%, 3.6%, 22.8% and 64.9% of the non-participants, respectively.

Table 4.7 Effect of home gardens on the household food security status using the HFIAP

Categories	Home gardeners (%)	Non-participants (%)	X ² p-level
Food secure	10.3	8.7	0.921
Mildly food insecure	3.5	3.6	
Moderately food insecure	27.6	22.8	
Severely food insecure	58.6	64.9	
Total	100	100	

Source: survey outcome 2022

Although the results in Table 4.7 show that there is a difference in the food security status of home garden participants and non-participants, the Chi-square data analysis demonstrates that there is no statistically-significant difference between the two groups. This implies that the food security status of the households is not related to participating in the home garden programme in the study area.

4.7 Determinants of the households' food security status in the uMzumbe Local Municipality

The Tobit model was used to identify the determinants of the food security status of households in the uMzumbe Municipality. It sought to assess the contribution of each of the nine independent variables that were put in the model, and these are listed in Table 4.8 below.

The sign of the coefficient in the model defines the direction in which the independents variables impact the household food security (dependent variable) of the respondents. Thus, the positive sign of the coefficient implies that the independent variable increases the HFIAS score, which

means that the households' food insecurity situation increases, while the negative sign of the coefficient implies that there is a decrease in the HFIAS score by the variable, which implies that there is a decrease in the household's food insecurity status. The model indicates that all the selected independent variables of the model significantly influenced the food security status of the households in the study area.

a. Total income:

Table 4.8 indicates that the total income negatively impacted the food insecurity status of the households, which complied with the expected sign. According to the results, the total income significantly influenced their food insecurity status at a 1% level, which means that with every unit increase in the households' total income, the food insecurity level of the household decreases by a factor of 2.4. Since the income earned is considered to be the main power of a household for accessing adequate and nutritious food, low-income earning households are highly likely to suffer from food insecurity challenges, when compared to wealthier households, as they cannot cover and meet all their food requirements, in order to improve their food security status. These results agree with those of Maziya *et al.* (2017), who found that with every unit increase in the households' income, the smallholder farmers' food insecurity status decreased by a factor of 0.12, in Msinga. The results of a similar study in the Maphumulo Local Municipality, revealed that the higher the household income, the higher the food security level of the household (Ngema *et al.*, 2018).

b. Access to extension services:

The results in Table 4.8 revealed that extension services negatively impacted the food insecurity of households at 5%, which complies with the hypothesis of this study. It was found that the household level of food insecurity decreased by a factor of 3.16 when it accessed extension services, compared to that of their counterparts. Extension services enable farmers to improve their knowledge and enhance their access to agricultural training, inputs such as fertilizers, seeds, agricultural materials, etc., which could increase their agricultural production, and which, in turn, could directly or indirectly improve the food security status and sustain the livelihood of their households (Hussein and Janekarnkij, 2013).

Table 4.8 The Tobit regression model of factors determining food security in the uMzambe Municipality

Variables	Coefficient	Std. Err.	T	p-significance level
Total income	-2.407831	0.2873904	-8.38	0.000***
Extension services access	-3.156661	1.531033	-2.06	0.04**
Home Garden	3.424836	1.704035	2.01	0.046**
Community garden	3.533585	1.638199	2.16	0.032**
Credit access	-5.174623	2.811772	-1.84	0.067*
Age ^a :				
41-50	-4.567511	1.842491	-2.48	0.014**
51-60	-3.123352	1.683423	-1.86	0.065*
>60	-3.50907	1.678807	-2.09	0.038**
Household size	0.791626	0.106240	7.45	0.000***
Farm size	-0.8380994	0.3673492	-2.28	0.024**
Education level ^b :				
4-6	0.7828732	0.7935374	0.99	0.325 ns
7-9	0.7748672	0.9106958	0.85	0.396 ns
10-12	-0.3380557	1.25127	-0.27	0.787 ns
>12	-5.034894	2.963803	-1.70	0.091*
Constant	19.56184	1.957199	10.35	0.000***

Log likelihood = -623.13676, LR X^2 (14) = 117.50, Prob > X^2 = 0.0000, Pseudo R^2 = 0.0862,

Notes: ***, **, * and ns; significant 1%, 5%, 10% and non-significant, respectively. ^aBase age: 0-40 years and ^bBase education level: 0-3 years.

Thus, farmers who access extension services might have a better chance of improving their food security status, compared to their counterparts. These results are in line with those of Alia and Erenstein (2017), who found a positive relationship between access to extension services and household food security status, with their level of food security increasing by 1%.

However, these results concur with those of Ngomi *et al.* (2020), who revealed that the Household Dietary Diversity Score decreased by a factor of 0.27 for farmers who accessed extension services, compared to those who did not.

c. Home gardens:

The results in Table 4.8 show a positive relationship between the participation in the home garden programme and the food insecurity of households, at a 5% level. When the households participated in the home garden programme, their level of food insecurity increased by a factor of 3.42, compared to that of their counterparts. This implies that participation in the home garden programme in the uMzumbe Municipality results in the households becoming food insecure. A possible reason could be that the majority of uMzumbe farmers are poor, relying on social grants and pensions to sustain their livelihoods (uMzumbe, 2012), spend their income on buying inputs (fertilizers) to sustain the programme as the campaign did not adequately address all the needs of the gardens. Therefore, these households are faced with food insecurity challenges due to low production and the low financial return for their agricultural activities in the rural areas (HSRC, 2004; Rapsomanikis, 2015). In addition, as the size of the majority of farms in the study area is small, it hinders the effectiveness of the programme for improving the food security status of households. These results agree with those of Khanyisile (2011), which revealed that the home garden campaign at Ekhudeni (Nkandla) did not address the households' food insecurity situation due to high levels of poverty in the study area. However, they contradict those of Ngema *et al.* (2018), who found a positive relationship between the home garden programme and household food security status of those living in the Maphumulo area, where programme participants were 1.26 times more food secure than their counterparts in the study area. Baiyegunhi and Makwangudze (2013) also found that the home gardening programme in the Mpophomeni area positively impacted the food security status of the households, which increased by a factor of 0.15. This study suggests that many other factors should also be combined with the home garden programme, in order to effectively improve the farmers' food security status, as it cannot improve the food security status of households in the uMzumbe Municipality by itself.

d. Community gardens:

According to the study results in Table 4.8, there is a statistically negative relationship, at a 5% level, between the participation of households in community garden programme and their food security status, which did not comply with the expectations of the study. The model results show that the household's food insecurity level increases by a factor of 3.53 for the households participating in community garden programme. Similar to home garden, this implies that participation in community garden programme increases the food insecurity status of its

households. These results are in line with those of Mpanza (2008), which indicate that despite all efforts put by members on the community gardens implemented in Bergville and Hlanganani Districts in KwaZulu-Natal, the community gardens did not yield the expected outcomes.

e. Credit access:

The results in Table 4.8 indicate that credit access complied with the expectations of the study. According to the Tobit model results, this variable negatively impacted the households' food insecurity at 10%, which implies that credit access reduces the household's level of food insecurity by a factor of 5.17. The credit received from any form of financial enterprise permits farmers to purchase agricultural inputs and materials in order to increase their agricultural production which, in turn, could improve the food security status of their households. Thus, compared to non-credit users, households receiving credit could improve their food security status. These results coincide with the findings of Tekle and Berhanu (2015), which revealed that with any access to credit, the food security status of households in the Bosolo Sore District increased by a factor of 55.78. Similarly, a study conducted by Hussein and Janekarnkij (2013) in the Jigjiga District of Ethiopia found that the food security status of households increased by a factor of 6.08, when they had access to credit.

However, these results concur with those of Ngema *et al.* (2018), who found that credit access negatively impacted the food security status of households. The regression model indicated that the households' food security decreased by 0.73% when they had access to credit, while Maziya *et al.* (2017) found that the households' food insecurity increased by 0.1 when there was access to credit.

f. Age of the household head:

Table 4.8 shows a negative relationship between the age of the household heads and food insecurity, which complies with the *priori* expectations. The results indicate that, compared to a household managed by 0-to-40-year-olds, households managed by heads who are older than 40 years old are less food insecure. According to the literature, households managed by older people are less likely to suffer from food insecurity, as it is assumed that they have accumulated enough resources that could enable them to cope with any financial issues, in order to improve the food security of their households. In addition, they are assumed to be more experienced and skilled in

managing the resources, in order to provide a sustainable livelihood for their households (Bogale and Shimelis, 2009). These results comply with those of Alpizar *et al.* (2020), who found that there was a significant relationship between the age of the household heads and the food insecurity situation of their households. The regression model results revealed that an increase of one year in the age of the household head decreased the household food insecurity level by a factor of 0.01; similar results were found by Abdullah *et al.* (2019).

g. Household size:

Table 4.8 indicates that the expectations for this variable have been complied at a 1% level. According to the results of the model, the household food insecurity situation increases by a factor of 0.79 for every increase in household members. Compared to small households, households with more members are more likely to suffer from food insecurity, as the number of mouths to feed increases; this implies that the higher the number of mouths there are to feed, the more the family needs to increase its food expenditure and resources to meet the food needs of the household, and the higher the probability that it will become food insecure. In addition, when a household is composed of a large number of members, the probability of it meeting all the nutritional requirements decreases, due to competition of nutrition among family members, as the demand for food increases. These results are in agreement with those of Aragie and Genanu (2017), who found a negative relationship between the household size and food security, at a 5% level. According to the statistical analysis, the addition of one extra family member directly increases the household food insecurity situation by 1.3. In a study analysing the factors that determine the food security of smallholder farmers in Msinga, Maziya *et al.* (2017) found that the household size positively impacted the food insecurity status of the respondents. According to the results, the food insecurity level of farmers increased by a factor of 0.12, with an increase in one household member. However, these results contradict those of Ndobu (2013), who found that an increase of one family member increased the household food security situation by 0.03. This could be explained by the fact that, to a certain extent, family members can be used as labour force, which could enable households to improve their food security status.

h. Farm size:

Table 4.8 shows that the farm size variable negatively influenced the food insecurity status of households at 10% level, which complied with the prior expectations. The results show that any

increase in the households' farm size unit decreases the food insecurity level of a household by a factor of 0.84. Households that own larger farms have a higher probability of becoming more food secure, compared to those with smaller farms. This could be because with larger farms they tend to improve their agricultural production and the quality of their products, in order to move from subsistence production to commercial production which, in turn, increases their food security status. These results agree with those of Tekle and Berhanu (2015), who found that households owning larger farms are less likely to face food insecurity issues in the study area, compared to small land owners. According to the statistical analysis, any increase in the land size unit increased the food security situation of the household by 2.23, and Asenso-Okyere *et al.* (2013) found that it increased by a factor of 1.9.

However, Maziya *et al.* (2017) and Alpizar *et al.* (2020) found no relationship between the farm size and the food security status of households in their respective study areas.

i. Education level:

The results of this study showed a negative statistical relationship between educational level and the food insecurity status at a 10% level for households whose heads had spent more than 12 years at school, compared to those who only spent three years, or less, at school. The sign of the variable complied with the study's expectations. According to the results, the household's food insecurity level decreases by a factor of 5.03 with every increase in household heads' schooling years. The education level possibly increases their knowledge, awareness and innovativeness, which could enhance the probability of them accessing better and secure jobs and reproductive resources which, in turn, directly or indirectly improves the food security status and sustains the livelihoods of their households. It is also assumed that educated family members might have a good understanding and a better knowledge, which could enable them to manage their resources well and to improve the food security and income of their households. Thus, compared to household heads who have a low education level, those who have spent more years at school are less likely to face food insecurity challenges. These study results agree with those of Lutomia *et al.* (2019), who found that the food insecurity status of a household decreased by a factor of 0.02 with every increase in the number of schooling years of the household heads. Similarly, Yousaf *et al.* (2018) found that an additional year of schooling in rural household's heads in the Punjab, Pakistan, increased the household's food security by 10%, and Maziya *et al.* (2017) and Ngema *et al.* (2018) confirmed

these results, with the food security level of the households increasing by 0.17 and 0.82, respectively.

4.8 Summary of the Findings

The study was undertaken in the uMzumbe Local Municipality and produced the following results: The mean age of the participants in the area was found to be 64.16 years, 66.4 and 63.58 years for programme participants and non-participants, respectively. The average number of years that the participants spent at school was found to be 4.44 years. The number of hours that the participants and non-participants spent in the programme weekly was 23.64 and 20.16 hours, respectively, with an average of 20,98 hours spent weekly by all respondents. According to the results, the average farm size of programme participants and non-participants was 0.28 ha and 0.19 ha, respectively, with a mean farm size of 0.217 ha for all participants. The majority of programme participants and non-participants (41.5% and 38.2%, respectively), were found to have a household size ranging from four to six members. About 60.4% and 64.7% of the programme participants and non-participants, respectively, farmed for home consumption and to supply the market, and for household consumption only. In the uMzumbe Municipality, the use of inputs represents no challenge, as nearly 98.2% and 77.7% of programme participants and non-participants, respectively, used these inputs. Approximately 60.4% and 34.7% of the programme participants and non-participants, respectively, access the market for selling and buying their agricultural outputs. This study found that the majority of respondents in uMzumbe are low-income earners, and that 92.5% and 3% of the programme participants and non-participants, respectively, have access to extension services.

Thus far, the study results have revealed that, despite the implemented food garden programmes, only 23.8% and 76.2% of the respondents participate and do not, respectively. Among the programme participants, about 10.3%, 13% and 0.5% participate in community garden, home garden and a combination of community and home garden programmes, respectively. The study found that livestock ownership, the purpose of farming, the farm size, their total income and access to extension services influenced the participation of households in the community garden programme, whereas the farm size, the purpose of farming and access to extension services affected the farmers' participation in home garden programme.

By using HFIAS, it was found that 64.1%, 23.3%, 3.7% and 8.9% of the respondents are severely food insecure, moderately food insecure, mildly food insecure and food secure, respectively, and when using HDDS, 18.8%, 63.2%, 15.2 and 2.8% of respondents are severely food insecure, food insecure, moderately food insecure and food secure, respectively. The results also indicated that about 8.7%, 26% and 65.3% of participating community gardeners are food secure, moderately food insecure and severely food insecure, respectively, while 9%, 4%, 23% and 64% of the non-participants are food secure, mildly food insecure, moderately food insecure and severely food insecure, respectively. With regard to the participating home gardeners, 10.3%, 3.5%, 27.6% and 58.6% are food secure, mildly food insecure, moderately food insecure and severely food insecure, respectively, while the same applies to 8.7%, 3.6%, 22.8% and 64.9% of the non-participants, respectively. Finally, the results of the study showed that the variables total income, extension access, home garden, community garden, credit access, age, household size, farm size and education level determined the food security status of households in the uMzombe Municipality.

CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

The majority of rural residents rely on agricultural activities as the source of their food and income, yet many studies have reported that most households in the rural settlements are severely food insecure. Programmes that aim to improve rural agricultural production should be encouraged, as they seek to eradicate these food insecurity challenges. Therefore, the South African government has been implementing home and community food garden programmes to boost subsistence food production and to address the poverty and food insecurity issues in rural settlements. However, despite all successive strategies and programmes that have been implemented, food and nutrition insecurity remain high, at a household level. By using the uMzumbe Municipality as a case study, this study aimed to assess the food security status of households and their determinants. The specific objectives of the study were as follows:

- (a) to determine the participation level of households in the aforementioned two programmes and the factors influencing their access to them; and
- (b) to assess the effects of each of the two programmes on the food security status of these households in the uMzumbe local Municipality and the determinants of food security for them.

In order to attain the objectives of the study, random sampling was applied to collect data, by using a structured questionnaire, which was administered directly to 223 participants.

5.2 Conclusions

Based on the findings, the study has led us to the following conclusions:

- (a) Despite the home and community food garden programmes have been implemented to address the food insecurity challenges in the uMzumbe Municipality, the participation in these programmes is still very low (23.8%). Therefore, all the organisations working in the food security sphere in the Municipality should encourage, and promote any efforts that will positively influence the participation of households in the home and community food garden programmes. Thus, this study found that livestock ownership, farm size and the

extension services had a significant impact on the participation of households in these programmes.

- (a) The uMzumbe Municipality is still facing food insecurity challenges, as the majority of households are still food insecure. The home and community garden programmes implemented in the area have been ineffective in improving their food security status, which shows that they cannot improve the situation, or solve this problem, on their own. Thus, the following factors should be considered to address the food insecurity challenges, and perhaps to enhance the effectiveness of the food garden programmes, as they positively impacted the food security status of the households in the study area: household income, extension services, credit access and education.

5.3 Recommendations

In order to improve the participation of households in, and the effectiveness of, home and community garden programmes, and to improve the food security status of households in uMzumbe Local Municipality, this study makes the following recommendations to those development agents who are working on food security:

- (a) There needs to be an intensification of, and improvement in, the extension services through an employment of more extension officers, and service delivery in the area to increase the participation of households in the programme.
- (b) Food security intervention programmes should not focus on crop production alone; livestock and poultry farming programmes should also be encouraged and implemented in the area, to improve the participants' resource base, which will enable them to participate in the food security programmes.
- (c) Interventions on food security should add income generation components such as intensification and designing of more non-farming projects in order to eradicate hunger and food insecurity in the area.
- (d) Access to education should be improved and it should be considered as one of the main means of improving the food security status of households in rural areas. The number of bursaries, scholarships, and other forms of funding, should be significantly increased, to improve access to education.
- (e) The South African government should intensify and improve credit access to the poor and vulnerable smallholder farmers.

5.4 Areas for Further Research

As the home and community garden programmes have been promoted by the South African extension services, further research should consider analysing the impact of the extension services on them and their sustainability. This will help to understand the reasons why the programmes have been ineffective in improving the food security status of households. Future research should select sample households into proportional numbers of programme participants and non-participants, in order to better compare the participants to the non-participants in the programme. The sample households should be selected purposefully, so that the required sample sizes of community gardeners, home gardeners and the control samples (those who do not participate in either of the two programmes) are satisfied.

5.5 Study Delimitation

The study was limited to participant and non-participant households involved in the home and community food garden programmes in the uMzumbe Municipality. Because the samples represented only this Municipality, the results and recommendations of the study regarding the two different programmes are specifically attributed to it, but they could be generalised for areas with similar socio-economic and agro-ecological conditions.

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APPENDIX A: HOUSEHOLD SURVEY QUESTIONNAIRE

University of KwaZulu-Natal

Department of Agriculture (Food and Nutrition Security)

The assessment and determinants of household food security status in the uMzumbe Local Municipality, KwaZulu-Natal

The collected information by this questionnaire is confidential and will particularly be used for research purposes by students and staff of the University of KwaZulu-Natal. The respondent to the questionnaire is free to respond and should represent the selected household and be a permanent resident of uMzumbe Municipality.

Date of survey:...../...../2022		Enumerator's name:.....
Respondent's name:		Respondent's age:.....
Respondent telephone's number:		
Location: uMzumbe Municipality	Ward no:	HH number:.....
	Village:.....	

Location: uMzumbe Municipality	Ward:, Village:	HH no:
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SECTION A: HOUSEHOLD SOCIAL CHARACTERISTICS

1.Name of HH head:.....	2.Gender HH head:.....	3.Age of HH head:.....
4.Number of Household's members:.....	5.Educational status of HH head in years:.....	6.Marital status:.....

Codes: HH: Household; Q2: 1=Male and 0=Female; Q6: 1=Married and 0=Single.

SECTION B: HOUSEHOLD ECONOMIC CHARACTERISTICS

7.Main source of HH income:.....	8.Does HH practise Agriculture?.....
9.If 1(Q8), does HH use inputs?.....	10.If 1(Q8),does HH practise livestock and poultry?.....

11.If 1(Q10), which category does the HH practice and how many owned?					
Category	Cattle	Goats	Sheep	Pigs	Poultry
Number					

Codes: Inputs: (fertilizers, insecticides, veterinary products, organic varieties, etc.); Q7: 1=Farming and 2=Non-farming (formal employment, informal employment, Social grants, Business income/entrepreneurs, Remittances, Pensions, Others); Q8: 1=yes and 0=Non; Q9: 1=yes and 0=No; Q10: 1=yes and 0=No

12.If 1(Q8), does HH practices Vegetable, grain and food production?.....					13.If 1(Q12), how many hours does HH work in the garden per week?.....				
14: What category of the following crops does HH produce and its estimated production per year in kilogram (Kg)?									
Production	A	B	C	D	E	F	G	H	I
Season 1									
Season 2									
Season 3									
Season 4									
Total (kg)									

Codes: A: Maize and sorghum; B: Beans; C: Groundnuts; D: Onions; E: Tomatoes; F: Spinach; G: Cabbages; H: Carrots and I: Potatoes; Q12: 1=yes and 0=No.

15.If 1(Q12), does HH own a land?.....		16.If 1(Q15), what land size does HH own (ha)?.....	
17.If 1(Q8), what is the purpose of your farming activity?.....	18.If 1(Q8), money earned from farming(R)?.....	1.From sale of agricultural produce(R)?.....	
		2.Consummed if sold(R)?.....	
19.If 2 and 3 (Q17),do you make a profit?.....	20.Who does manage the finance/sales of agricultural produce?.....		

Codes: Q15: 1=Yes and 0=No; Q17: 1= Home consumption, 2= Market and 3= Home consumption and market; Q19: 1=Yes and 0=No; Q20:1=HH head, 2=wife, 3=husband.

21. How much income does the household earn per month from all sources (total income in Rand)?

1. R1-1000
2. R1001-2000
3. R2001-3000
4. R3001-4000
5. R4001-5000
6. >5000

22. Do you access the market to sell and buy the agricultural outputs and inputs?.....	
23. If 1(Q22), is the market secure?.....	24. If 1(Q22), how often do you access the market?.....
25. Do you access extension services?.....	26. If 1(Q25), how often?.....
27. Do you access credit?.....	28. If 1(Q27), how is the quality of credit access?.....

Codes: Q22: 1=Yes and 0=No; Q23: 1=Yes and 0=No; Q25: 1=Yes and 0=No; How often (Q24 and 26): 1. Rarely (accesses market once or twice a month, 2. Sometimes: (accesses market 3 to 10 times a month) and 3. Often: (accesses market more than 10 times a month); Q27: 1=Yes and 0=No; Q28: 1. Very good, 2. Good, 3. Acceptable, 4. Poor and 5. Very poor.

Q29. Do you experience any challenges in your farming activity?.....yes/ no

Q30. If yes (29), what kind of challenges do you face?

1. Animal damage:/
2. Floods:/
3. Droughts: /
4. Theft:/
5. Plant pest and disease:/
6. Lack of agricultural knowledge and skills:/
7. Shortage and lack of agricultural inputs: /
8. Lack and shortage of land space:/

31. What is the main source of the household food?

1. Own production: /
2. Supermarkets:/
3. Tuck shops:/

4. Food aid:/, 5. Own production and supermarkets:/, 6. Other specify:/

SECTION C: HOME AND COMMUNITY FOOD GARDEN PROGRAMMES.

32. Do you participate in the government agricultural programmes?.....	33. If 1(Q32), in which of the following programmes do you participate?.....
34. If 1(Q32), what inputs and assistance do you receive from the programme (s)?.....	35. If 1(Q32), Participating in the programme has improved your household food security status?.....

Codes: Q32: 1=Yes and 0=No; Q33: 1. One home one garden, 2. Community garden and 3. Home and community garden; Q34: 1. Fertilizers, 2. Seeds, 3. Veterinary products, 4. Pesticides, 5. Agricultural materials (hoes, forks etc.); 6. Training; 7. Plots of land; 8. Domestic animals and others; Q35: 1. Strongly agree, 2. Agree, 3. Neutral, 4. Disagree and Strongly disagree.

36. If 1 (Q32), can you please describe your current agricultural production compared to before participating in the programmes based on your above satisfaction (Q35)?

Production	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Decreases														
Stagnates														
Doubled														
Tripled														
Total (kg)														

Codes: A: Maize; B: Beans; C: Groundnuts; D: Onions; E: Tomatoes; F: Spinach; G: Cabbages; H: Carrots; I: Potatoes; J: Cattle; K: Goats; L: Sheep; M: Pigs and N: Poultry.

SECTION D: HOUSEHOLD FOOD SECURITY.

37. Household Food Insecurity Access Scale (HFIAS):

Please, mark the following code based on your response:

Household Food Insecurity Access Scale (HFIAS)

	(rarely: once or twice; sometimes: 3 to 10 times; Often: more than 10 times in the last 4 weeks	1: Yes 0: No	How did this happen? 1, 2 or 3
1	In the past four weeks, did you worry that your household would not have enough food? (if answer is No, skip to Q2)		
2	In the past four weeks, were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources? (if answer is No, skip to Q3)		
3	In the past four weeks, did you or any household member have to eat a limited variety of foods due to a lack of resources? (if answer is No, skip to Q4)		
4	In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food (if answer is No, skip to Q5)		
5	In the past four weeks, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food? (if answer is No, skip to Q6)		
6	In the past four weeks, did you or any other household member have to eat fewer meals in a day because there was not enough food? (if answer is No, skip to Q7)		
7	In the past four weeks, was there ever no food to eat of any kind in your household because of lack of resources to get food? (if answer is No, skip to Q8)		
8	In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food? (if answer is No, skip to Q9)		
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?		

Codes: *How often: 1: Rarely (once or twice), 2: Sometimes (3 to 10 times), 3: Often (more than 10 times) in the last 4 weeks.*

38. May please describe the kind of food did the household eat in the past 24 hours, excluding the food eaten outside the household?

Household Dietary Diversity Score (HDDS)				
Question number	Food groups	Examples	No (0)	Yes (1)
A	Cereals	Any bread, rice noodles, biscuits, or any other foods made from millet, sorghum, maize, rice, wheat		
B	Root and tubers	Any Potatoes, yams, manioc, cassava or any other foods made from roots or tubers		
C	Vegetables	Any Sweet pepper, dark green/leafy vegetables, including wild ones + locally available vitamin-A rich leaves such as cassava leaves, wild vegetables, etc.		
D	Fruits	Any fruits, including wild fruits		
E	Meat, poultry, offal	Any beef, pork, lamb, goat, rabbit, wild game, chicken, duck, or other birds, liver, kidney, heart or other organ meats or blood-based foods		
F	Eggs	Eggs		
G	Fish and seafood	any fresh or dried fish or shellfish?		
H	Pulses/legumes/nuts	Any foods made from beans, peas, lentils, or nuts?		
I	Milk and milk products	Any cheese, yogurt, milk or other milk products?		
J	Oil/fats	Any foods made with oil, fat, or butter?		
K	Sugar/honey	Any sugar or honey?		

L	Miscellaneous	Any other foods, such as condiments, coffee, tea?		
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