

**THE CONTRIBUTION OF URBAN AGRICULTURE TO FOOD SECURITY IN
EMFULENI LOCAL MUNICIPALITY, GAUTENG PROVINCE**

By

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DECLARATION

I THABO PHILLIP MODIBEDI hereby make a declaration that “THE CONTRIBUTION OF URBAN AGRICULTURE TO FOOD SECURITY IN EMFULENI LOCAL MUNICIPALITY, GAUTENG PROVINCE” is my work and is original. All the sources that I have used in this dissertation were cited accordingly. I confirm that this dissertation has not been submitted at other university.

Signed: _____



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DEDICATION

I dedicate this dissertation to my late brother, Motsapi Joseph Modibedi who regretfully passed on while I was busy with my studies. Regrettably, he could not live more days to witness the completion of this work.

ABBREVIATIONS

ABBREVIATION	EXPLANATION
DoA	Department of Agriculture
ELM	Emfuleni Local Municipality
EPWP	Expanded Public Works Programme
FAO	Food and Agriculture Organisation
GDARD	Gauteng Department of Agriculture and Rural development
HFIAS	Household Food Insecurity Access Scale
IDP	Integrated Development Plan
IDT	Independent Development Trust
OLM	Ordered Logit Model
RSA	Republic of South Africa
SADC	Southern African Development Community
STATS SA	Statistics South Africa
SWOT	Strength, Weakness, Opportunities and Threats
SPSS	Statistical Package for Social Sciences
USA	United States of America

UN	United Nations
UNDP	United Nations Development Programme
UNISA	University of South Africa
WHO	World Health Organisation

ABSTRACT

This study evaluated the contribution of urban agriculture (community gardens) to food security in Emfuleni Local Municipality in Gauteng province. The objectives were to determine the socio-demographic characteristics of farmers in urban community gardens; determine the contribution of urban community gardens to food security (availability, accessibility, utilisation and stability); evaluate the factors that influence food utilisation of the farmers in urban community gardens; and to conduct the SWOT analysis of urban community gardens in Emfuleni Local Municipality. The study was conducted in 6 large townships of Emfuleni Local Municipality using a quantitative research approach and survey design. A sample of 254 urban farmers and 30 key informants were randomly selected from 30 urban community gardens with a population of 418 farmers. Data was collected through face-to-face interviews using a semi-structured survey questionnaire. Quantitative data was analysed by the use of Statistical Program for Social Sciences (SPSS) Version 23.0 whereby descriptive (mean, standard deviation, standard error or mean and others) and inferential statistics formed part of the analysis. Open-ended responses (qualitative data) were analysed using code and themes; and converted into frequencies. Results from the study revealed that there were more female (71.3%) farmers in urban community gardens than male farmers (28.7%). Only 23.2% of youth (<35 years) participated in urban community gardens. The language spoken by majority (59.4%) of the respondents was Sesotho whereby 53.5% were not married. The main source of income of most (78.7%) urban farmers was farming activities precisely urban community gardens. The study found that community gardens contribute to food availability with regards to providing freshly produced vegetables, high consumption of vegetables and ensured that families of the beneficiaries ate sufficient

vegetables produced from the gardens. It was therefore found that, in relation to food accessibility, an average of 47% did not experience anxiety, uncertainty and had consumed sufficient quantities of vegetables from the community gardens. With regards to food utilisation, majority (96.1%) of the respondents ate vegetables as a relish whereas others consumed vegetables for various reasons such as salad, health and others. On vegetable consumption pattern, it is concluded that gender, age group, level of education, participation period in community gardens, family size, number of family member working, number of working hours in the community garden per day, number of days working in the community garden per month and annual income from community garden influenced vegetables consumption pattern of the respondents (utilisation) in the study area. Coping strategies which were mostly adopted by the respondents to ensure food stability were: reducing vegetable intake to ensure that children ate enough, purchasing of vegetables on credit, reducing vegetables in the daily meals and borrowing money to buy vegetables. Some of the challenges that hindered vegetable production in urban community gardens were theft of garden tools and crops produce, lack of fencing and grazing of vegetables by stray animals. Based on the results of the current study, it is suggested that youth participation should be encouraged to ensure that the future of urban community gardens is not threatened because majority of the farmers were above 35 years old. The South African Government should continue to provide monthly stipend to the farmers (beneficiaries) in urban community gardens through Extended Public Works Program (EPWP) and Independent Development Trust (IDP) for a period of 9 months to attract people into urban farming. This will ensure sustainability of urban community gardens and positively contribute to food security of urban dwellers. The challenges that hinder the sustainability of urban community gardens such as theft of garden tools and produce and lack of fencing should be addressed urgently. For

instance, issues of theft and vandalism should be reported to the relevant law enforcement agencies to ensure that food security is not threatened. Urban community gardens should focus on increasing and sustaining their production to ensure that all the members have sufficient vegetables to feed their families throughout the year. Farmers in urban community gardens should be trained on marketing to enable them to supply vegetable to local markets, supermarket, spaza shops and other formal markets because the quantity and quality are satisfactorily. A variety of vegetable cultivars that are drought resistant should be introduced in order to increase vegetable production in the urban community gardens. Water boreholes should be drilled, irrigation equipment installed in urban community gardens that had lower production because of water shortage and unreliable irrigation systems.

Keywords: Community gardens, Emfuleni Local Municipality, Food security, Urban agriculture

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CHAPTER 1

ORIENTATION OF THE STUDY

1.1 Background and Introduction

It is estimated that urban inhabitants will be about 84% by 2050, from 3.4 billion in 2009 to 6.3 billion in 2050 (United Nations, 2010). As a result of increased urbanisation, poverty and food insecurity in urban settings are becoming a challenge (Korir *et al.*, 2015). Urban agriculture has been identified as a potential mechanism to eradicate poverty and uplift poor households in urban setting (De Bon *et al.*, 2009; Richards & Taylor, 2012). It is therefore this reason that there was a proposal for food to be grown around urban areas (Despommier, 2011). Owing to this, most countries in the world have been recognizing urban agriculture as a possible intervention to food insecurity particularly in Africa (Korir *et al.*, 2015).

Several studies showed that urban agriculture could be instrumental in reducing urban food insecurity if it is geared towards increasing urban food production and creating employment opportunities (Zezza & Tasciotti, 2010; Korir *et al.*, 2015). Farming in an urban setting has been recommended as a survival strategy because the poor observe food security as the main motivation (Foeken *et al.*, 2004). It may contribute to poverty reduction by generating an income to the farmers and providing employment prospects related to small-scale food production (Hovorka *et al.*, 2009). Urban farming has a potential of improving household food security and income; hence, the practice should be included in the urban food policies

(Omondi *et al.*, 2017). According to Dubbeling *et al.* (2010) urban agriculture typically contains features of production site and scale, economic activities and individuals that are involved. Some observers have noted that urban agriculture appear in a form of community garden that produces food and are typically situated in urban open spaces (Ferris *et al.*, 2001; Eigenbrod & Gruda, 2015) and backyard gardens for food produced at a residential place (Kortright & Wakefield, 2011).

South Africa is not excluded to this phenomenon that almost two third of the South African population currently resides in urban areas (Edmonds, 2013). Some Metropolitan municipalities have started promoting urban agriculture, particularly City of Cape Town (City of Cape Town, 2007) and eThekweni Metropolitan Municipality (eThekweni Metropolitan Municipality, 2004). The City of Johannesburg has also finalised its urban agriculture strategy and is implementing it as part of food security initiative (City of Johannesburg, 2013). It is against this background that food production in urban areas is mostly a response to food security. Although residents from Emfuleni Local Municipality have benefited from household food security programmes initiated by Gauteng Department of Agriculture and Rural Development (GDARD), such as community gardens, provision of gardening tools and others, the contribution of urban agriculture programmes to food security has not been thoroughly evaluated. To fill this significant void, this research conducted a descriptive study to investigate the contribution of urban agriculture to food security in Emfuleni Local Municipality.

1.2 Significance of the study

The study will be most beneficial to the prospective and current members of community gardens because the finding will form the basis for formulating a decision making tool for urban farming. As a policy framework, the model will be used as a viable policy option to achieve national priorities of economic growth, poverty alleviation, job creation and social cohesion. The plan may include correcting the weakness that will be identified in order to strengthen the good practice of community gardens. The study will further be important to the Gauteng Department of Agriculture and Rural Development (GDARD) because it identified challenges faced by urban community gardens supported by the department. This will enable government to implement regulatory interventions for the purpose of providing sustainable agriculture for emerging community gardens in urban settings. Additionally, urban planners will benefit by developing policies that promote agriculture because most of the population migrate to urban areas. Finally, the research findings will also form basis for future researchers and scholars to identify research gaps on areas of urban agriculture and food security and the performance of community gardens in urban settings.

1.3 Problem statement

Several studies conducted about urban agriculture have indicated that it contributes towards food security in developing countries (Zezza & Tasciotti, 2010); for example, in the Republic of South Africa (RSA) it has been reported in the White Paper on Social Welfare that the quality of lives of South Africans would be improved when they participate in programmes of food security, poverty alleviation projects, poverty relief and community development

programmes such as community gardens (Republic of South Africa (RSA), 1997). Furthermore, Van der Merwe (2011) suggested that there is a need for further research regarding farming in inner cities in order to fully understand food insecurity in urban centres.

There is empirical evidence that majority of food security studies have focused on poverty and food insecurity in general (Du Toit, 2011; Wight *et al.*, 2014; Masuku *et al.*, 2017); yet there has been little attention paid to the link between food security and agriculture in urban areas. In the area of Emfuleni in the Vaal region, this is not an isolated case. Several studies have attempted to address the problem of food security in Vaal triangle (Oldewage-Theron *et al.*, 2006; Lekotoko, 2009; Selepe, 2010; Selepe & Hendriks, 2014). Nevertheless, these studies have not thoroughly evaluated the contribution of urban farming to all the pillars of food security namely food availability, accessibility, utilisation and stability. Therefore, in light of this, there was a need to conduct a study to evaluate the contribution of community gardens to food security using the four pillar listed above.

1.4 Research questions

In closing the research gap identified in the literature, the study answered the following research questions about Emfuleni Local Municipality:

- What are the socio-demographics characteristics of the farmers in urban community gardens?
- What is the contribution of urban community gardens to food security with specific reference to food availability, food accessibility, food utilisation and food stability?

- What are the factors that influence food utilisation of the farmers in urban community gardens?
- What are the Strength, Weaknesses, Opportunities and Threats (SWOT) analysis of urban community gardens?

1.5 Research aim and objective

1.5.1 Research aim

The aim of the study was to explore food security status of urban farmers in community gardens located in Emfuleni Local Municipality.

1.5.2 Research objectives

This study was premised on the following research objectives about Emfuleni Local Municipality:

- to determine the socio-demographic characteristics of farmers in urban community gardens;
- to determine the contribution of urban community gardens to food security with specific reference to food availability, food accessibility, food utilisation and food stability;
- To evaluate the factors that influence food utilisation of the farmers in urban community gardens;
- To conduct SWOT analysis of urban community gardens.

1.6 Definitions of concepts

The researcher explained the concepts used in the study to avoid ambiguity. It was taken into consideration that various organisations and researchers define urban agriculture and food security differently depending on their understanding even though the fundamental concepts are similar.

1.6.1 Urban agriculture

Urban agriculture in this study is considered as a community garden in an urban setting that is involved in the cultivation of vegetables (spinach, cabbage and others) and agronomic crops (maize, beans and others).

1.6.2 Food security

This study adopted a definition of food security that consists of 4 pillars that are recognised by Food and Agriculture Organization of the United Nations (FAO, 2006). The definition state that food security is the availability of sufficient amount of correct quality of food that is supplied through domestic production (food availability); secondly, an individual's access to sufficient resources in order to acquire appropriate foods for a nutritious diet (food accessibility); thirdly, the utilisation of food through adequate diverse diet, clean water, sanitation and health care to reach a state of nutritional well-being where all the needs of physiology are met (food utilisation); and lastly, when individuals or household members have access to sufficient food at all times (food stability).

1.7 Scope of the study

This study concerns the community gardens that are mainly cultivating vegetables in the area of Emfuleni Local Municipality (ELM). It evaluates food security status of the farmers and it adopts the definition of food security that has four pillars, namely food availability, food accessibility, food utilisation and stability. No attention was given to clean water, sanitation, health care and physiological needs.

1.8 Organisational structure of the dissertation

The dissertation is organised into five (5) chapters. **Chapter 1** is the orientation of the study which provides background and introduction, significance of the study, research problem and questions, aims and objectives, operational definitions and scope of the study. **Chapter 2** is based on relevant literature on urban agriculture and food security. **Chapter 3** explains the research methodology employed to conduct the study. In **Chapter 4**, the results of the study are presented, followed by the discussion. Finally, **Chapter 5** include conclusion and recommendations of the study.

CHAPTER 2

REVIEW OF RELATED LITERATURE

2.1 Introduction

The purpose of this chapter is to highlight the contribution of urban agriculture to food security. This chapter is based on a literature review from research findings published in accredited journals, textbooks, formal reports, conference proceedings, masters' dissertations, doctoral theses and other accredited sources of information. It provides an overview of urban agriculture, urban food production in the SADC region, crop production in small-scale farming, urban agriculture and food security globally, contribution of urban farming to food security, and urban farming in the urban areas of South Africa as well as challenges of urban and rural agriculture.

2.2 Overview and definition of urban agriculture

Across the globe, urban agriculture is regarded as one of the livelihood strategies adopted by urban poor communities and is advocated by various scholars as a way to improve food security (Battersby & Marshak, 2013). The emergence of urban agriculture as a concept is regarded amongst others as key intervention strategies to expand food security in urban areas (Simatele & Binns, 2008). This concept of urban agriculture also appears to be problematic owing to the fact that there are different settings in which it takes place. In attempting to address the problem, the documented literature has proposed a number of

definitions of urban agriculture. Due to the different views on urban agriculture as a concept, Reese (2014) is of the view that the operations of urban agriculture varies across different sectors e.g. private, public, commercial and others. This urban agricultural scholar suggested that it is noticeable in numerous forms and not limited to households, place of learning and community gardens, farms in urban settings, backyard chicken pens, aquaculture, hydroponics and aquaponics facilities, and rooftop and indoor farms (Reese, 2014). In supporting this view, Series (2001) reported that urban agriculture refers to a trade that usually produce, processes food and fuel that grew in response to the consumer day-to-day demands in towns, cities or metropolitan areas. Chaudhuri (2015) argued that the significance of urban agriculture cannot be underestimated as it can enhance air quality in urban areas by absorbing carbon dioxide. The author further indicated that urban agriculture contribute towards the growth of the economy and has a potential to create livelihood opportunities by supplementing food supply.

In another setting, the United Nations Development Programme (UNDP) (1996) emphasizes urban farming as activities that produces, and processes food in urban settings, using intensive production methods. Onyango (2010) defined urban farming as a technique that combined social, physical as well as economic functions in the land area around homes and settlements. In another study, the Food and Agriculture Organisation (FAO) (2010) found that urban agriculture includes crop production in cities, towns and in surrounding areas. It is said to include anything from small scale gardens in the backyard to farming activities on community land by neighbourhood groups (FAO, 2010). The Food and Agriculture Organisation (2010) is also of the view that urban agriculture can be of assistance in increasing the resilience of some urban poor communities to external shocks and improve

their accessibility to fruits, fresh vegetable crops, and animal products. Previous empirical studies conducted by Austin & Visser (2002) cited by Crush *et al.*, (2011) and Ruysenaar (2013) have generally defined urban agriculture as farming activities such as aquaculture, horticulture, and livestock husbandry taking place in an urban environment. In simple terms, urban agriculture is characterized by optimum use of urban resources and by contributing vegetables, milk and poultry products to increase the efficiency of nationwide food systems (Van Veenhuizen, 2006). Given the listed benefits of urban agriculture, there are also contrasting views. The use of pesticide and insecticide may lead to health challenges such as dizziness, eye and respiratory problems, and dermatological conditions (Ackerson & Awuah, 2010). An extensive literature review highlighted that there are a number of activities that are associated with farming in urban settings that may carry higher health risks than in rural areas (Githugunyi, 2014). This author also suggested that the air, water, soil, and waste in urban settings may be polluted and pose a risk on sustainability of urban farming. Scholarly evidence reveals that occupational risks in urban agriculture cannot be ignored as they are reasonably high and it is extremely important to encounter health problems as well (Ackerson & Awuah, 2010).

Agricultural practices in urban areas are progressively playing a significant role in improving food security status worldwide. Urban agriculture is also viewed as one of the key intervention approaches to improve food security in urban settings (Simatele & Binns, 2008). The recent development about urban agriculture in South African Metropolitan municipalities is an indication that urban agriculture has the potential to improve food security (City of Cape Town, 2007; City of Johannesburg. 2013). This is not surprising because urban agriculture has yielded positive results in addressing food insecurity; and this is the reason why urban

food gardening is getting attention from policy makers and government officials around the globe (Richards & Taylor, 2012). Food security in urban agriculture is viewed in different ways such as food availability, accessibility, utilisation and stability (Lupia & Pulighe, 2015) and were identified by the FAO in a number of ways (FAO, 2006). It can be a source of income at both household and national level and the opportunity to directly access a large number of vegetables and diverse diet (food accessibility); increasing the use and consumption of safe and nutritious food (food utilisation); increases the access of reasonable to sufficient food at all times and can grow the stability of household food consumption against seasonality or other temporary shortage (food stability); the availability of adequate good quality food supplied by domestic production (food availability) (Egal *et al.*, 2001; FAO, 2006).

2.3 Urban food production in the Southern African Development Community (SADC) region

The Southern African Development Community (SADC) is a regional organisation consisting of 15 member states, namely, Angola, Botswana, Democratic Republic of Congo, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe (SADC, 2012a). The mission of SADC is to ensure that there is promotion of fair economic growth and sustainability, a socio-economic development through capable systems that are productive, deeper co-operation and integration as well as peace and security, in order for the region to advance as a competitive and effective player in international relations and the global economy (SADC,

2012b). According to article five (5) of the SADC, the treaty organisation has 8 objectives and two of these objectives, viz, a and g have a direct influence on food security. The objectives can be summarised as *“promotion of equitable and sustainable economic growth and socioeconomic development to ensure poverty alleviation with a view to eradicate it and achievement of sustainable use on natural resources and protection of the environment (SADC, 2012c)”*. The evidence about the contribution of community gardens in South Africa and other Southern African Development Community (SADC) countries such as Lesotho can be visible over time and Mashinini (2001) pointed out that community gardens improved the nutritional status of beneficiaries.

In Malawi, Mkwambisi *et al.* (2011) evaluated the role of food production in urban households in two cities, Blantyre and Lilongwe using a survey method on 330 households. Amongst others, they found that participants that were categorised as less educated, low-income and lastly women-headed households use urban farming as a source of income to maintain their livelihoods. This shows that urban farming can alleviate poverty among poor people as urban food production in Blantyre and Lilongwe included livestock production, horticulture and arable crops.

In other settings, it has been reported that there were successes in urban food production at the country level, for example, in Zimbabwe. As a result of promoting informal settlements and sustainable agricultural activities, residents earned sufficient income that enabled them to pay revenue for targeted service delivery in the City of Masvingo (UN-HABITAT, 2015). In support of this, Drescher (1994) as cited by Crush *et al.* (2010) reported that in other Southern African Development Community (SADC) countries such as Zambia and Zimbabwe,

household food production was regularly increased and this was a positive response to poor urban households who had experienced economic hardship.

In Tanzania, the study conducted by Shimbe (2008) evaluated the contribution of urban agriculture to household poverty alleviation in Morogoro municipality. The findings showed that livestock enterprise was characterized by an increasing lack of equality in income; while crop production represented a decreasing lack of equality on income. The author recommended that there was a need to integrate livestock enterprise and crop production in the urban economy so that it can play an integral role in food production. This shows that when livestock is sold there is higher income, whereas, on crop production there is low income. This shows that by combining both activities urban farming will ensure sustainability.

2.4 Crop production in small-scale farming

2.4.1 Overview

This section provides an understanding about crop production in small-scale farming in which community gardens form a part because farming in urban settings is often practised on smallholder settings. Small-scale farming is understood to mean small-scale farmers who operate on a scale that is very small making it a challenging task to attract services that are required to considerably increase output (Kirsten & Van Zyl, 1998). Ortmann & King (2006) pointed out that the challenges of small-scale farming are the lack of information, credit access and constrained markets. Despite these difficulties, some of the small-scale farmers

have managed to produce food for household consumption and for the market (Ortmann & King, 2006). Globally, it has been indicated that the majority of small-scale farms operate on less than two hectares of cropland (Kirsten & Van Zyl, 1998; Carletto *et al.*, 2013; Lowder *et al.*, 2016; Naab *et al.*, 2017).

Machethe (2004) observed that production of crops is one of the key projects in subsistence agriculture for several family units. Being mindful of food security, small-scale farming plays an important role in making sure that long-term adequacy of household food is possible (DoA, 2002). When individuals or households are engaging in crop production they may be in a better position for economic growth and availability of food (DoA, 2002). When poor households start to generate income through crop production, they will have access to more and diverse foods, as well as money to be used in other areas of the economy, such as small business development which could further reduce the level of poverty and food insecurity (Mishra & Khanam, 2010). Crop production in a small-scale farm can be one of several ways of ensuring that households have access to food because Machethe (2004) postulated that small-scale farming is expected to contribute significantly to food availability.

2.4.2 Land tenure

Land tenure is defined as the relationship that is either typical or legally among people either community groups or individuals on acquisition and use of land under certain conditions (FAO, 2003). It is usually categorised as private, communal and open access or state land (Chagutah, 2013). Kane-Berman (2016) observed that small scale farming is usually operated on communal land. The availability of land used for growing crops is an important

issue as it touches on food security (FAO, 2011). However, Lee (2010) postulated that in a small-scale farm, land can be publicly or privately owned. For example, small scale farms are mostly owned by local municipalities, institutions, community garden members, land trusts and some other entities. In private land, small farm holders may occupy the land with an agreement; however, in public land they will have to obtain necessary approvals and that will vary depending on who owns the land (Lee, 2010).

2.4.3 Crop yields

Mungalaba (2015) stated that small-scale farmers have faced the problem of low crop yields combined with low profitability for decades. In the case of maize, it has been stated that yields are directly related to the cob size and number of cobs produced (Ncube, 2014). A lack of rainfall appears to be a limiting factor in farming because the capability of rainfed crops would be compromised and resulting in low production (Agbonlahor *et al.*, 2007). Zavadil (2009) observed that water is also an important natural resource that plays a crucial part in growth of vegetables, and enough water can improve the quality, uniformity and yields of crops. Fanadzo *et al.* (2010) found that crops that perform poorly in a small-scale farm results in overall low production. Agbonlahor (2000) indicated that in some instances yield is increased because of better tillage practices, improved soil fertility and pest management.

2.4.4 Crop rotation

Crop rotation is understood to mean movement of crops from site to site on the farm in a planned sequence season to season (GRACE Communications Foundation, 2018). Crop

rotation is an effective management system for controlling pests, weeds and diseases (Miller *et al.*, 2002; Tanaka *et al.*, 2002) reducing the risk level of farm inputs, crop failure and duration of fallow, as well as improving economic and sustainability of environment in cropping systems (Gregory *et al.*, 2002. According to Laik *et al.* (2014) it has been confirmed that changing from monoculture to rotating crops was a positive move as it also increased crop yield. Moreover, it has been revealed that the interaction effects between ploughing and rotation of crops was significant and found to have impacted on crop yield significantly (Fischer *et al.*, 2002). Pennington (2012) observed that crops are rotated on small-scale setting including in large scale farming in order to support healthy soil. It was further indicated by the same author that rotating crops continually over the seasons will confuse pests and minimize the danger of soil disease. This observation was validated by the study of Ngobese (2015) where it found that Thuthukani community garden had employed crop rotation in order to avoid plant diseases, improve soil stability by preventing nutrient depletion as well as ensuring that plants grow well. Empirical evidence shows that small scale farmers practice crop rotation (Ngobese, 2015; Muzawazi, 2015, Mugivhisa *et al.*, 2017).

2.4.5 Crop failure in small-scale farming

Most small scale farmers have limited access to pesticides and therefore do not control diseases (Sibiya *et al.*, 2013). However, there are already risks to agricultural production, and they include pest and disease outbreak, extreme weather events and market shocks, among others, which often make the household to be vulnerable to food and income security (O'Brien *et al.*, 2004).

2.4.5.1 Pest and diseases

In a study conducted by Mandiriza-Mukwirimba *et al.* (2016) in a small-scale settings of South Africa it was found that pests and diseases were the main contributing factors to crop failure for brassicas. Pests and diseases cause major losses to farmers and eventually threaten food security. Amongst other things, the study concluded that farmers need to be properly trained in the use of pesticides. Proper training of chemical use will assist farmers for identification and control measures to be followed when curbing the diseases that are a risk to crop production (Mandiriza-Mukwirimba *et al.*, 2016). Khapayi & Celliers (2016) were of the view that pests may damage the produce and will in turn negatively affect quality of the crops resulting in yield loss.

2.4.5.2 Climate Change

Adger *et al.* (2003) highlighted that while climate change remained a universal problem, vulnerability is higher among developing countries and there is a need for adaptation. In many countries of sub-Saharan Africa, farmers are vulnerable to risks in agriculture due to climate change, market shocks and extreme weather, among others, making it difficult to eradicate poverty and achieving food security (Hertel & Rosch, 2010; McDowell & Hess, 2012). Harvey *et al.* (2014) argued that climate change is expected to unduly affect smallholder farmers by further exacerbating the risks that they face. The results showed that climate affects crop productivity and crop revenue is expected to decline (Kabubo-Mariara & Karanja, 2007) and it was projected that food security will be decreased (Parry *et al.*, 2005; Schlenker & Lobell, 2010). The finding is corroborated in the study of Tesso *et al.*, (2012) by

highlighting that in Ethiopia, food production is confronted with severe challenges due to climate change, observing that the losses of annual production is due to climate variability. In a study conducted by Musetha (2016) in Vhembe District Municipality, Limpopo Province South Africa, it was found that 99% of farmer's crops were affected by climate change. In Sekhukhune district, food production was negatively affected because of changes in rainfall patterns resulting in shortage of food availability (Masekoameng & Molotja, 2016). This is a clear indication that climate change plays a big role on negatively impacting food security status of respondents. Like many other countries, the Republic of South Africa (RSA) was also identified as being extremely vulnerable to the impacts of climate change (RSA, 2011)

2.4.5.3 Drought

According to Devereux (2007), it was pointed out that drought plays a role in food insecurity. Johnson & Smith (2003) maintained that drought also contribute to crop production losses and agricultural producers experience losses in revenues from low vegetable crop sales. This is corroborated by the study that analysed the impact of drought on household food security in northern region of Tanzania (Ndzelen, 2015). About 81.3% of smallholder farmers were affected adversely while only 15.5% of farm households cultivating large size farms were affected. This implies that smallholder farmers tend to be more affected by drought than farmers cultivating medium and large scale farms (Ndzelen, 2015). Similarly, the finding was validated by Harvey *et al.* (2014) when they maintained that farmers at the small scale setting are more affected by drought. It is evident from the preceding studies that drought can cause farmers to be at risk of being food insecure, particularly those that operate at a small scale setting.

2.4.6 Open fields farming

Majority of farmers prefer to grow crops in open space and they adopt the conventional method of farming (FarmNXT, 2017). According to Corrigan (2011) community gardens are commonly an open space in which mainly food is cultivated run by a group managed by local communities. The author further indicated that they operate on a wide range of farm groups such as youth, hospitals, schools, prisons, hospitals, and elderly local residents of neighbourhoods (Corrigan, 2011). Community gardens often occupy open field spaces (Schmelzkopf, 1995; Saldivar-Tanaka & Krasny, 2004) and are commonly run by lay person volunteers (Egli *et al.*, 2016). There is also the downside of the open field farming. Alam & Zurek (2006) and Khaita *et al.* (2006) have stated that the production system of open field farming is very difficult to control, and the fields were prone to face multiple contamination by diseases. Another risk is posed by livestock and wild animals which also depend on the dominance of the microorganisms that causes diseases as well as the degree of interaction between the crop production field and animals (Alam & Zurek, 2006; Khaita *et al.*, 2006). Ivey *et al.* (2012) observed that birds are also problematic because they are capable of transmitting pathogens over substantial distances and are difficult to control. Baker (2012) stated that hail and lashing winds can cause serious damage to livestock and most commonly to farmer's crops. This appears to be a threat to food security in community gardens located in open space farming. Members of the community gardens may eventually be food insecure.

2.5 Urban agriculture and food security as a global norm

Urban agriculture is a worldwide phenomenon across the globe in developed as in developing countries. As a topic of academic interest worldwide, this study reviewed literature in developed countries. From this view, the discussion in developed countries will be as follows:

2.5.1 From Developed countries' perspective

In developed countries such as in United States of America (USA), Canada, Australia, New Zealand, the notion of urban agriculture has been increasing at a very fast pace. Extensive studies in urban agricultural conducted in the USA, indicated that urban farming can enhance food security status of individuals, households, and communities (Corrigan, 2011). Other agricultural scholars and academics reported that urban community gardens maybe used to assist residents, strengthen social networks, exercising informal social control, reduction of crime, engaging youth and adults in constructive activities, develop interpersonal skills, enhance neighbourhood aesthetics, improve access to fresh produce, and increase the consumption of healthy foods (Schmelzkopf 1995; Allen *et al.*, 2008; Krasny & Tridball, 2009; Alaimo *et al.*, 2010; Ghose & Pettygrove, 2014). Burdine & Taylor (2018) indicated that community gardens were found to have produced significant economic benefits. Similarly, Algert *et al.* (2014) are of the opinion that community gardens increase gardeners' intake of fresh vegetables and provide access to fresh, culturally acceptable produce to the surrounding communities.

Study conducted by Wakefield *et al.* (2007) in Toronto, Canada found that community gardens had impacted positively on food security because farmers obtained fresh vegetables from their gardens rather than purchasing them expensively from the supermarkets. Farmers preferred produce from the community gardens because they were fresh compared from those purchased in the supermarkets. Majority of the farmers stated that their access to food had improved and they saved money because of growing vegetables on their own instead of relying on the supermarkets. This shows that community gardens contributed positively to food security because farmers were able to produce and consume fresh food with their households.

In New Zealand, Tóth & Feriancová (2015) presented various designs of urban agricultural landscapes; and within the intra-urban area, community gardens in Okeover were used mainly for learning purpose. Moreover, individuals who freely offered to partake in community gardens would take home their share of the fresh produce. In the Christchurch Farmers' Market at the Riccarton House, this type of market showed a common form of retail where producers sold their products directly to consumers with lower prices than in supermarkets. In another setting, the Agropolis urban farm, vegetables were produced in a small plots and lastly in an urban production garden, the products ranged from seasonal vegetables that were grown in household backyard.

In Australia, Ramsey & Danielle (2011) evaluated changes in peri-urban agriculture among the capital cities of Australia. The findings indicated that peri-urban regions were found to be fundamental in the provision of fresh food to the people in the city. Another major concern around the increase in urbanisation and resultant decrease in peri-urban agriculture is its potential effect on food security. For that matter, food insecurity occurred when access to or

availability of foods is compromised. This showed that there is an important level of connectedness between food security and food production and a decrease in peri-urban agriculture may have adverse effects on food security. Through this observation, this study indicated the total area of crops that were available in urbanised areas of Australia it increased slightly by 1.8%. The land for urban agriculture in Brisbane and Perth also experienced decrease in available land for vegetable crops by 28% and 14%, respectively. Finally, Sydney, Adelaide and Perth experienced reductions in land available for cereal crops by 10 – 79%. These findings suggested that population increased and consequent urban sprawl may have resulted in a decrease in peri-urban agriculture, specifically for several core food groups including fruit, breads and grain based foods. Therefore access to/or availability of these foods may be limited and the cost of these foods is likely to increase, which may compromise food security for certain sub-groups of the population (Ramsey & Danielle, 2011).

2.5.2 Developing countries' viewpoint

There is a suggestion that urban agriculture is an important reality for many households, particularly in developing countries (FAO, 2010; Zezza & Tasciotti, 2010). However, other low income and developing countries have neglected urban agriculture. For example, it was reported by FAO (2012) that many city administrations have mixed emotions about urban farming. In Lusaka, Zambia urban agriculture is regarded as an illegal activity under the Public Health Act, although it is infrequently enforced (FAO, 2012).

Korir *et al.* (2015) examined the role of urban agriculture in contributing to the food security in the low income residents of Eldoret Municipality, Kenya. Among other things, the study found that participants were able to produce food, earned an income and they were able to provide for their households. Farming in an urban setting had positively contributed to food security. It was therefore concluded that urban farming makes substantial contributions to social, economic and ecological development in urban areas (Korir *et al.* 2015). In another study conducted by Rezai *et al.* (2016) in Malaysia who investigated the possible contribution of urban agriculture to food security, it was revealed that vegetables are eaten on daily basis and thus improving fresh food accessibility, availability, and nutritional intake status resulted in food security. Furthermore, food bills of residents were reduced and they were able to spend money on other products (Rezai *et al.*, 2016). The purchasing power of the residents had improved as they had the ability to consume vegetables with their household members as well as generating income. This is consistent with the findings by Machethe (2004) who indicated that urban agriculture also made efforts to alleviate poverty in four ways including: (a) reduction of food prices; (b) creation of employment; (c) increasing wages; and (d) finally to improve farm income.

Frayne *et al.* (2010) conducted a study on the distribution of food sources in the poor urban communities in SADC cities concurrently in 11 SADC cities (Blantyre, Cape Town, Gaborone, Harare, Johannesburg, Lusaka, Maputo, Manzini, Maseru, Pietermaritzburg and Windhoek in eight (8) countries. **Table 2.1** shows the distribution of food sources in the poor urban communities in SADC cities.

Table 2.1: Distribution of food sources in the poor urban communities in selected SADC cities

Source of food	% of households using source	% of households using source on daily basis
Supermarket	79	5
Informal market/street food	70	31
Small shop/ restaurant/take away	68	22
Grow it	22	3
Shared meal with neighbours	21	2
Food provided by neighbours	20	2
Borrow food from others	21	2
Remittances (food)	8	0
Community food kitchen	4	1
Food aid	2	0
Other source	2	0

Source: Frayne *et al.* (2010)

Table 2.1 shows that poor urban households in SADC cities obtained food from a wide variety of sources. It is evident that more than 67% used supermarkets, the informal sector and small outlets (corner stores, spaza shops, restaurants and fast-food outlets). The fact that approximately 80% of households purchased food at supermarkets illustrated that households in urban areas were not producing food by themselves. It is therefore for this reason that Frayne *et al.* (2010) concluded that urban food production in eleven SADC cities was insignificant in most communities and many households largely relied on purchasing food from the supermarkets and the street vendors rather than practising urban agriculture.

Therefore, this shows that urban agriculture did not contribute to food security because households sourced food mainly from supermarkets.

In another study conducted by Muzawazi *et al.* (2017) in Bikita District, Masvingo Province, Zimbabwe, coping with climate shocks and food security in community gardens was evaluated. It was revealed that 53% of the respondents did not receive an income from their community gardening, however, they only produced food for their own consumption. It was also found that 49% of the farmers earning an income from the community garden used the money to purchase basic food such as milk, bread, sugar and cooking oil. The participants were of the view that community gardens have become their source of formal employment, since they wake up and go to work and thus contribute financially in the household (Muzawazi *et al.*, 2017).

2.6 Contribution of urban farming to food security

There is a notion that urban agriculture is an important reality for many households in developing countries (Zezza & Tasciotti, 2010). Other studies have also quantified the potential contribution of urban agriculture to the production and consumption of food for few cities, commonly in developed countries (Duchemin *et al.*, 2009). The study of Korth *et al.*, (2014) could not confirm whether urban agriculture positively impact on individual or household food security in low and middle-income countries. On the other hand, Shisanya & Hendriks (2011) examined the overall contribution of community gardens to food security in Maphephetheni, KwaZulu-Natal, South Africa. It was found that 89% of household consumed

small amount of food and they were severely food insecure. It was concluded that community gardens were unable to solve the problem of food insecurity. This was a clear indication that majority of the participants were at risk of losing access to food and they were food insecure.

According to Egal *et al.* (2001) urban farming has the ability to increase food availability and this contributes to the general urban food supply. Mudhara *et al.* (2014) were of the view that farming in an urban setting makes an important contribution to the supply of fresh foods; however, its contribution differs from one area to the other. Egal *et al.* (2001) argued that in most cities in Southern Africa people have access to a small plot allocated for food production for their own consumption and income generation. This is also supported by Smit *et al.* (1996) cited by Satterthwaite *et al.* (2010) who reported that urban dwellers rely on urban agriculture for part of their food consumption. In 2006, FAO regarded food security to be grounded on four dimensions namely; food availability (sufficient quantities of food of appropriate quality), food access (adequate resources to appropriate food, not just access food, but access to sufficient food of diverse diet), food utilisation and food stability (FAO, 2006). It is extremely important that when an individual meets all four pillars of food security (availability, access, utilisation and stability) it is deemed to be food secure. The discussion for each pillar will be as follows:

2.6.1 Food availability

According to FAO (2006), sufficient quantities of quality food should be available and every individual must have access to food through domestic production or imports. Food

production is determined by various factors that such as land use and ownership, soil management, crop selection, breeding, management and harvesting (FAO, 1997). Gebremariam *et al.* (2017) reported that availability is related to the physical presence of food; this can include foods offered or served in different settings. Small scale farmers usually practice organic farming because they cannot afford chemical fertilisers due to their cost (Mugivhisa *et al.*, 2017). According to Borlag and Gibbon (2007) as cited by Mbachii & Likoko (2013) organic farming increases the availability of food in three categories:

- Improved quantity of the food that is produced on a farm; this leads to household food security and all household members having sufficient food;
- The purchasing power of farmers are increased from extra income when producing and selling food surpluses at local markets;
- The broader community having fresh organic produce. The advantage of organic farming is to enable various community groups to get involved in agricultural production and trade where previously they were excluded for financial or cultural reasons (Borlag & Gibbon, 2007 as cited by Mbachii & Likoko, 2013).

According to Zwane (2012) food is also supplied through household production and other domestic output and commercial imports. It is evident that to ensure food security, food must be available in satisfactory quantities and it must be of good quality. Community gardens in an urban setting contribute to food availability as they produce food in order to improve availability of local food (Ferris *et al.* 2001), by allowing local people to avoid purchasing food from the supermarkets (Veen, 2015). Furthermore, community gardens that were

established in Lesotho in the 1960s improved the nutrition of beneficiaries by providing fresh vegetables (Mashinini, 2001). As recommended by Dibsall *et al.* (2002) community gardens would produce fresh vegetables that could be donated to friends and neighbours and senior citizens. This is a clear indication that community gardens did not only contribute to the individuals that engaged in producing food but their household members also realised the benefits of food produced by community gardens. Similarly, the study of Carney *et al.* (2012) indicates that community gardens produced food also for household consumption. The study of Frayne *et al.* (2009) revealed that community gardens contributed to food security among the poor by providing access to locally produced food. On the other hand, in the study of Harvey *et al.*, (2014) it was found that in a small scale setting, food security was a major problem for farmers, with 75% of the households reporting that they did not produce sufficient to feed their households year-round.

2.6.2 Food accessibility

Broca (2002) observes that food access by individuals allows sufficient resources to acquire appropriate foods for a nutritious diet. The author further indicated that these resources do not necessarily mean exclusively monetary but may also include traditional rights such as sharing common resources (Broca, 2002). It has also been indicated that access by individuals to adequate resources for acquiring appropriate foods for a nutritious diet is not guaranteed (Broca, 2002). Furthermore, Jiao *et al.*, (2012) maintains that food access refers to both economic and physical access. According to Schönfeldt (2003), as cited by Sakyi (2012), physical access refers to the availability of physical infrastructure such as markets, road transport facilities and food distribution while economic access is centred around people

having money to purchase or grow their own food. With regard to the social access, it meant that food that is traditionally accepted into the diet of the community (Schönfeldt, 2003 as cited by Sakyi, 2012). Bearing in mind that limitations to access of food means that the individual is food insecure, studies conducted in urban settings revealed that the majority of households relied on food that was purchased rather than farmed (de Zeeuw & Prain, 2011).

In a study conducted by Crush *et al.* 2010, it was suggested that urban farming was mainly attributed to household survival rather than income-generating opportunities. Food insecure households are inclined to engage in urban food production, suggesting that it was as a successful approach to poverty alleviation (Crush *et al.* 2010). The majority of such households though remained food insecure, which alternatively indicates that whilst urban farming relieves severe food insecurity, the food insecurity problem was not solved (Crush *et al.* 2010). Musemwa *et al.* (2015) recognized that majority of households in Eastern Cape Province of South Africa were depending on government social grants for household food requirements rather than producing their own food. Several studies observed that the government was also found to be the main role player of accessing food in a form of social grant (De Cock *et al.*, 2013; Masekoameng & Maliwichi, 2014; Masekoameng, 2015).

The study of Masekoameng (2015) in selected rural areas of Sekhukhune district in South Africa revealed that 84% of participants were anxious that their households did not have sufficient food. Only 33% slept without eating whereas others did not eat the whole day and night (24%). It was indicated that majority of households were food insecure because more than 80% of the households in Sekhukhune District lacked food accessibility (Masekoameng, 2015). Being mindful that the study conducted by Masekoameng (2015) included other food types whereas the focus of the current study is solely vegetables.

2.6.3 Food utilisation

According to Verhart *et al.* (2016), the utilisation pillar of food security refers to actual consumption of diverse food to meet individual dietary needs. The authors further indicated that it covers food processing and storage options and decisions around what food is purchased, prepared and consumed and allocated in the household. Highly skilled people at producing food are better at handling and using food (Gaungoo & Jeewon, 2013). Jones (2013) maintains that the distribution of food within households is not always equal among household members because of various reasons. Households with large membership are inclined to be allocated a lesser share of the vegetables based on their budget (Keller, *et al.*, 2012). It is therefore useful to know how decisions are made about what to produce, where to produce it, and how to use income (Quisumbing & Maluccio, 2000) and issues of culture in food allocation may play a significant role (Gittelsohn & Vastine, 2003). Devereux & Maxwell (2003) advised that for food to be eaten in the right way, it must be orderly organised for adequate adsorption of nutrients. For the purpose of this study, the researcher shall focus on food consumption practices as part of food utilisation.

Vegetables are eaten for various reasons and they have been reported to lower the risks of diseases (Pem & Jeewon, 2015). Food is consumed at different times of the day that is breakfast, lunch, and dinner (Ma, 2015). It was reported that most people do not eat vegetables for breakfast (Ma, 2015). This corroborates the study by Lazzeri *et al.* (2013) where it found that there was a low frequency of vegetable consumption. Vegetables in an African diet are mostly regarded as a relish that is very crucial (Oniang'o *et al.*, 2003; Smith

& Ezyaguirre, 2007). *Papa* (meaning maize meal porridge) in South Africa is normally eaten with relish (Mavengahama *et al.*, 2013). Vegetables as relish is usually served on its own or with meat or it can be referred to as a supplement (Kepe, 2008).

In a study conducted by Litt *et al.* (2011) it was found that those who participated in an urban community garden consumed more vegetables per day than those who did not. This shows one advantage of partaking in community gardens. Similarly, studies have reported that there an increase in availability and consumption of vegetables among household participating in community gardens (Alaimo *et al.*, 2008; Castro *et al.*, 2013).

2.6.4 Food stability

Food stability is understood to mean the maintenance of the availability, accessibility and utilisation of food over time in the face of a variety of natural, economic, social and political shocks and stresses (Drimie *et al.*, 2009). On the other hand, stability is when an individual or households has the ability to procure food throughout all seasons and transitory shortages or the long term ability to maintain consumption levels (Owino, 2014). This is related to people's vulnerability and their ability to cope with stresses and shocks. Factors that increase vulnerability and reduce coping ability include extreme weather events, conflict, and political and economic factors (Webb *et al.*, 2006). For an individual to be food secure, four dimensions must continuously be in place at the same time (Maxwell *et al.*, 2013). An individual cannot be at risk of losing access to food as a result of shocks (FAO, 2006). It has been indicated by the FAO that food stability is comprised of two dimensions, namely, vulnerability and

resilience (FAO, 2009). Vulnerability to food security can be either short-term or long term (FAO, 2009). However, vulnerability can be avoided by using one or more of the three possible livelihood strategies namely: (a) risk prevention, (b) risk mitigation, and (c) risk coping (FAO, 2009; Pieters *et al.*, 2013). The risk coping strategies include reducing the diversity of the diet, obtaining credit, limit food intake to ensure that children ate enough (Kuchler *et al.*, 2012; Pieters *et al.*, 2013).

It has been indicated by Du Toit (2011) that access to food implies the ability of a nation and its households to acquire sufficient food continuously and have any means to acquire the type of food that they need in sufficient amounts. Empirical evidence shows that the coping strategy of households relied on borrowing from local shops in the period of shortage of food (Musemwa *et al.*, 2015).

Machethe *et al.* (2004) had associated small crop yields with inadequate skills as well as limited knowledge among farmers. A recent study by Manenzhe *et al.* (2016) in Bushbuckridge, Mpumalanga Province reported that 83% of small scale farmers lacked farming skills; while only a minority (17%) had farming skills. As result, it is important for farmers to be capacitated with necessary skills for sustainability and feasibility of the farm as well as mitigating the effects of food insecurity.

2.7 Farming in the urban areas of South Africa

The study conducted by Van Averbek (2007) in the informal settlements of Atteridgeville in Pretoria, reported that urban farming played a significant role in the food security status of

the households of poor migrants from rural areas that came to cities. This is evident that they had physical and social access because they were able to re-create social and physical components of their rural homes in order to adapt to severe urban realities. Although the study had concluded that the contribution to overall household income was commonly not very large; however, their income level had improved compared to their rural counterparts. This means that their earnings and purchasing power had improved. In this case, their households were not at constant risk of being unable to acquire food to meet the needs of all members because they were able to supply their household with 6.85 kg of fresh vegetables on a monthly basis. The study was limited to crop production at home gardens, open urban spaces and community gardens (Van Averbek, 2007).

Onyango (2010) found that active participation in urban farming can contribute significantly on improving livelihoods. It was further revealed that most urban farmers in Orange Farm were women (Onyango, 2010) and the finding showed that they played a key role and this is consistent with studies from other parts of the world (Maswikaneng *et al.*, 2002; Kekana, 2006; Adebisi & Monisola, 2012, Mudhara *et al.*, 2014; Korir *et al.*, 2015). Amongst others, the study concluded that food would otherwise be unaffordable to many residents in the area, and by utilising money saved from buying food on other uses; it helps ease poverty conditions thus improving livelihoods (Onyango, 2010). In contrast, a recent study by Swanepoel *et al.* (2017) has found that there were more males than females involved actively in community gardening.

In Soshanguve not far away from Pretoria, Kekana (2006) found that urban farming makes a contribution to the livelihoods of poor urban households. It was reported that households save on food expenditure, earn income from sales, access food without direct buying and consume a variety of food crops in their fresh state. It is for this reason that Reuther & Dewar (2006) held a strong view that if urban farming is practiced under the correct circumstances, urban cultivation could be economically and socially viable to informal settlements in South Africa. On the other hand, Shackleton *et al.* (2010) pointed out that many people who practice urban farming do not regard themselves as full-time farmers, but see it rather as a supplementary strategy to their livelihoods.

In a study conducted by Musemwa *et al.* (2013) in Ngqushwa Local Municipality, Eastern Cape Province, the findings indicated that majority (59.1%) of the household heads had home gardens while only 40.9% did not own gardens. Furthermore, most (51.6%) of the participants grow cabbages and other vegetables. It appears that the type of weather in Ngqushwa Local Municipality had negative effects on crop production; this is a clear indication that climatic condition poses a threat to food security. The other concern in relation to food security, is that only few (30.2%) participants had access to land that is suitable for growing crops. The study concluded that majority of the households have limited access to enough food from gardens because they depend mostly on food purchases rather than own production. Therefore, most of the people in the area did not explore agriculture up to its potential.

In a study led by Battersby & Marshak (2013) in Seawinds and Vrygrond in Ward 64 in the City of Cape Town, it was reported that the City of Cape Town views urban agriculture as a

potential source of income; however, the market structures do not support the sustainable entry of produce from these projects into existing formal markets. The study found that urban farmers had the opportunity to socialize and to build unity among themselves, before they could explore economic access in the market. The other risk related to the projects is that they were constantly threatened by theft and other criminal activities in the area. Although there is a potential that project members could be empowered economically in urban agriculture there are risks that make the project vulnerable, as farmers may still be insecure with economic access. Finally, Shisanya & Hendriks (2011) have expressed a view that regardless of the benefits being reported in the literature there is still little empirical evidence about the impact of community gardens on food security.

In the province of Kwazulu Natal, Ngobese (2015) evaluated the performance of a community garden located in Tumbleweed with respect to social and crop production activities. It was found that community gardeners planted a range of crops, and above 50% of gardeners planted potatoes, spinach, and cabbage. It was further revealed that members of Thuthukani community garden use the garden to obtain food for household consumption and to save money which affords the members' households to purchase other household needs or use it for other food items. It was concluded that Thuthukani community garden has a potential to be a cooperative, provide necessary skills as well as available resources (Ngobese, 2015).

2.8 Challenges of rural and urban agriculture

This section highlights certain challenges that farmers are faced with in vegetable cultivation. A study conducted by Olawepo (2012) showed that problems of urban agriculture included

absence of fencing in the garden which causes disturbance from invaders and stray animals. Battersby & Marshak (2013) have indicated that theft and vandalism have been ongoing problems at the community garden sites. Graefe *et al.* (2008) identified attack by insects and high labour needs for irrigation as major constraints to gardening activities. In another study, Maswikaneng *et al.* (2002) found that the main trouble experienced by urban farmers was water supply that was unreliable. In another setting approximately 50% of farmers could not get seeds on a regular basis because they indicated that the price was too high since they produced for their own consumption, the surplus was sold and did not save any seeds for the following year (Betek & Jumbam, 2015). It was further found that farmers predominantly sold their crops alongside the road and avoided selling to the supermarkets due to the poor price they get from larger enterprises. For instance, if a bunch of spinach can be sold at R5.00, the supermarkets would offer them R3.50 (Betek & Jumbam, 2015). In other instances, it was found that absence of storage facilities was also the main challenge (Douglas *et al.*, 2017).

Based on the review above, it is clear that the literature does not contain enough information on the contribution of urban agriculture to food security in all areas of South Africa. Furthermore, the literature shows that urban farming has the potential to contribute positively provided there is commitment from the urban farmers. There are still households that depend entirely on supermarkets in order to obtain food than producing their own. Gender is also key in the urban farming because women show a strong passion at the opportunity of participating in the community gardens.

However, there are studies that have not investigated urban agriculture and the pillars of food security. This limitation or gap in the literature gives an opportunity for this study to scrutinize the contribution of urban agriculture to food security in Emfuleni Local Municipality, Gauteng Province and contribute towards agricultural literature by indicating the good practices and proposing improvement plans. This also provides an opportunity to contribute towards more understanding on the subject, particularly urban community gardens and food security.

CHAPTER 3

STUDY AREA AND RESEARCH METHODOLOGY

3.1 Introduction

This chapter provides the approach adopted to investigate the contribution of urban agriculture to food security in Emfuleni Local Municipality. It begins by describing the study area, followed by describing quantitative research approach. Thereafter, questionnaire development, data collection procedure and analysis of data were outlined. Finally, issues relating to ethical aspects and limitations of the study are included.

3.2 Description of the study area

The study was conducted in Emfuleni Local Municipality (ELM) of Sedibeng District Municipality in Gauteng Province of the Republic of South Africa. The area of Sedibeng District Municipality consists of three (3) local municipalities, namely Midvaal, Lesedi and Emfuleni. **Figure 3.1** shows the exact location of Sedibeng District Municipality in Gauteng Province. Although the area of Emfuleni appears to be small in the Sedibeng District, yet about 79% of the people in the District live in Emfuleni Local Municipality (Stats SA, 2011), and it is a municipality that is highly urbanised (Emfuleni Local Municipality, 2018). That is the reason why Emfuleni has a high population compared to the other two local municipalities

(Lesedi and Midvaal). For that reason, the researcher selected the area of Emfuleni as the focus of the study.



Figure 3.1: Map of Sedibeng District Municipality showing all the three Local Municipalities.

(Source: http://www.sedibeng.gov.za/tourism_maps.html, 31 January 2018)

Figure 3.1 shows that Emfuleni is located on the west part of the three municipalities that constitute Sedibeng District Municipality. The area of Emfuleni is 987.45 km² in size (ELM, 2017). It shares boundaries with North West Province on the west, Midvaal on the east, City of Johannesburg on the north and Metsimaholo Local Municipality in Free State Province on the south (ELM, 2017).

Figure 3.2 below shows the map of Emfuleni Local Municipality.

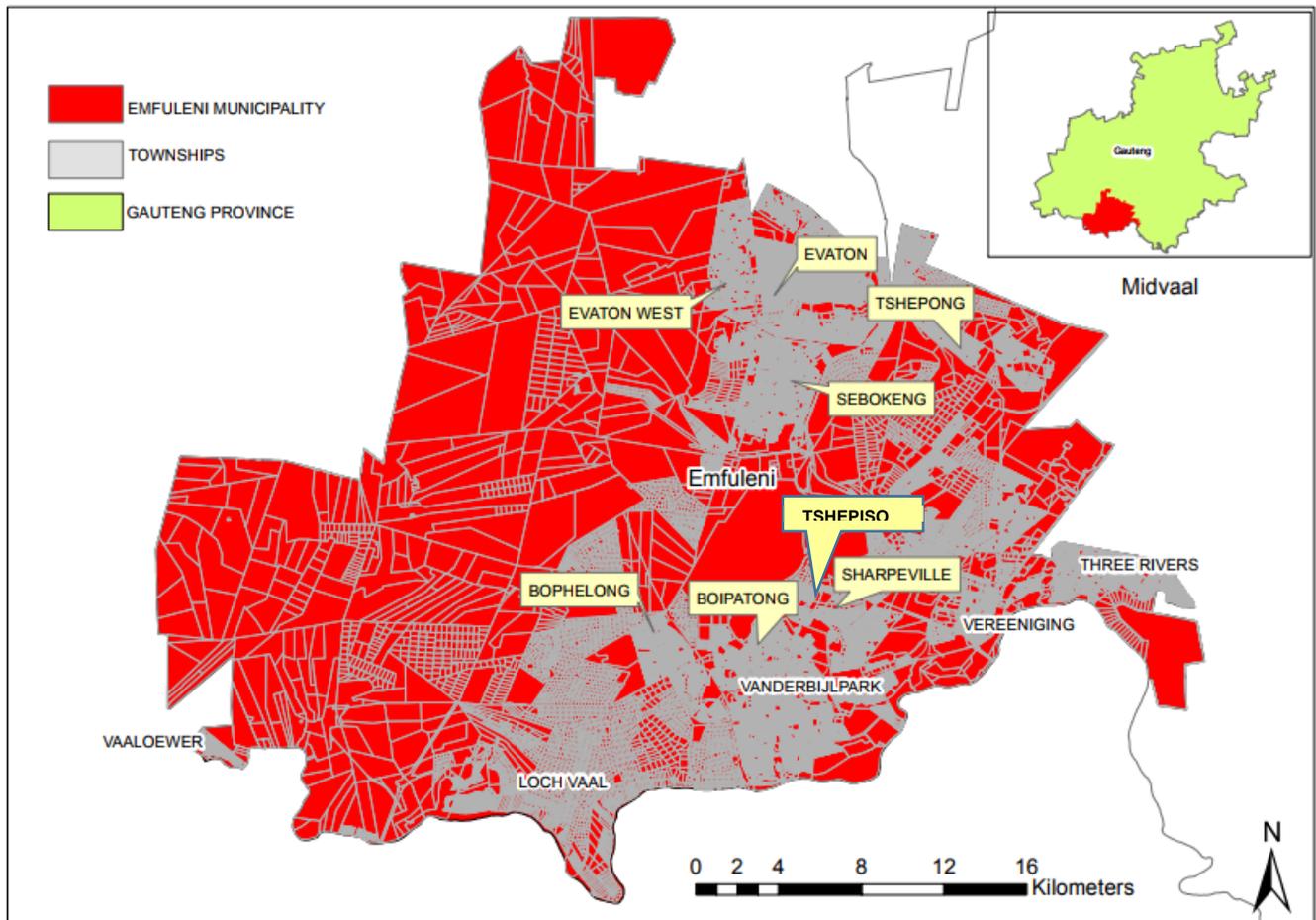


Figure 3.2: Map showing different locations of Emfuleni local Municipality (ELM)
(Source: Emfuleni Local Municipality, 2017)

The area of Emfuleni is advantageously situated in an opportunity to a well-maintained road network that links Bloemfontein and Johannesburg. The area has (2) two main town centres; namely Vereeniging and Vanderbijlpark. It was formerly known as the Vaal Triangle and has six (6) large townships of Sebokeng, Bophelong, Boipatong, Sharpeville and Tshepiso, Evaton (ELM, 2017).

3.3 Research approach and design

The study employed a quantitative research approach (Leedy & Ormrod, 2005). Quantitative research approach was adopted because it included numeric data and was subjected to statistical treatment (Creswell, 2003). A survey research design was used as part of the research methodology. Survey design contain features of possibly including all population of interest in the sample and the results can be generalized to the same population (de Leeuw *et al.*, 2008).

3.4 Population of interest, sampling technique and sample size

Population of interest refers to identified group of people with the same essential characteristic to which conclusion can be made by the researcher (Boslaugh, 2008). In the current study, the beneficiaries (farmers) of the urban community gardens were identified as the ideal target population. From the list of community gardens obtained from Gauteng Department of Agriculture and Rural Development (GDARD), the total number of community gardens in Emfuleni Local Municipality were 43 with total of 418 members. The distribution of locations of the community gardens were as follows: Sebokeng, Evaton, Sharpeville, Tshepiso, Bophelong and Boipatong. The average number of farmers per community garden was 10, which ranged between 2 and 44 farmers.

A 50% sampling fraction was targeted to select the number of farmers from urban community gardens, therefore 209 farmers were targeted from 21 urban community gardens. However,

there was interest from many farmers than anticipated; therefore, the sampling fraction was increased to 61% and 71% for farmers and urban community gardens respectively. As a result, a total of 30 urban community gardens participated in the study. The sample size was 254 farmers who were randomly selected from 30 urban community gardens that participated in the study.

Furthermore, the study adopted purposive sampling for deliberately selecting one key informant from 30 urban community gardens that participated in the study. This was done because the researcher believed that they possess relevant knowledge (Etikan *et al.*, 2016). Key informants who were deemed to have first-hand information about community gardens were purposively selected for interviews.

Therefore, the total sample size in this study was 284 respondents (254 farmers plus 30 key informants).

3.5 Data collection techniques

Data was collected through face-to-face interviews using a semi-structured survey questionnaire (Appendix 1). The questionnaire contained closed questions (to capture numeric data) and open-ended questions (to capture qualitative data). Prior to the interviews, appointments were made telephonically with the liaison person of each community garden and the extension officers in some instances. Data was collected during March and April 2017 at the premises of the community gardens. Face-to-face interviews were also conducted with key informants who are regarded as knowledgeable about community

gardens. This was to ensure that data was collected from those who have knowledge and were directly engaged in the farming activities.

The average time to complete a questionnaire during the interviews was approximately 45 minutes. The researcher took into consideration that 4% of the people in the study area did not have formal education, while 3.6 % completed primary school (Stats SA, 2011). Owing to this, interviews in a face-to-face setting were employed because some of the respondents were illiterate and showed interest in participating in the study. As a result, the researcher was able to verbally conduct interviews and complete the questionnaire according to their answers. However, some of the respondents preferred to complete the questionnaires by themselves. This method of a fieldworker completing questionnaires according to respondents' answers was also followed by Van wyk (2014) whom it was reported that many respondents responded positively. The researcher was listening attentively to the respondent's answers and kept eye contact, nodded his head. Every effort was made to ensure that respondents were comfortable during the interviews.

3.6 Development of measuring of variables

For the purpose of this study, a standard semi-structured survey questionnaire and a key interview guide were used. The type of data was diverse ranging between quantitative as well as information from the open ended questions.

Sections of survey questionnaire were structured as follows:

Section A: General information

The general information such completion date of the questionnaire, questionnaire number and name of the community gardens.

Section B: Participants characteristics

This section comprised of the participants' characteristics which include both demographic (gender, race, age group, home language, marital status, education level).and socio-economic information (family size, farming experience, sources of income and others).

Section C: Food security

C1 – Food availability

The questionnaire was developed to determine vegetable production in community gardens. The attitude scale measurements such as Likert scales was used whereby the respondents had five options to choose from. Respondents were asked whether they strongly disagreed (1), disagreed (2), neutral (3), agreed (4) and strongly agreed (5) with the statement in the questionnaire. In survey design, Likert scales are suitable and reliable (Allen & Seaman, 2007). Furthermore, the question about the frequency of taking vegetables from the community gardens to their households was continuous; respondents had options to indicate any number. In relation to the limitations of the community gardens, respondents had the options to choose from “yes” or “no” in some of the questions.

C2 – The Household Food Insecurity Access Scale (HFIAS)

The HFIAS entails nine items, an individual item was first administered as a yes/no question. When a respondent's answer was yes to any question, there was a follow-up question regarding how often the item had been experienced in the four weeks preceding the survey (for instance, on Item 1. In the past four weeks, did you worry that your household would not have enough vegetables? If the answer was "yes": How often did this happen? Rarely (once or twice in the past four weeks); Sometimes (3 to 10 times in the past four weeks); Often (more than 10 times in the past 4 weeks) (Coates *et al.*, 2007).

Several studies in selected countries in a developing context have used household food insecurity access scale (Becquey *et al.*, 2010; Gebreyesus *et al.*, 2015). Empirical evidence shows that HFIAS shared more light on three (3) aspects of household food insecurity access which include uncertainty and worrying about the prospect of food insecurity, insufficient quality of food consumption and household food insecurity access prevalence (Shisanya, 2008).

C3 – Food utilisation

Food consumption practices questions were included in order to determine consumption practices. Respondents were asked to indicate the reason for consuming vegetables; they had options to answer "yes" or "no". Respondents were also requested to indicate the frequency of eating vegetables from the community gardens per week and they had option to rate the frequency on a scale from 1 – 5.

C4 – Food stability

The coping strategies, cultivation practices, garden skills, quality and quantities of vegetables produced were determined in order to investigate stability in community gardens. Respondents had the options to answer “yes” or “no”.

Key informant interview guide

Various sections of the community gardens were asked and respondents had options to in numbers and some instances they had to tick the appropriate answer. The types of crops (vegetables and agronomic crops) grown in community gardens and sales frequency were determined using the interview guide. Furthermore, the SWOT analysis was determined using open-ended questions (Appendix 2).

3.7 Pilot study

A pilot study was conducted January 2017 prior to main data collection. Eleven (11) respondents from various urban community gardens were randomly selected to participate in the pilot study. The aim of the pilot study was to ensure that the questionnaire was clear and respondents understood the questions (Van Teijlingen & Hundley, 2001). During the pilot study, when the researcher discovered that the respondents were hesitant to answer some of the questions because they did not understand them. Such questions were revised accordingly and simplified. This was a good move for the current study as few of the questions were improved after the pilot study. Respondents included in the pilot study were excluded from the main research.

The study was conducted under the supervision of the leaders of his study who are experts in the field of food security and rural development. The questionnaire was validated and subjected to reliability test to improve the efficiency.

3.8 Data analysis process

The researcher captured quantitative data in Microsoft Excel 2013. The numeric data was analysed by a computer program called SPSS (Statistical Package for the Social Sciences) version 23.0. The analysis included both descriptive and inferential statistics. In descriptive statistics, percentages, means, frequencies, pie chart, bar graph, cross tabulations were used. The statistical significance was determined at 5% confidence interval.

In Inferential statistics, Ordered Logit Regression Model (OLRM) was employed to determine the factors influencing consumption pattern of vegetables. According to Long & Freese (2014), ordered logit model is regarded as a method that is commonly known for analysing ordinal outcome variables. Vegetable consumption pattern was categorised as 1=Never; 2=Once a week; 3=Two to four times per week; 4=Five to four times per week and 5=Daily. Ordered Logit Regression can predict a polychotomous ranked dependent variables as a function of explanatory variables that describe the characteristics of a unit, individual or economic agent (Gujarati & Porter, 2009). To determine the factors influencing vegetable consumption pattern of the farmers in urban community gardens “Never”, “Once a week”, “Two to four times per week”, “Five to four times per week” and “Daily”, the following OLRM model defined regression equation will be used:

$$Y^* = X'\beta + \varepsilon \quad (1)$$

Where Y^* , the latent variable in equation (1), is not observable. What is observable is the polychotomous Y , defined by the following:

- $Y=1$ (Never) if $Y^* \leq 1$,
- $=2$ (Once a week) if $1 < Y^* \leq \mu_2$,
- $=3$ (Two to four times per week) if $\mu_2 < Y^* \leq \mu_3$,
- $=4$ (Five to four times per week) if $\mu_3 < Y^* < \mu_4$
- $=5$ (Daily) if $\mu_4 < Y^* < \mu_5$

The μ s are unknown parameters to be estimated with β . The ε in equation (1) is normally distributed across observations. With a constant mean and zero variance. The probabilities derived from equation (1) are:

- $\text{Prob}(y=1 | x) = \Phi(-x\beta)$,
- $\text{Prob}(y=2 | x) = \Phi(\mu_2 - x\beta) - \Phi(-x\beta)$,
- $\text{Prob}(y=3 | x) = \Phi(\mu_3 - x\beta) - \Phi(\mu_2 - x\beta)$,
- $\text{Prob}(y=4 | x) = \Phi(\mu_4 - x\beta) - \Phi(\mu_3 - x\beta)$,
- $\text{Prob}(y=5 | x) = \Phi(\mu_5 - x\beta) - \Phi(\mu_4 - x\beta)$,

Marginal effects show the change in probability of being a certain category when the explanatory variable increases by one unit. They are approximations of how much the dependent variable is expected to increase or decrease for a unit change in an explanatory variable. For continuous variables this represents the instantaneous change given for a unit increase and for dichotomous variables, the change is from zero to one. The marginal effects of the regressors (X s) on the probabilities are not equal to the coefficients. For the five probabilities, the marginal effects of changes in the explanatory variables are:

$$\delta \text{Prob}(y=1 | x) = -\phi(x\beta)\beta \quad \delta x$$

$$\delta \text{Prob}(y=2 | x) = [\phi(-x\beta) - \phi(\mu - x\beta)]\beta, \quad \delta x$$

$$\delta \text{Prob}(y=3 | x) = \phi(\mu - x\beta)\beta \quad \delta x$$

$$\delta \text{Prob}(y=4 | x) = \phi(\mu - x\beta)\beta. \quad \delta x$$

$$\delta \text{Prob}(y=5 | x) = \phi(\mu - x\beta)\beta. \quad \Delta x$$

The base group is the "Never" category. The higher categories are "Once a week", "Two to four times per week", "Five to four times per week" and "Daily".

The above Ordered Logit Regression Model will be estimated as follows:

$$Y = f(x_1, x_2, x_3, x_4, x_5, x_6, x_7, -x_8, \dots, \mu) \dots (xx)$$

Table 3.1: Variable labels and their expected sign

Independent variable	Variable description	Expected sign
Y	Gender	Positive
	Age group	Positive
	Level of education	Positive
	Participation period in community garden	Positive
	Family size	Positive
	Number of family members working	Positive
	Number of working hours in the community garden/day	Positive
	Number of working hours in the community garden/day	Positive
	Main source of income	Negative
	Annual income from community garden	Positive

Table 3.2 below presents definitions and explanations of variables used in the empirical Ordered Logit Regression Model.

Table 3.2: Definition and explanation of the variables used in the Ordered Logit Regression Model

Variable	Measurement type	Description and value	Expected sign
Vegetable consumption pattern	Scale	Never = 1 Once a week = 2 Two to four times per week = 3 Five to six times per week = 4	-
Gender	Nominal	0=Female 1=Male	Positive
Age group	Nominal	1 = 18 - 35 yrs 2 = 36 – 45 yrs 3 = 46 – 55 yrs 4 = Above 55 yrs	Positive
Level of education	Nominal	1 = No formal education 2 = Primary education 3 = Secondary education 4 = Tertiary education 5 = Other (Specify)	Positive
Participation period in community garden	Continuous	Number of years/months participating in community garden	Positive
Family size	Continuous	Family Size (Including participant)	Positive
Number of family members working	Continuous	Number of family members working	Positive

Number of working hours in the community garden per day	Continuous	Number of working hours in the community garden per day	Positive
number of working hours in the community garden per day	Continuous	Number of working hours in the community garden per day	Positive
Main source of income	Nominal	1= Farming 2=Non farming	Negative
Annual income from community garden	Continuous	Annual income from community garden	Positive

Goodness-of-fit measures

The goodness of Fit (GOF) are regularly used in evaluating how well the data fits into a set of observations (Maydeu-Olivares & Garcia-Forero, 2010). In the current study, reliability of the fitted model is assessed by employing commonly used standard measurement which may or may not give same results.

The Pearson goodness-of-fit statistic is expressed as:

$$X^2 = \sum_j \frac{(O_j - E_j)^2}{E_j}$$

The deviance statistic is expressed as:

$$D = 2 \sum \sum O_{ij} \ln \left(\frac{O_{ij}}{E_{ij}} \right)$$

The qualitative data was transcribed in Microsoft word 2013. The qualitative data was detailed in an orderly examination using codes and themes (Saldaña, 2013). As a result, table frequency listing Strengths, Weaknesses, Opportunity and Threats (SWOT) were generated.

3.9 Ethical considerations

The Ethical approval was obtained after all requirements of the College of Agriculture and Environmental Science (CAES) Research Ethics Review Committee of the University of South Africa were met (Reference number: **2016/CAES/118**). A permission was also granted by the Gauteng Department of Agriculture and Rural Development (GDARD) for the research to be conducted in Gauteng province. In each community garden, prior to data collection the researcher thoroughly explained the aims and purpose of the research to all the participants. Participants were informed that their participation was solely voluntary as they had the right not to participate (Parahoo, 2006). The respondents were informed about their rights and that they can withdraw from the study at any given during the study (Strydom, 2011).

Prior to completing the questionnaire and/ key interview guide or being interviewed, all participants were requested to complete and sign consent form. By signing the consent form (Appendix 4), it meant that the participant was willing to partake in the study. Respondents who could not personally sign the consent form due to illiterate, gave verbal permission to the researcher to complete the form on their behalf and signed afterwards.

The researcher ensured that the respondent's real names were not written in the questionnaires. The real names of respondents were written in a separate consent form and signed by respondent as it was required to give consent before participating in the study. On the questionnaire, a code was assigned to each respondent; only the researcher knew about the code assigned to each respondent. After the completion of the questionnaire, the consent form was stored separately from the questionnaire. All the respondents involved in this study were over the age of 18 years.

3.10 Limitations of the study

This section reports the limitations that were encountered during the study. This include language, and respondents that required special training to be interviewed are presented below:

3.10.1 Language

The researcher was worried that the language could be a limitation particularly IsiZulu and IsiXhosa (which is part of the Nguni group), Afrikaans, Xitsonga, Tshivenda. The researcher

was not fluent in the above listed languages. However, the respondents understand Sesotho because it is the predominant language in the study area. Where the respondent sought clarity, the researcher clarified in their home language. The researcher is of the view that no meaning has gone astray during the interview and completion of questionnaires.

3.10.2 Few respondents required special training to be interviewed

In one community garden, the key informant administered questionnaires on behalf of the researcher. The fact that completion of questionnaires in one community garden was not done by the researcher, it could be another limitation. In an attempt to overcome this limitation, researcher went through each question on the questionnaire with the chairperson to ensure that there is proper understanding. The researcher is of the view that no meaning has gone astray during the interview and completion of questionnaires.

3.10.3 Study assumptions

The research relied on the opinions and insights concerning the individual's experiences. It is therefore assumed that the participants in this study answered all questions in a truthful manner.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Introduction

The chapter presents the results and discussion of the study. The demographic characteristics of respondents; followed by analysis of food security status of the respondents. Factors that influence food utilisation and SWOT analysis of community gardens are presented, and the last one is the discussion of the findings.

4.2 Results

4.2.1 Socio-demographic characteristics of the respondents

4.2.1.1 Demographic characteristics

Demographic characteristics such as gender, race, age group, home language, marital status and level of education were included in the study. **Table 4.1** below present demographic characteristics of the respondents.

Table 4.1: Demographic characteristics of the respondents (n=254)

Variable	Frequency	Percent
Gender		
Female	181	71.3
Male	73	28.7
Total	254	100.0
Race		
Black Africans	254	100.0
Total	254	100.0
Age group		
18 – 35	59	23.2
36 – 45	55	21.7
46 – 55	73	28.7
Above 55	67	26.4
Total	254	100.0
Home Language		
Setswana	13	5.2
Sepedi	5	2.0
IsiZulu	45	17.7
Xitsonga	1	0.4
IsiXhosa	29	11.4
Tshivenda	9	3.5
Sesotho	151	59.4
Afrikaans	1	0.4
Total	254	100.0
Marital Status		
Single	136	53.5
Married	72	28.3
Divorced	11	4.3
Widowed	20	7.9

Cohabitation	13	5.2
Other - Separated	2	0.8
Total	254	100.0
<hr/>		
Level of education		
No formal education	10	4.0
Primary education	74	29.1
Secondary education	158	62.2
Tertiary education	11	4.3
Other – Home based care	1	0.4
Total	254	100.0

Source: field data (2017)

The results in **Table 4.1** show that majority (71.3%) of the respondents in the study area were females, while the males were 28.7%. The age group of respondents between 18 and 35 was at 23.2%; this clearly shows that participation of youth in community gardens was low. Majority of the respondents were 36 years and above (76.8%) and this is a worrying factor regarding the future of the community gardens. Some of the respondents above the age of 55 indicated that they were participating in community garden because they retired and were also keeping their body active. The language spoken by most respondents (59.4%) was Sesotho; this is not surprising because the study area is located in a predominant Sesotho region of Vaal. The least spoken language was Afrikaans (0.4%). Majority (53.5%) of the respondents were not married (single) followed by those that were married (28.3%). With regards to the level of education, the largest proportion (62.2%) of the respondents attended secondary school, while only 4.3% attended tertiary education. Amongst the respondents, 4.0% had no formal education; this may be attributed by the fact that majority of the participants were above 35 years of age and grew up during the segregation system which had limited schooling opportunities for Black Africans.

4.2.1.2 Family composition of the respondents

Statistical analysis of family composition of the respondents was also done. The variables that constituted the family composition included family size, number of adults, number of children and number of family member working. The results in **Table 4.2** below present family composition of the respondents.

Table 4.2: Family composition of the respondents (n=254)

Item	Family Size (Including participant)	Number of adults in the household	Number of children in the household	Number of family members working
Mean	4.74	2.24	2.76	1.43
Std. Error of Mean	0.128	0.069	0.103	0.067
Mode	5	2	2	1
Std. Deviation	2.038	1.098	1.570	.813
Minimum	1	1	1	1
Maximum	15	8	12	7

Source: field data (2017)

The results on **Table 4.2** show that on average the family size of the respondents was 4.74 members which ranged between 1 and 15; this shows that there were small and big families amongst the respondents. On average, there were more children than adults in the families of the respondents; and few family members were reported to be working, as shown by an average of 1.43. The standard deviation for the all variables of family composition presented in **Table 4.2** ranged from 0.813 to 2.038, this shows the variation was low. This implies that

the different between the family size, number of adults, number of children and number of family member working was low. The standard error of mean for the variables of family composition ranged between 0.067 and 0.128 which is quite low.

4.2.1.3 Participation period of the respondents in community gardens

The participation period of the respondents in community gardens was determined. The variables are number of years, daily working hours and number of working days per month. The results in **Table 4.3** below present participation period of the respondents in the community gardens.

Table 4.3: Participation period of the respondents in the community garden (n=254)

Item	Participation period in the garden		
	Number of years	Daily working hours	Number of working days per month
Mean	3.2	7.3	18.6
Std. Error of Mean	0.202	0.092	0.166
Mode	1	8	20
Std. Deviation	3.220	1.463	2.646
Minimum	0	1	10
Maximum	18	12	23

Source: field data (2017)

Table 4.3 depicts that on average, respondents have been members of a community garden for 3 years; 18 years was the highest participation period. Zero (0) year indicate that respondents have been members for less than a period of 1 year. The standard error of

mean (0.202) indicate that the variation was low. Results reveal that on average, respondents worked 7.3 hours per day in the garden; this is less than 8 working hours that most people in South Africa work. The variation was low because the standard deviation was 1.463. The variation of the number of working days per month was also low as shown by a standard deviation of 2.646 and the standard error of mean of 0.666. On average, the respondents were working on community garden for 18.6 days per month with the range between 10 and 23 days. This shows that there were community gardens that were busy throughout the month whereas some were not.

4.2.1.4 Main sources of income among the respondents

The main source of income of the respondents was taken into consideration. The variables are farming and non-farming activities. The main source of income among respondents is presented in **Table 4.4**.

Table 4.4: Main source of income among the respondents (n=254)

Item	Frequency	Percent
Farming	200	78.7
Non-farming	54	21.3
Total	254	100.0

Source: field data (2017)

Table 4.4 indicate that the highest number of the respondents (78.7%) relied on farming, precisely community gardens as their main source of income. Few respondents (21.3%) relied on social grants, stayed with family members that are employed and earned income

from other sources. This shows the sustainability of community gardens is important because the respondents relied on them to provide for their families.

4.2.1.5 Other sources of income among the respondents

The results of the other sources of income among the respondents at the time of the study are presented in **Table 4.5**.

Table 4.5: Other sources of income among the respondents

Source of income	Frequency
Social grant	19
Business	3
Remittances	2
Total	24

Source: field data (2017)

The results in **Table 4.5** show that only 24 respondents received additional income from social grant, business and remittances. Social grant was the main source of additional income received by the respondents, followed by business with remittances being the lowest. Some of the respondents have started small businesses to supplement income received from vegetables gardens. This may be because income earned from the gardens is not sufficient to sustain their livelihoods.

The other sources of income were grouped from R0 to R40 000. The distribution of other sources of income among the respondents is presented in **Table 4.6** below.

Table 4.6: Distribution of other sources of income per annum.

Income range	Source of income		
	Social grant (n=19)	Business (n=3)	Remittances (n=2)
R 1 – R 10 000	10	1	2
R 10 001 – R 20 000	6	-	-
R 20 001 – R 30 000	3	1	-
R 30 001 – R 40 000	-	1	-
Total	19	3	2

Source: field data (2017)

The results in **Table 4.6** indicate that majority (10) of respondents earned social grant income ranging from R 1 to R 10 000. Respondents whose income fell in the said income range were mostly childcare grant. The income range of R 10 001 to R 20 000 and R 20 001 to R 30 000 were mostly from pensioners, foster child and disability grant. Furthermore, there were total of 3 respondents who were also engaged in business activities with different categories of income; while 2 respondents had received remittances in the range of R 1 to R 10 000 from family members.

4.2.1.6 Net income earned by respondents from community gardens

The annual net income earned by the respondents from the community gardens was determined. **Table 4.7** below present the analysis of annual net income earned by the respondents from community gardens.

Table 4.7: Analysis of annual net income earned by respondents from community gardens (n=254).

Item	Net income
Mean	4 080.28
Std. Error of Mean	326.212
Mode	0
Std. Deviation	5 198.966
Minimum	0
Maximum	18 000

Source: field data (2017)

The results in **Table 4.7** indicate that the average annual net income earned by the respondents was R 4 080.28. The standard deviation of annual net income was very high at R 5 198.966, which showed that there was inequality in the annual net income earned by the respondents. This is attributed by the fact that only 40% of the respondents earned income in the past twelve months, this clearly shows that the highest proportion (60%) did not earn income from the gardens during the same period. Majority of the respondents who received income were beneficiaries of Extended Public Works Program (EPWP) as well as Independent Development Trust (IDP) because they had participated in community gardens.

As a result, respondents were paid stipend for a period of 9 months. Those who were not receiving a stipend from EPWP and IDP only relied on the income from vegetables gardens which is derived by selling vegetables.

4.2.2 Food security status of the respondents

The results of food security measures are presented in section 4.2.2.1 to 4.2.2.4. The measures of food security that forms part of this section are food availability, food accessibility, food utilisation and food stability.

4.2.2.1 Food availability

The availability of vegetables in community gardens was determined. The responses were observed in order to assess frequency of vegetables received by respondents from the community garden. In the next section, occurrence in which respondents received vegetables is discussed.

Table 4.8 display the average frequency in which the respondents received vegetables from the community garden on monthly basis.

Table 4.8: Average frequency in which the respondents received vegetables from the community garden on monthly basis

(n=254)

Month	Proportion of respondents (%)	Mean	Std. Error of mean	Mode	Std. deviation	Minimum	Maximum
January	67.7	3.39	0.246	4	3.926	0	20
February	70.0	3.41	0.267	4	4.251	0	30
March	66.9	3.08	0.221	0	3.527	0	20
April	66.9	3.02	0.225	0	3.584	0	20
May	66.9	2.73	0.212	0	3.384	0	20
June	62.5	2.56	0.204	0	3.248	0	20
July	62.5	2.54	0.201	0	3.204	0	20
August	65.3	2.94	0.223	0	3.553	0	22
September	67.7	3.20	0.242	0	3.857	0	26
October	67.7	3.50	0.268	0	4.272	0	30
November	68.1	3.46	0.262	0	4.173	0	30
December	64.1	3.45	0.277	0	4.410	0	30
Average	66.3	3.10	0.237	0.67	3.782	0	24

Source: field data (2017)

The results in **Table 4.8** show that on average, 66.3% of the respondents received vegetables from the community gardens throughout the year. On average, most respondents received vegetables three (3) times per month from the gardens throughout the year. The range was between 0 and 30 with an average annual maximum of 24; this indicate that there were respondents from some community gardens who did not receive vegetables between January and December. For example, there were respondents who did not receive vegetables in winter but in summer and vice versa. Most respondents largely received vegetables during October, November, December and February because the maximum was 30, which implies that some of the respondents received vegetables on daily basis during those months because of summer rainfall. On average, the respondents commonly received vegetables four (4) times per month as shown by an average mode of 0.67. They normally received vegetables on Fridays. The average annual standard deviation was 3.782, which ranged between 3.204 in July (minimum) and 4.410 in December (maximum). This shows that the variation was low.

Table 4.9 display the category of frequency in which the respondents received vegetables from the community garden on a monthly basis.

Table: 4.9: Category of frequency in which the respondents received vegetables from the community garden on monthly basis
(n=254)

Range	Months of the year												Average
	¹ Jan	² Feb	³ Mar	April	May	June	July	August	⁴ Sept	⁵ Oct	⁶ Nov	⁷ Dec	
Proportion of respondents (%)													
0	32.3	29.9	33.1	33.1	37.4	37.8	37.4	34.6	32.2	32.3	31.9	35.8	34.0
1 - 10	62.7	65.0	62.6	61.9	59.2	59.0	59.9	61.4	62.6	62.6	63.9	57.9	61.0
11 – 20	5.0	4.0	4.3	5.0	3.4	3.2	2.7	3.6	4.4	4.0	3.4	5.1	4.1
21 – 30	-	1.1	-	-	-	-	-	0.4	0.8	1.1	0.8	1.2	0.9
Total	100	100	100	100	100	100	100	100	100	100	100	100	100

Source: field data (2017)

¹ Jan = January

² Feb = February

³ Mar = March

⁴ Sept = September

⁵ Oct = October

⁶ Nov = November

⁷ Dec = December

Table 4.9 show that on average 34% of the respondents reported that they did not receive vegetables on monthly basis from community gardens. This occurred mainly to the respondents who had recently joined community gardens and/ respondents from community gardens that had water shortages. On average majority of the respondents (61%) received vegetables between 1 – 10 times per month; this shows that most respondents were consuming vegetables from the gardens on monthly basis.

The next section entails views of the respondents on cultivation of vegetables from the time they actively participated in community gardens. They included capability of providing fresh vegetables at home sustainably, ability to feed themselves sustainably and vegetables consumption patterns in relation to production are presented in **Figure 4.1** to **Figure 4.7**.

Figure 4.1 shows the level of agreement among the respondents with the statement: "*I am able to provide fresh produced vegetables at home*".

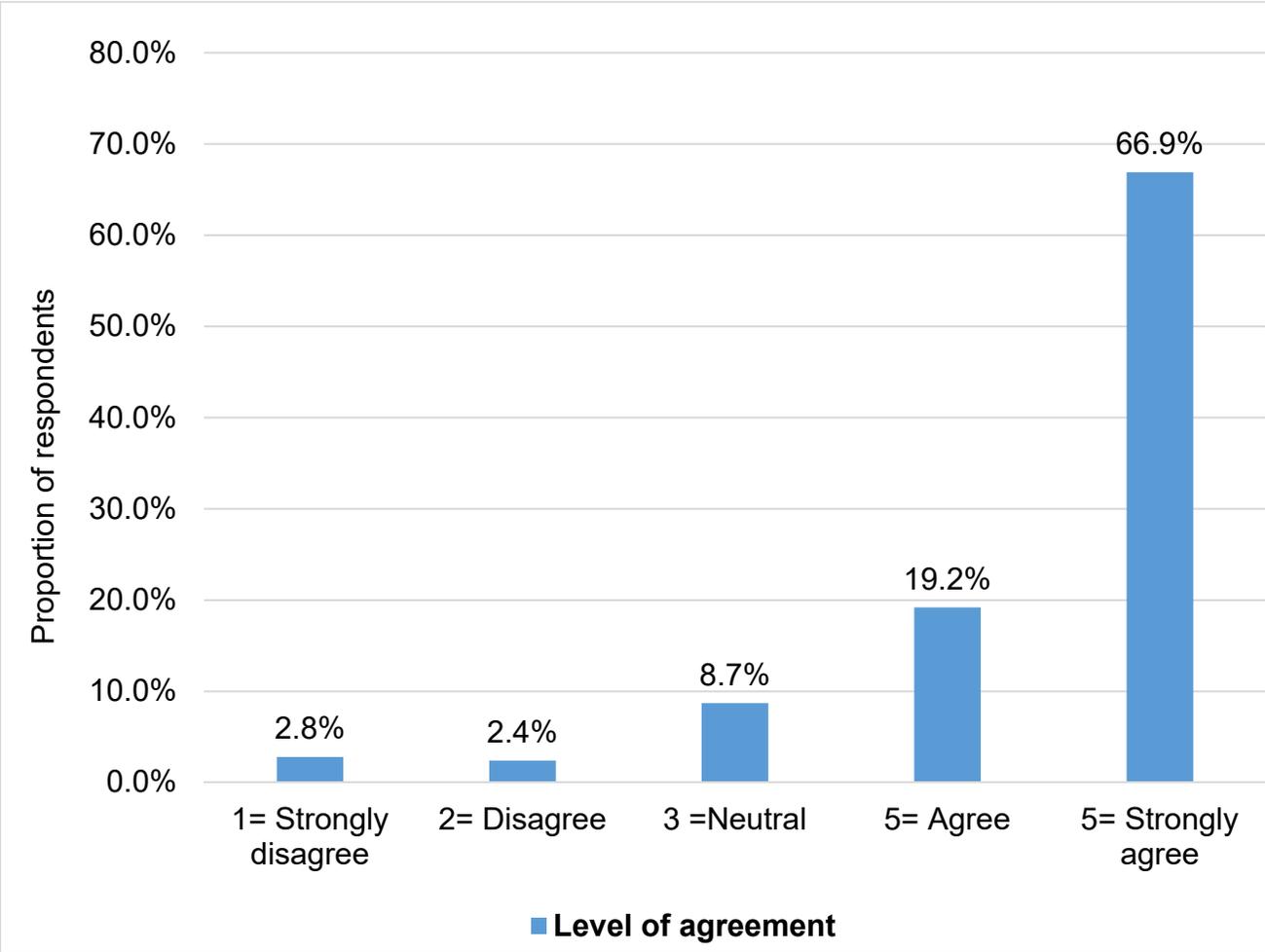


Figure 4.1: Level of agreement among the respondents with the statement: “*I am able to provide fresh produced vegetables at home*” (n=254)

The results presented in **Figure 4.1** show that the largest proportion (86.1%) of the respondents were able to provide fresh vegetables at home by participating in community gardens. Of the few (5.2%) respondents were not in agreement that their participation in community gardens enabled them to provide their families with fresh vegetables. It is evident that community gardens contributed to food availability of the beneficiaries because most of the respondents were able to provide fresh vegetables at home. This is an indication that most of the respondents and their household members were able to consume fresh

vegetables produced from the community gardens, and they did not rely on the vegetable markets, supermarkets, spaza shops and others. These encouraged respondents to enhance their production and reduced household expenditure on vegetables.

Figure 4.2 shows level of agreement among the respondents with the statement: *“I do not know where the next day’s vegetables will come from due to production that is not reliable”*

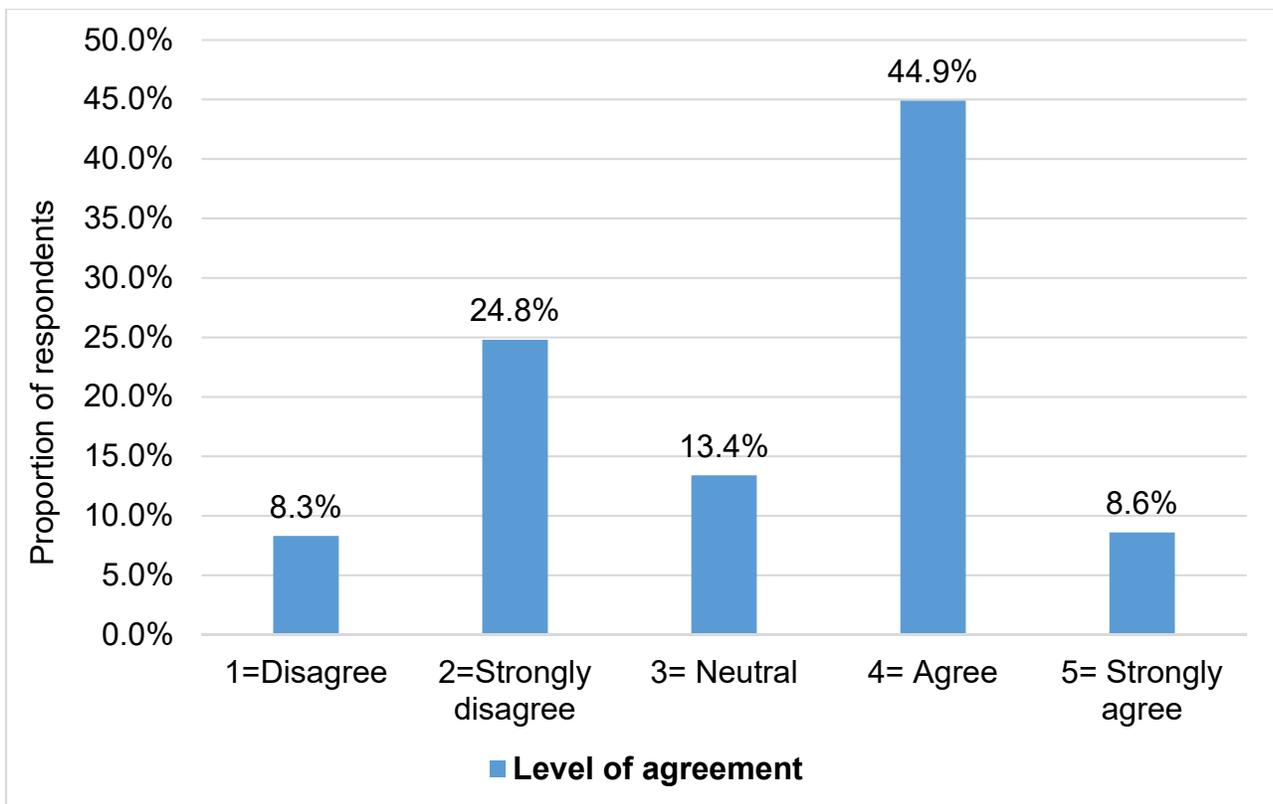


Figure 4.2: Level of agreement among community gardeners with the statement: *“I do not know where the next day’s vegetables will come from due to production that is not reliable”* (n=254)

The survey results in **Figure 4.2** clearly shows a positive response of 53.5% while the minority (13.4%) remained unclear; other respondents (33.1%) have disagreed with the statement. Since there is a high response of respondents who agree with the statement, it shows that there were community gardens that could not sufficiently produce vegetables as sustainably expected. This was also evident in **Table 4.8** whereby on average the respondents received vegetables from the garden less than six days/month. Meaning that there were days in which the respondents did not consume vegetables harvested from the gardens. Respondents indicated that pests (cutworms and others) negatively affected the yield and quality of the vegetables. Other respondents indicated that the plants were collapsing and they were convinced that it was the moles that were primarily attacking the plant roots. The other cause for concern was lack of rainfall that also contributed to unreliable production for vegetables gardens without boreholes. However, those with boreholes or access to municipality water were able to produce throughout the year.

Figure 4.3 shows the level of agreement among the respondents with the statement: “*The vegetables produced are not enough to feed my family*”

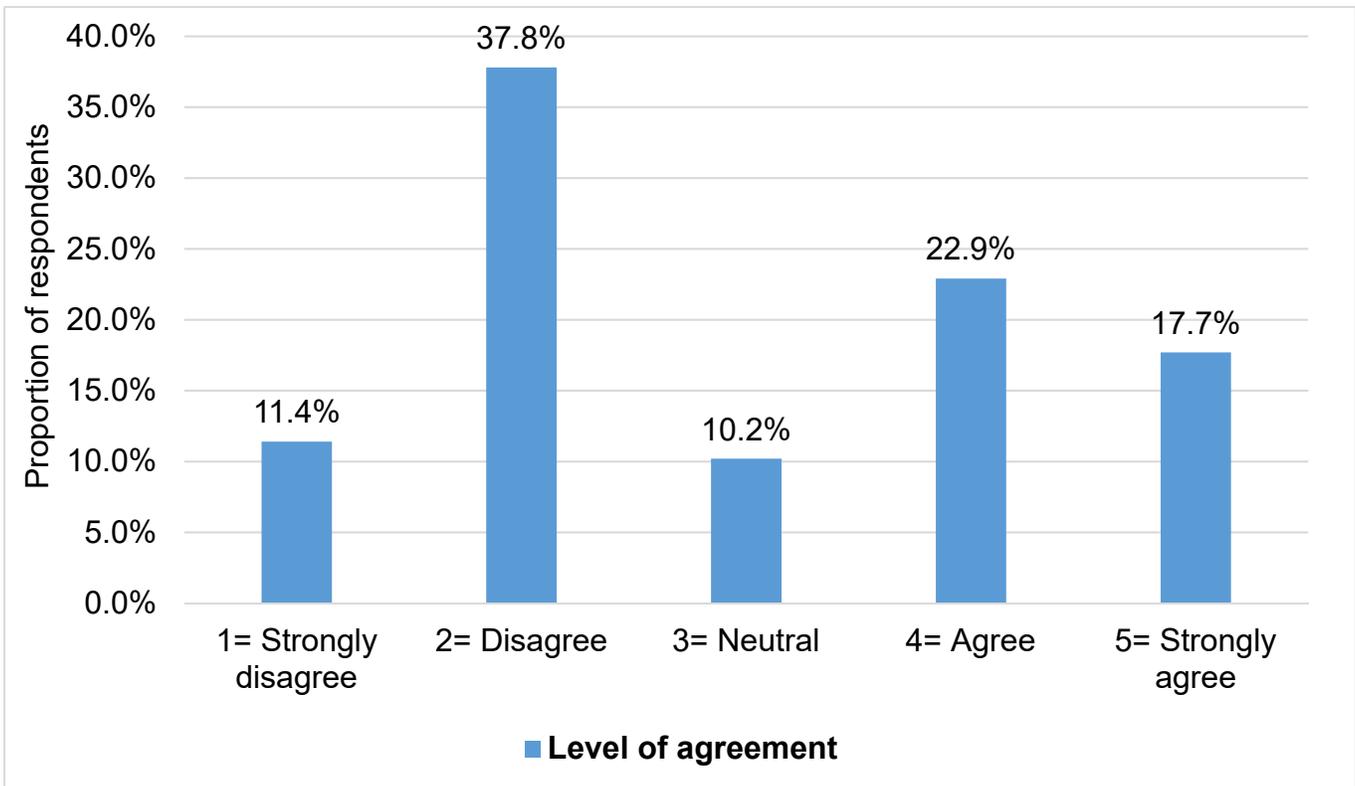


Figure 4.3: Level of agreement among community gardeners with the statement: “*The vegetables produced are not enough to feed family*” (n=254)

As presented in **Figure 4.3**, 49.2% of the respondents disagreed that vegetables produced from the community garden were not enough to feed families while 40.6% agreed with the statement. From the observation it shows that some of the respondents were negatively affected by low vegetable production in the gardens and their households were also affected. This shows that not all the participants in community gardens were able to sustainably feed their families with vegetables from the gardens. Therefore, not all community gardens contributed to food availability in the study area. The respondents were both food secure and insecure with specific reference to availability.

Figure 4.4 shows the level of agreement among the respondents with the statement: “I eat more vegetables due to high production”

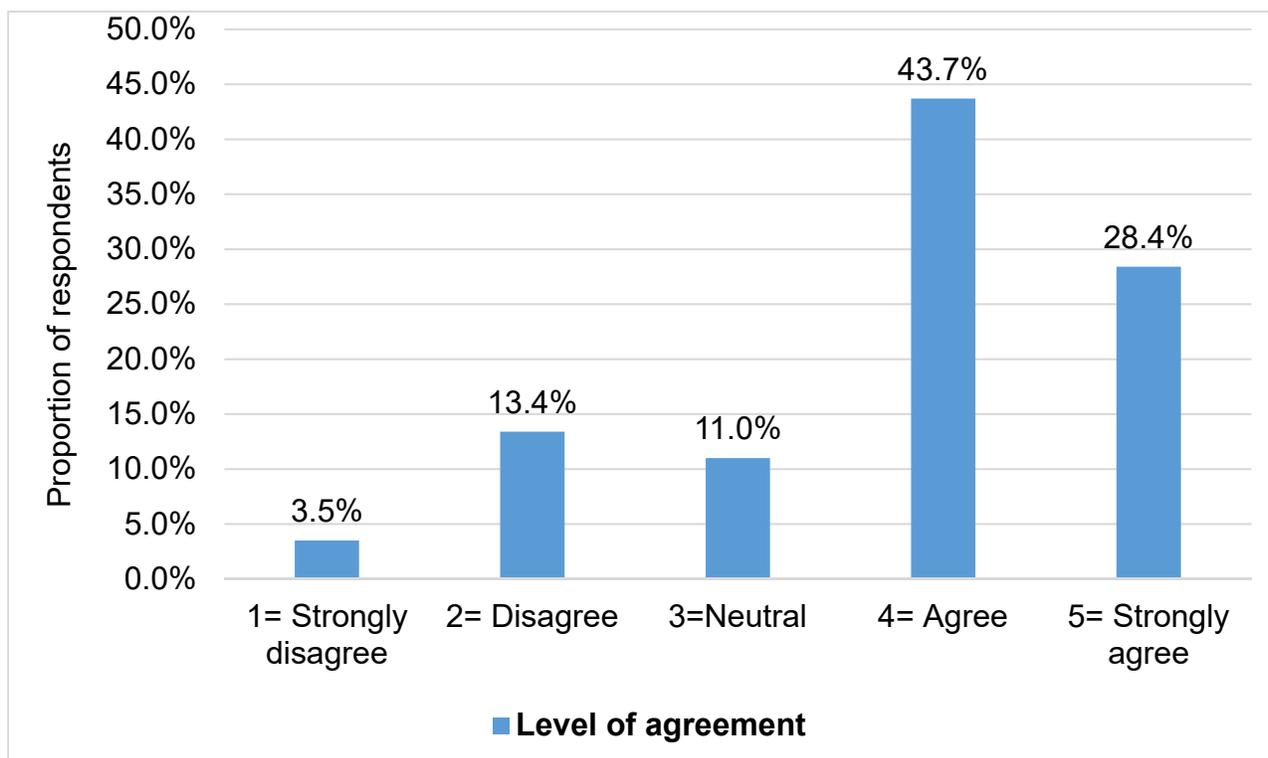


Figure 4.4: Level of agreement among the respondents with the statement: “I eat more vegetables due to high production” (n=254)

The results in **Figure 4.4** depict that most of the respondents (72.1%) agreed that they ate more vegetables due to high yield, only few disagreed (16.9%). This may be because some of the respondents were growing vegetables in greenhouse environment; while others cultivated in the open field. There were respondents who stated that they improved soil fertility by using kitchen waste material and earthworms, they were of the view that it has contributed to high vegetable production. Therefore, food availability because of high production encouraged households to consume vegetables.

Figure 4.5 shows the level of agreement among the respondents with the statement: “I eat less vegetables due to low production”

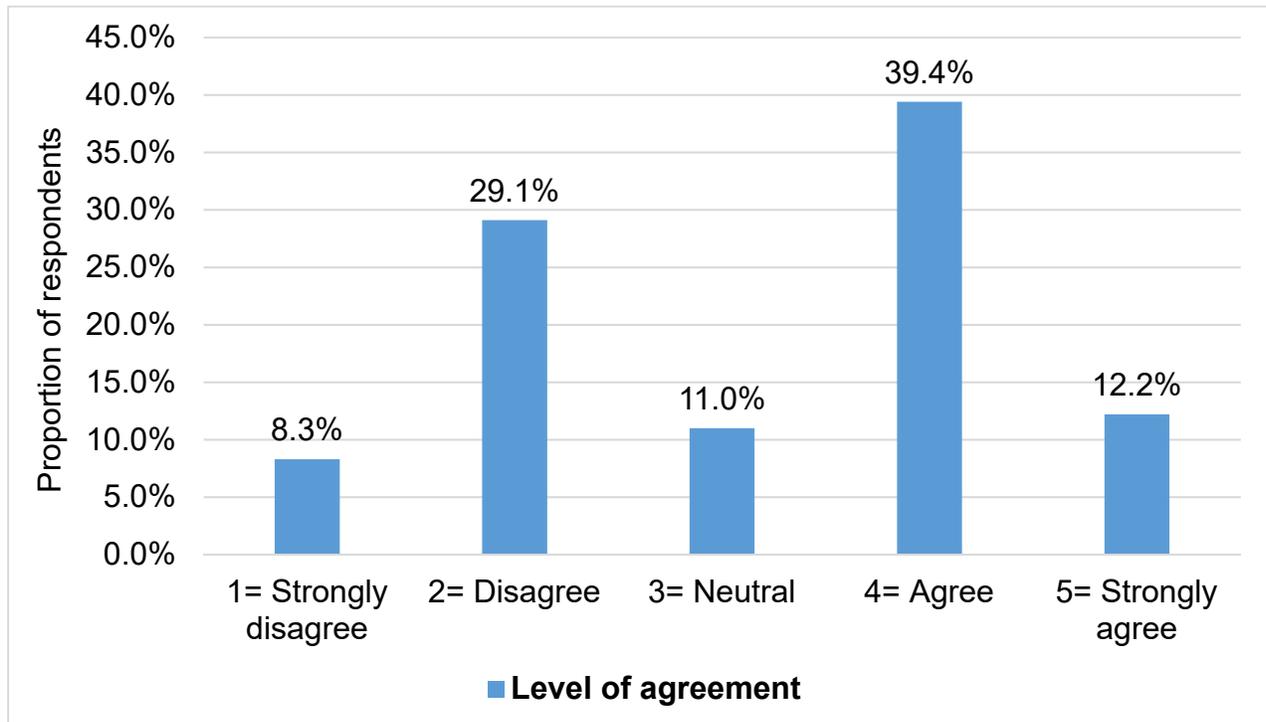


Figure 4.5: Level of agreement among the respondents with the statement: “I eat less vegetables due to low production” (n=254)

As depicted in **Figure 4.5** above, more than half (51.6%) of the respondents agreed that they ate less vegetable due to low production. This is the area of concern because most of the respondents ate less vegetables as well as their household members because were also negatively affected. Therefore, the respondents are likely to be food insecure with regards to utilisation because there were less vegetable available from the gardens due low production.

Figure 4.6 shows the level of agreement among the respondents with the statement: “My family is not getting enough vegetables to eat”

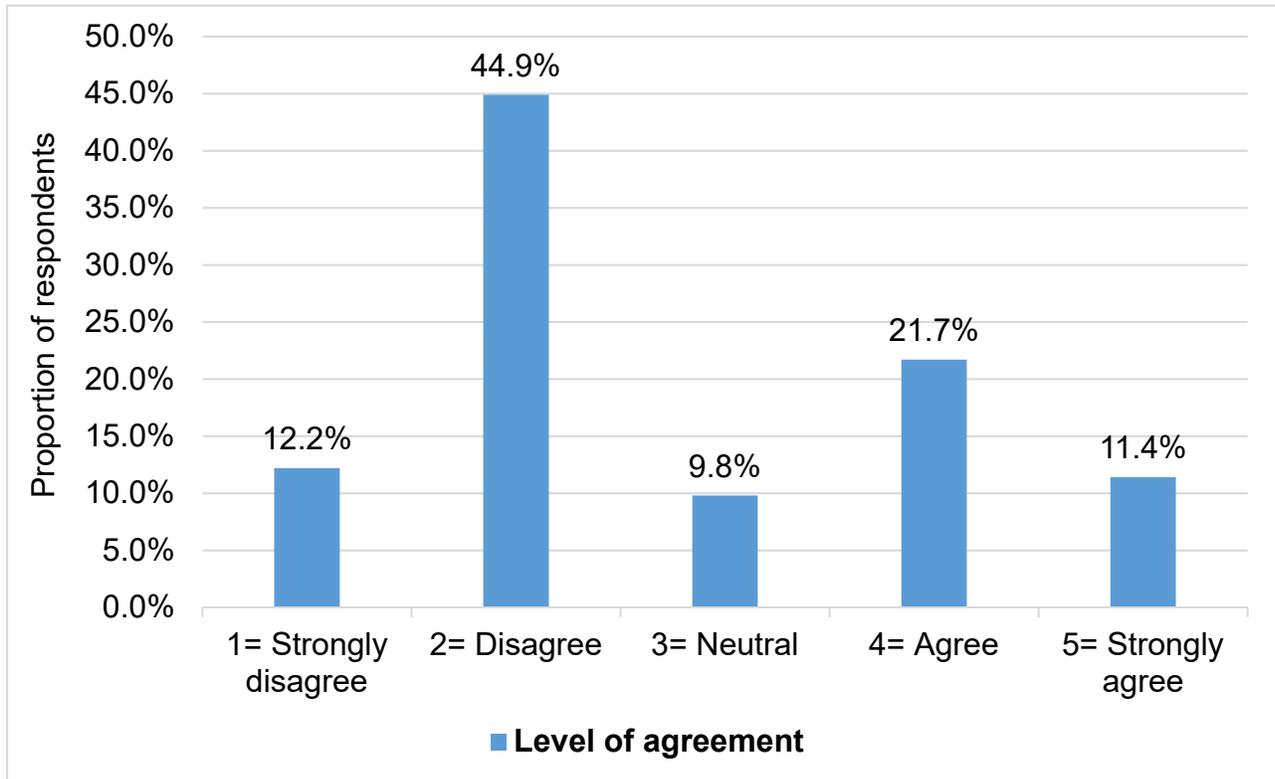


Figure 4.6: Level of agreement among the respondents with the statement: “My family is not getting enough vegetables to eat” (n=254)

As illustrated in **Figure 4.6**, the largest proportion (57.1%) of respondents have disagreed with the statement that their families were not getting enough vegetables to eat since they started participating in community vegetables gardens, while 33.1% responded positively. This indicate that some of the participants were still purchasing vegetables, although they grew them in the gardens. This may be attributed to low vegetables production as shown in **Figure 4.5**. Therefore, the participation of the respondents in community vegetables gardens did not guarantee that their families would always have enough vegetables to

consume. It is clear that production of vegetables in community gardens have positive effects to a certain degree in the households of the respondents.

Figure 4.7 shows the level of agreement among the respondents with the statement: “*I can afford to eat fresh produced vegetables everyday*”.

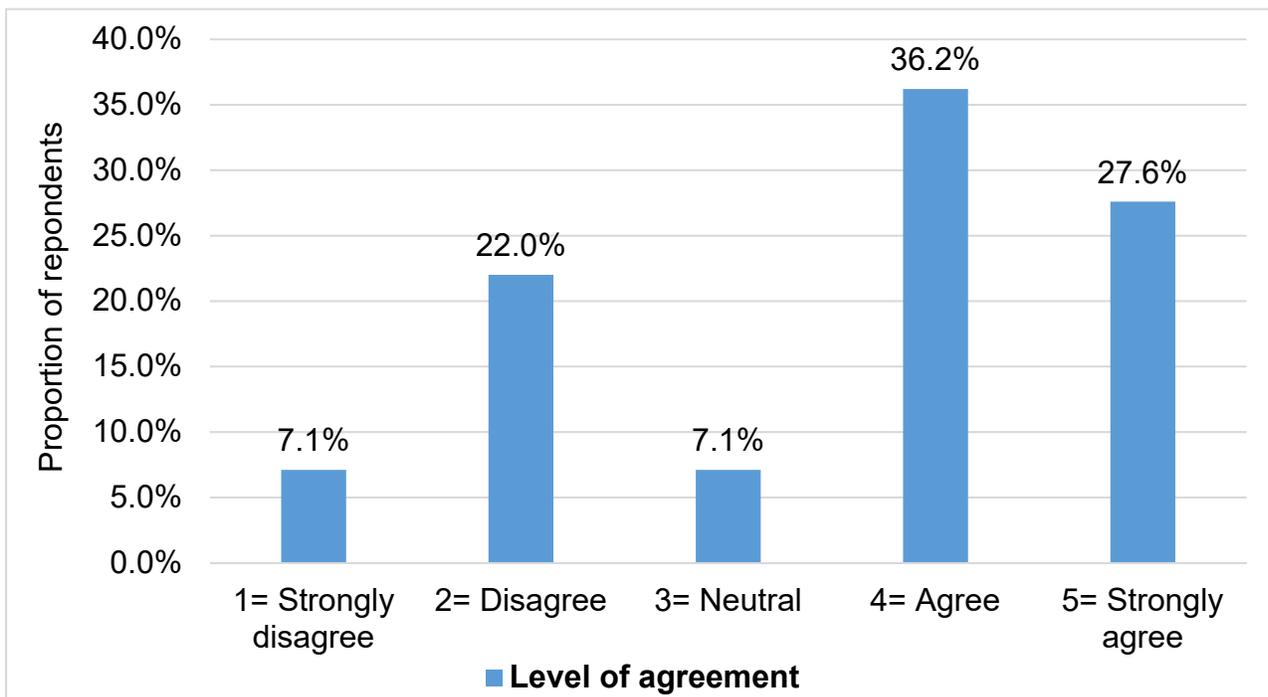


Figure 4.7: Level of agreement among community gardeners with the statement: “*I can afford to eat fresh produced vegetables everyday*” (n=254)

As reflected in **Figure 4.7**, 63.8% of the respondents have showed positive response on affording to eat fresh produced vegetables daily because they were the members of community gardens; while 29.1% did not respond positively. This is because community gardens cultivated vegetables throughout the year; this enabled the respondents to have vegetables on daily basis in some instances.

As reported in **Figures 4.1 to 4.7**, some of the respondents did not consume vegetables throughout the year because of low production.

Factors that limited vegetables production in the community gardens were determined because they affected food security of the respondents with specific reference to availability.

Factors that limit availability of vegetables in the community garden are presented in **Figure 4.8** below.

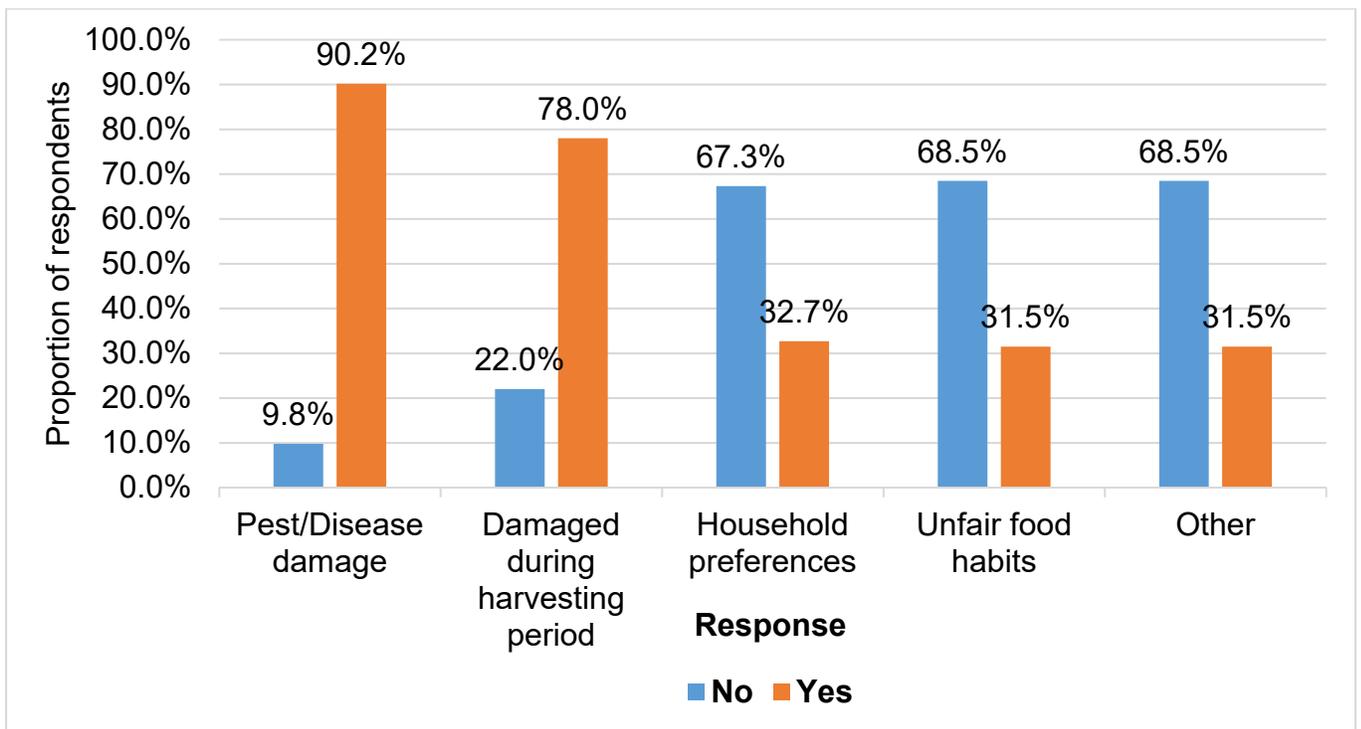


Figure 4.8: Factors limiting availability of vegetables in the community gardens (n=254)

The results presented in **Figure 4.8** indicate that low vegetable production in the community gardens was mainly due to pests and diseases as reported by 90.2% of the respondents. The second threat that had negative effects on production was damage during harvesting period. Again, respondents (67,3%) were of the view that preferences of vegetables at household was not the main challenge. Most (68.5%) were of the opinion that unfair food habits did not limit the availability, therefore urban farmers were sensitive and reasonable when obtaining vegetables from community gardens. This shows that individual status and cultural factors were not vital and did not result in limiting vegetables in community gardens. Other factors that influenced availability of vegetables in the community gardens include cattle walking over and eating vegetables particularly spinach, birds, cutworms, absence of cover nets, moles, rats and millipedes as indicated by 31.5% of the respondents. There were other factors that negatively affected availability of vegetables that were said to be lack of borehole equipment in some of the community gardens, as a result they were badly affected by drought. A certain proportion of the respondents relied on neighbours for drawing water using hosepipe; while other respondents indicated that they have been planting on the same soil for several years and they were of the opinion that the soil has worn out. They also indicated that they practiced crop rotation however there was low improvement on yield.

The distribution of percentage on response to availability of vegetables to a nearby neighbourhoods are presented in **Figure 4.9**.

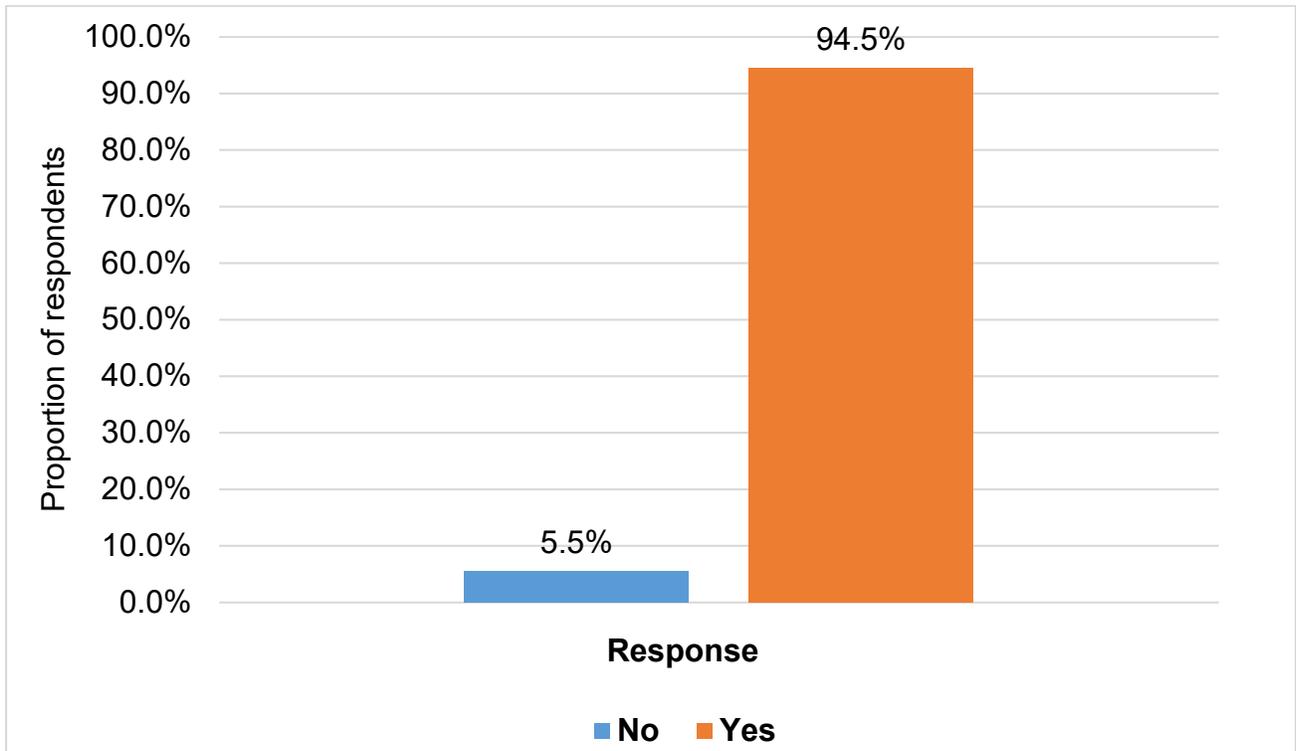


Figure 4.9: Distribution of community gardeners with the question: “*Are vegetables derived from the community gardens available within the reach of the residential community?*” (n=254)

As indicated in **Figure 4.9** few respondents (5.5%) reported that their community gardens were located far from the nearby residential community; although most respondents (94.5%) were of the view that it was a reasonable walking distance to reach community gardens. This is a hint that community gardens were not isolated from the residential neighbourhoods and the vegetables were simply obtainable. It shows that people who are interested to buy vegetables either walk or ride their bike to the community garden.

4.2.2.2 Food accessibility

The Household Food Insecurity Access Scale (HFIAS) measure captured the household food insecurity levels (access) in terms of anxiety and insecurity. The affirmative responses relating to each question were observed in order to assess the sequence and degree of food insecurity by addressing HFIAS questions. The responses to each of HFIAS question were four weeks preceding the survey and the results are presented in **Figure 4.10** to **4.18**.

Figure 4.10 displays the level of agreement among respondents with the question: “*In the past four weeks, did you worry that your household would not have enough fresh produced vegetables?*”

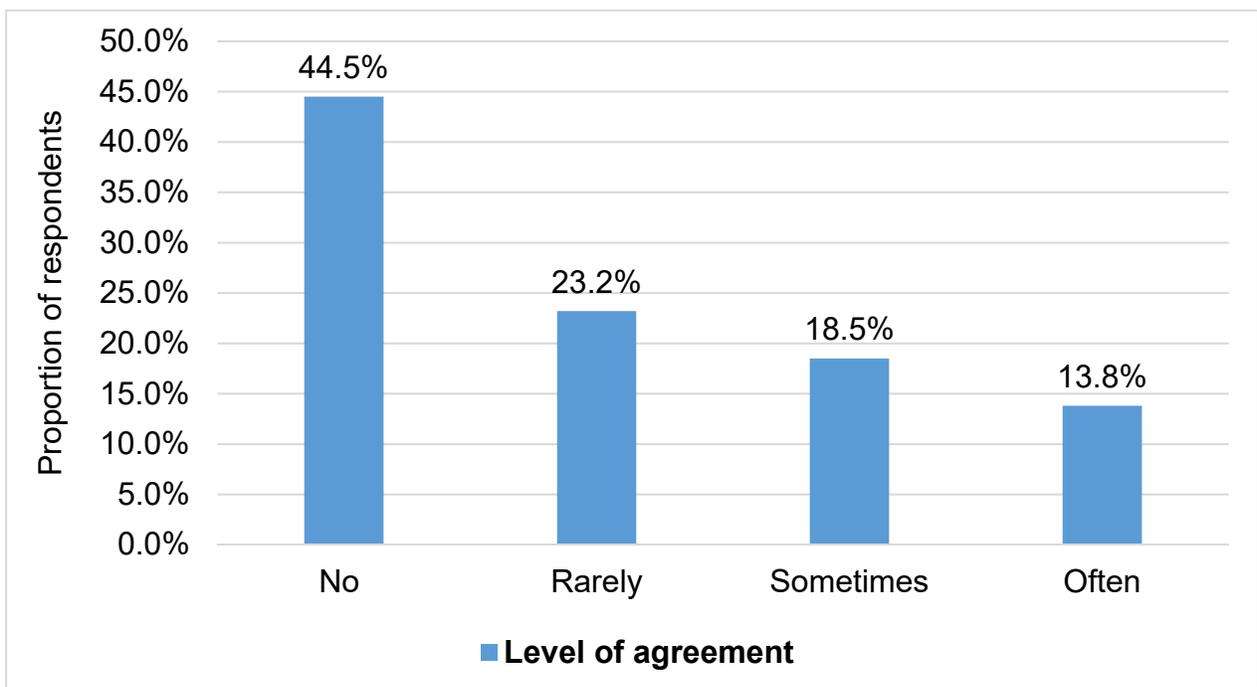


Figure 4.10: Level of agreement among respondents with the question: “*In the past four weeks, did you worry that your household would not have enough fresh produced vegetables?*” (n=254)

As depicted in **Figure 4.10**, it reveals that 44.5% of the respondents (community vegetable members) were not worried that their household would not have enough fresh produced vegetables. More than half (55.5%) of the respondents were worried, these three conditions either occurred rarely, sometimes or often. Of the few (13.8%) respondents indicated that they were frequently worried; while other respondents, indicated that they were rarely (23.2%) worried. This is an indication that in the previous month respondents were worried that they would not have fresh produced vegetables from the community garden. Therefore, majority of the respondents are said to be food insecure (55.5%) with regard to food access because they were worried that they would not have fresh produced vegetables.

Figure 4.11 displays the level of agreement among respondents with the question: *“In the past four weeks, were you or any household member not able to eat kinds of vegetables you preferred because of lack of resources?”*

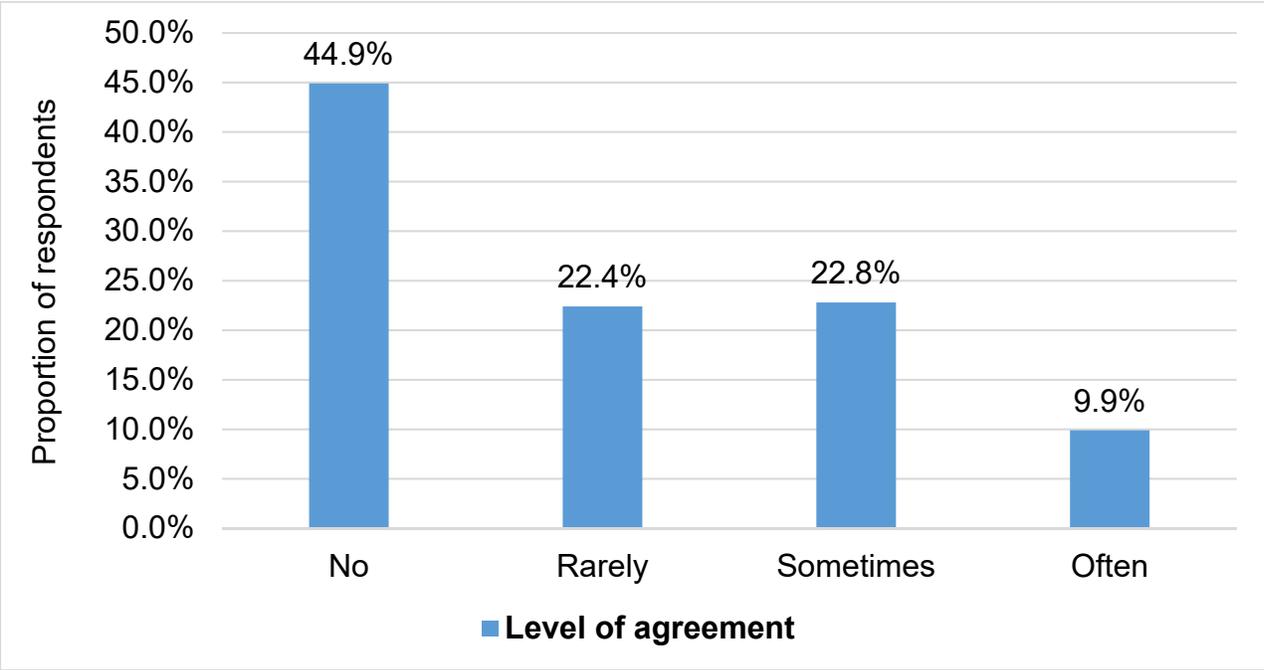


Figure 4.11: Level of agreement among respondents with the question: *“In the past four weeks, were you or any household member not able to eat kinds of vegetables you preferred because of lack of resources?”* (n=254)

Figure 4.11 above displays that the largest proportion (55.1%) of the respondents or their household members were unable to eat their preferred types of vegetable because they did not earn sufficient income from the community garden to purchase them. The occurrence was in three different categories namely rarely (22.4%), sometimes (22.8%) and often (9.9%). This shows that minority (44.9%) of the respondents were food secure with regards to food access because they were able to eat their preferred vegetable types as they had money to purchase vegetables when there was low harvest from the community garden.

Figure 4.12 displays the level of agreement among community gardeners with the question: *“In the past four weeks, did you or any household member have to eat limited variety of vegetable due to lack of resources”*

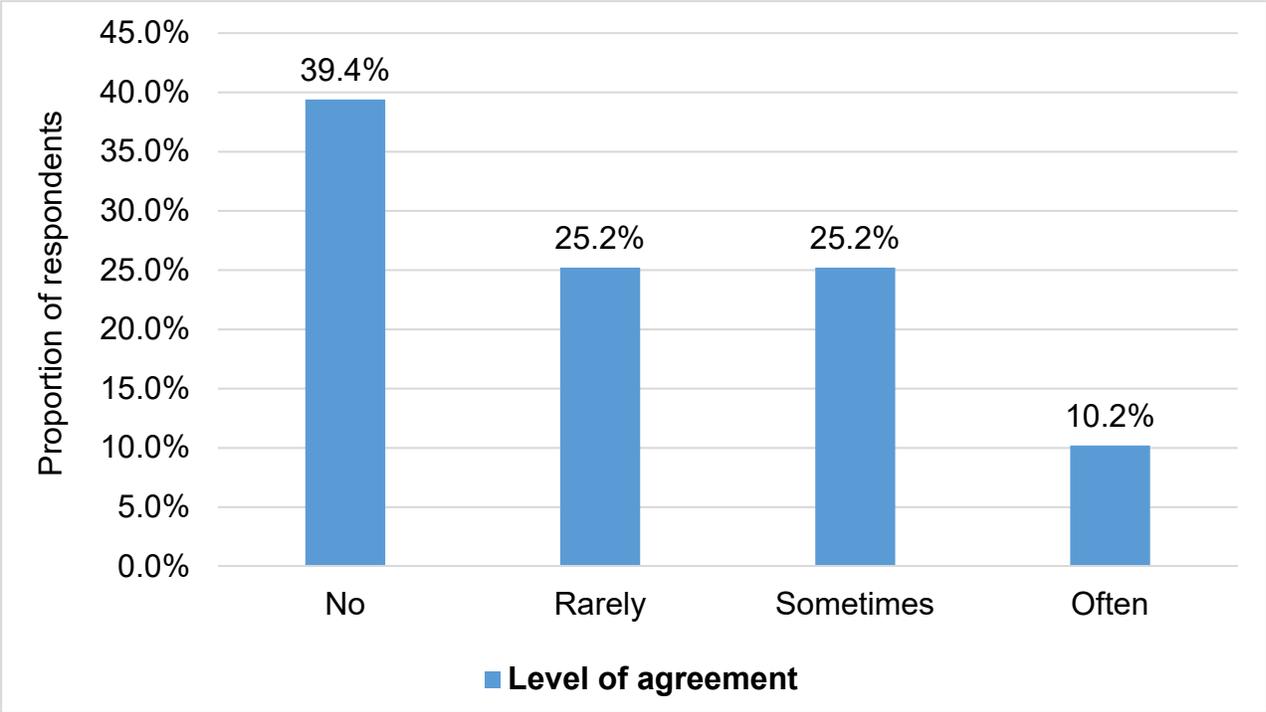


Figure 4.12: Level of agreement among community gardeners with the question: *“In the past four weeks, did you or any household member have to eat limited variety of vegetable due to lack of resources?”* (n=254)

The survey results in **Figure 4.12** shows that 39.4% of the respondents ate variety of vegetables with no limits; other respondents agreed in three dissimilar conditions, 10.2% indicated that they often ate whereas 25.2% rarely and sometimes ate limited range of vegetables. Other respondents (25.2%) hardly ate types of limited vegetables. The highest share (60.6%) of respondents suffered a shortage of range of vegetables available to them

and this made them to be insecure with food access because they lacked purchasing power since income earned from the community gardens was not sufficient.

Figure 4.13 shows the level of agreement among community gardeners with the question: *“In the past four weeks, did you or any household member have to eat some vegetables that did not want to eat because of lack of resources to obtain other vegetable type?”*

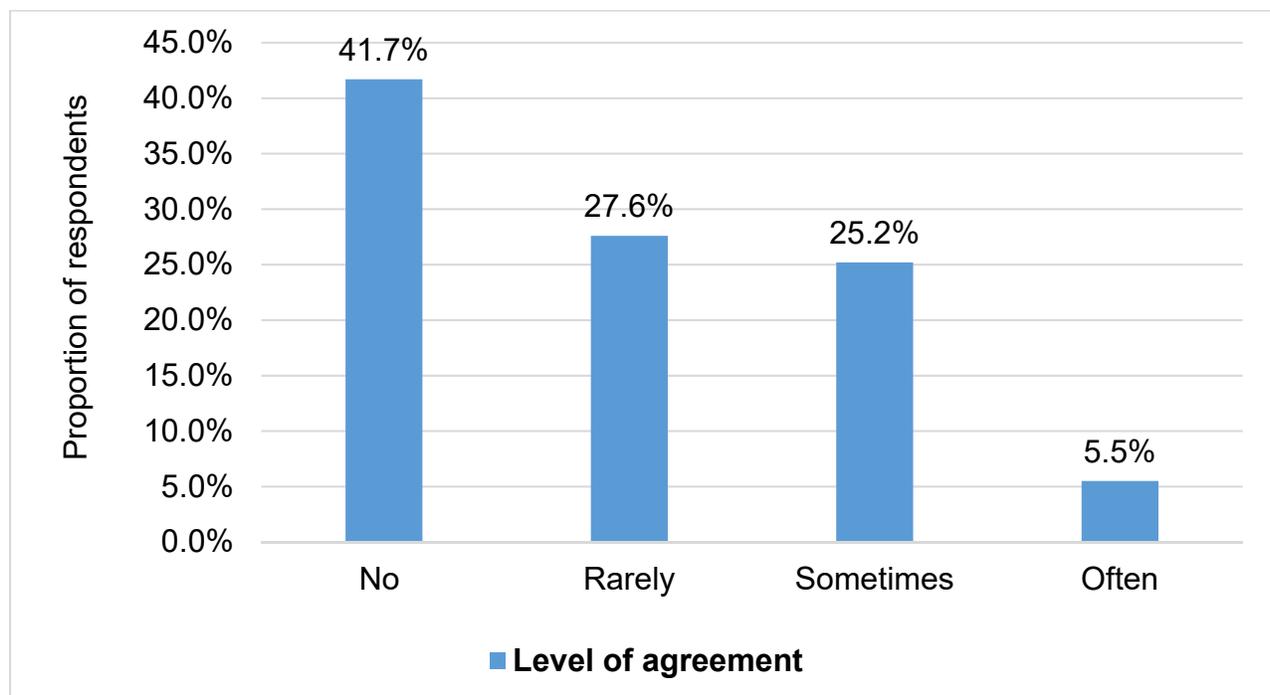


Figure 4.13: Level of agreement among community gardeners with the question: *“In the past four weeks, did you or any household member have to eat some vegetables that did not want to eat because of lack of resources to obtain other vegetable types?”*

As shown in **Figure 4.13**, 58.3% of the respondents indicated that they consumed a portion of vegetables that they did not want to eat because they did not have the means to obtain other vegetable types. Respondents agreed in three different ways, 27.6% rarely, 25.2%

sometimes and 5.5% often. This is a clear indication that more than half (58.3%) of respondents displayed uncertainty in relation to food access as they ate few vegetables from community garden, that they did not want to eat because they also lacked financial means of obtaining desired type of vegetable.

Figure 4.14 illustrate the level of agreement among community gardeners with the question: *“In the past four weeks, did you or any household members have access to small vegetables than needed because there were no enough vegetables?”*

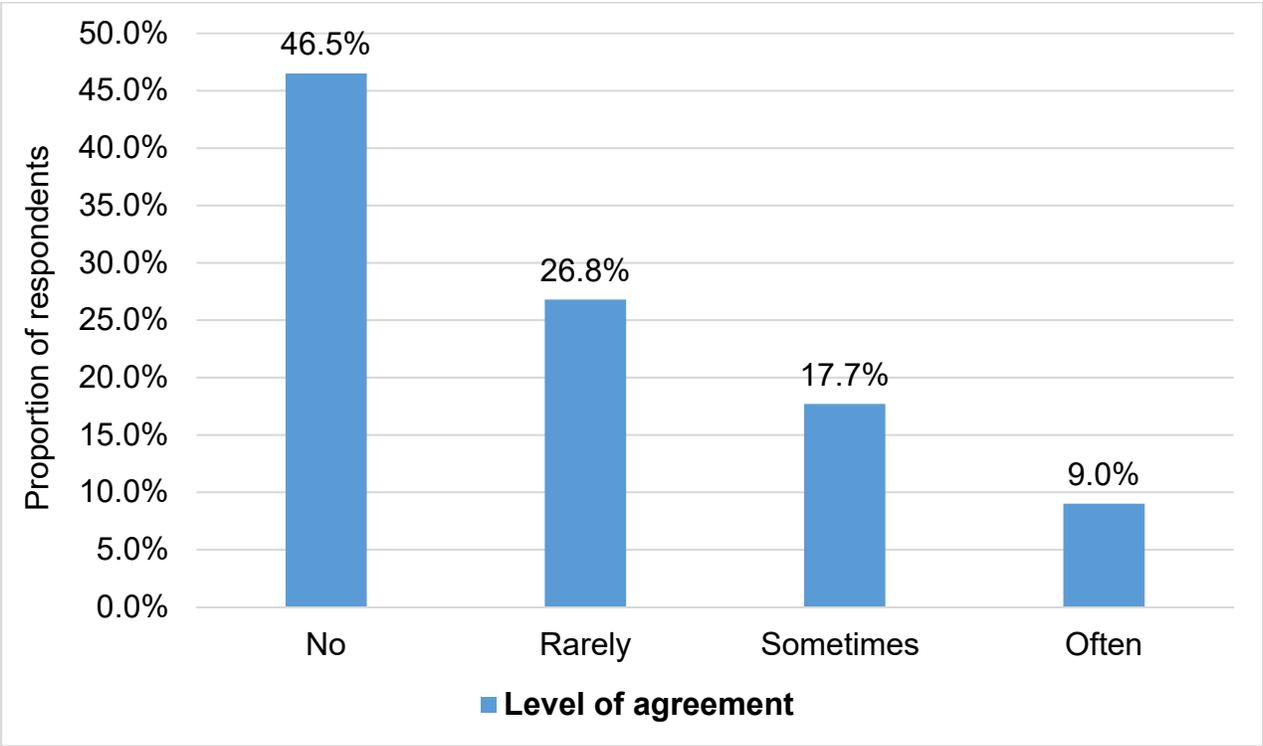


Figure 4.14: Level of agreement among community gardeners with the question: *“In the past four weeks, did you or any household members have access to small vegetables than needed because there were no enough vegetables?”*

Figure 4.14 revealed that 26.8% indicated that they rarely had a small access to vegetables than needed, while others (17.7%) sometimes had some small access to vegetables than what they needed. Again, 46.5% held a view that there were sufficient vegetables received from the gardens. It is evident that less than half (46.5%) had large amount of vegetables to their satisfaction and this made them food secure with food access, because they did not have small vegetables from the community garden.

Figure 4.15 illustrate the level of agreement among community gardeners with the question: *“In the past four weeks, did you or any household members have eaten fewer vegetables a day because there were not enough vegetable?”*

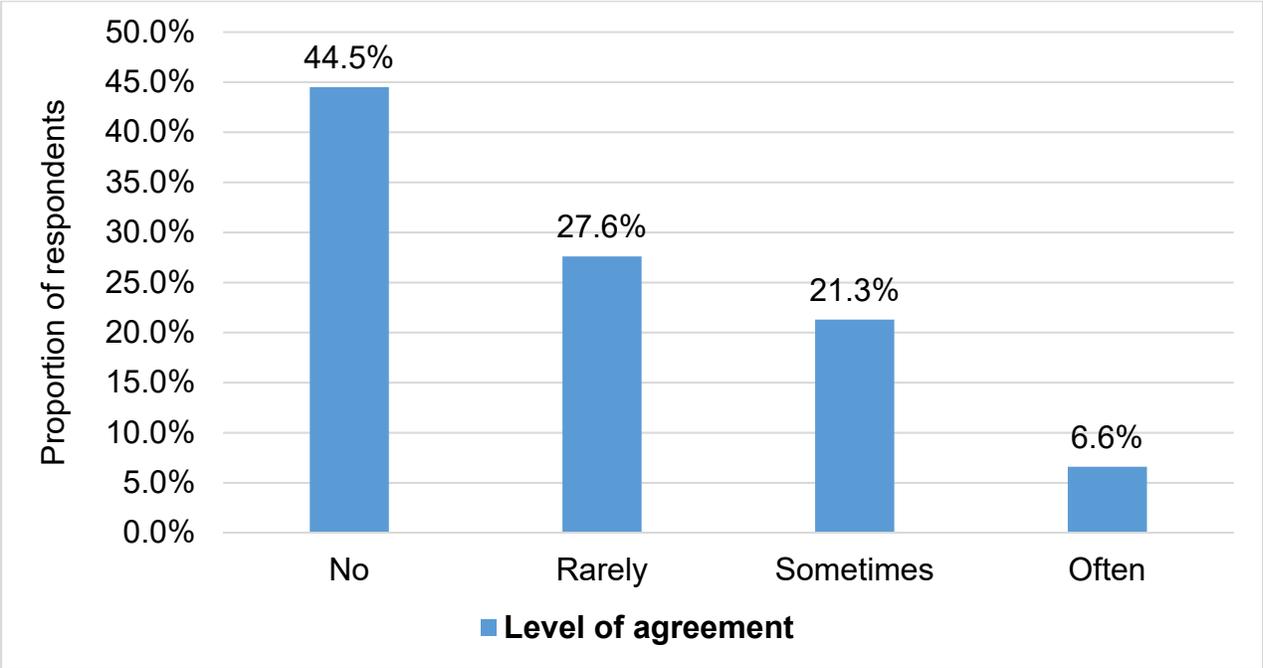


Figure 4.15: Level of agreement among community gardeners with the question: *“In the past four weeks, did you or any household members have eaten fewer vegetables a day because there were not enough vegetables?”*

The small share (44.5%) of the respondents as depicted in **Figure 4.15** illustrated that they ate sufficient vegetables because the community gardens produced enough. Although few (6.6%) reported that they often consumed less, some held a view that they sometimes (21.3%) ate smaller amount of vegetables as there were insufficient vegetables. It can be noticed that minority (44.5%) had consumed large quantity of vegetables from the community garden on a daily basis as they were sufficient. This is a suggestion that a small number of respondents were food secure with regard to food access on daily basis.

Figure 4.16 display the level of agreement among community gardeners with the question: *“In the past four weeks, was there ever no vegetables to eat of any kind in your household because of lack of resources to get vegetable?”*

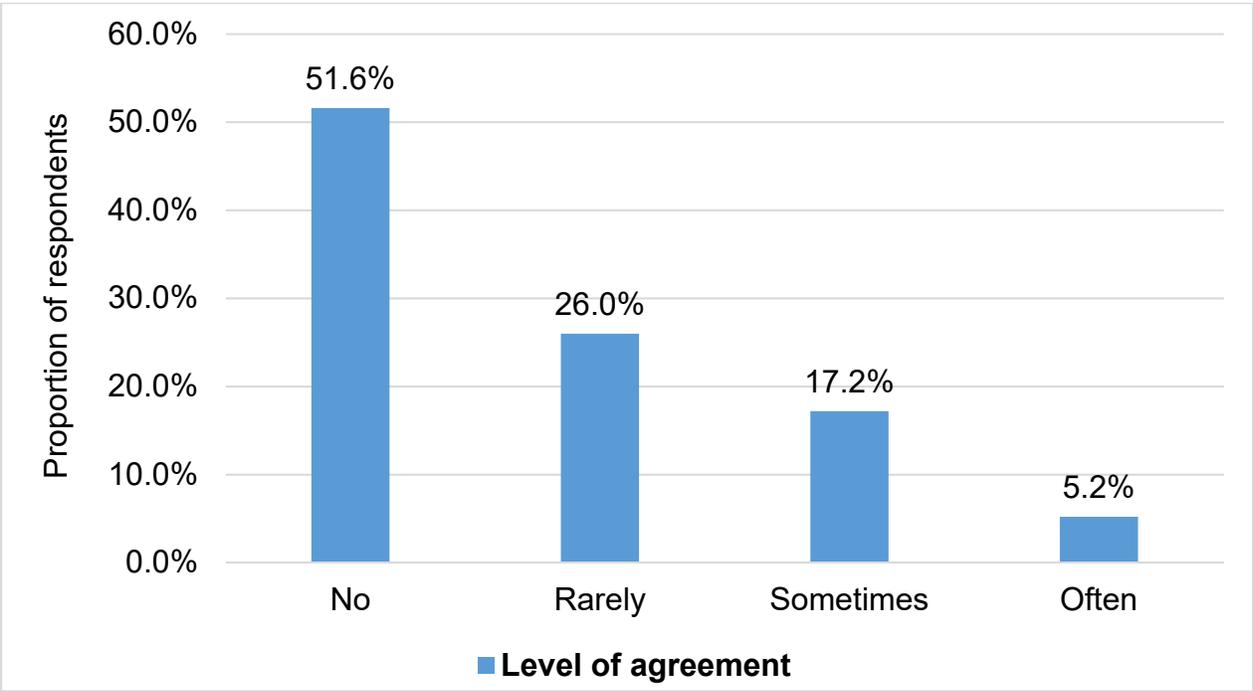


Figure 4.16: Level of agreement among community gardeners with the question: *“In the past four weeks, was there ever no vegetables to eat of any kind in your household because of lack of resources to get vegetable?”*

More than half (51.6%) of the respondents as shown in **Figure 4.16** indicated that they had vegetables in their household to eat in the past four weeks. Other respondents respectively stated that they rarely (26.0%), 17.2% ate sometimes, as well as regularly (5.2%) that they did not eat vegetables in their household because they did not have cash for acquisition of vegetables. The largest proportion (51.6%) were food secure relating to food access since they had various vegetable types obtained from community gardens. Furthermore, they were able to obtain other vegetable types by purchasing from local vegetable markets and or street vendors.

Figure 4.17 is the level of agreement among community gardeners with the question: *“In the past four weeks, did you, or any household member go to sleep without eating vegetables because there were not enough vegetables?”*

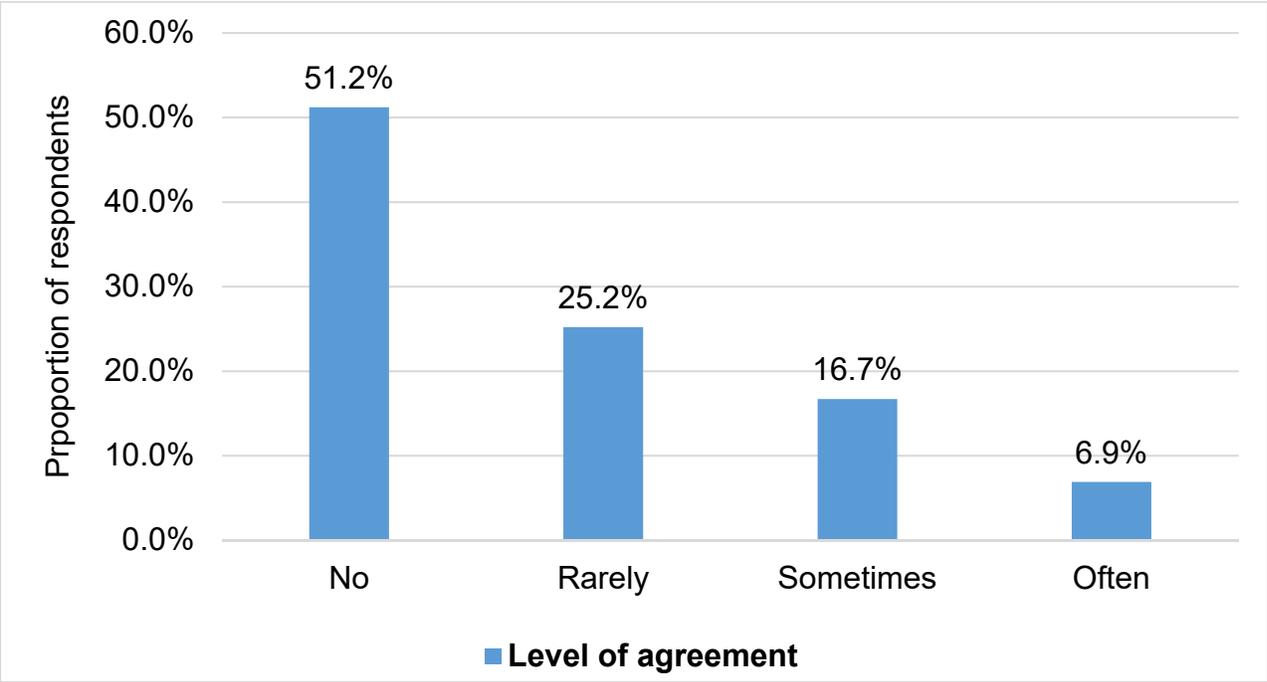


Figure 4.17: Level of agreement among community gardeners with the question: *“In the past four weeks, did you, or any household member go to sleep without eating vegetables because there were not enough vegetables?”*

Figure 4.17 illustrates that majority (51.2%) of the respondents reported that they or their household did not go to bed at night without eating vegetables. Of the proportion of respondents stated that they rarely (25.2%), sometimes (16.7%), often (6.9%) went to bed without eating vegetables. It is clear that most (51.2%) respondents were of the opinion that they had enough vegetables and consequently slept having eaten vegetables from the community gardens. Thus this makes most of the respondents to be food secure in respect of food access.

Figure 4.18 shows the level of agreement among community gardeners with the question: *“In the past four weeks, did you, or any household member go the whole day and night without eating vegetables because there were not enough vegetables?”*

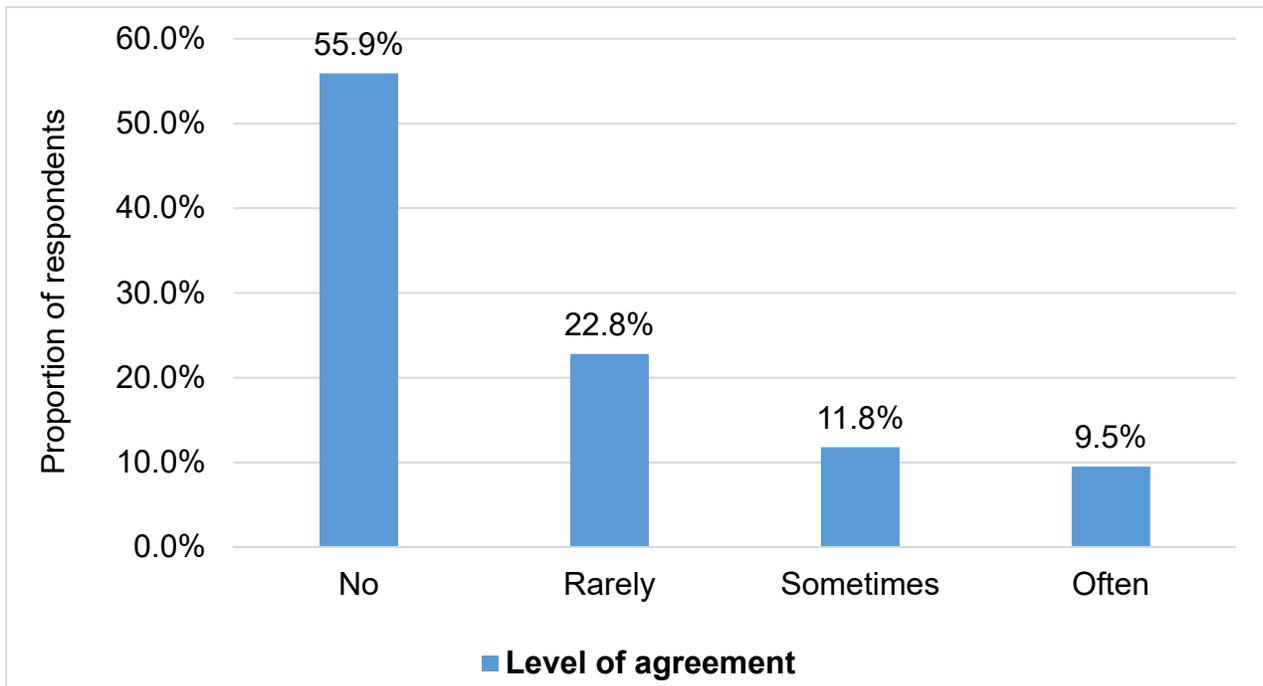


Figure 4.18: Level of agreement among community gardeners with the question: *“In the past four weeks, did you, or any household member go the whole day and night without eating vegetables because there were not enough vegetables?”*

Figure 4.18 demonstrate that the highest (55.9%) share of respondents or their household never went the whole day and night without eating vegetables as there were enough. To respondents with affirmative response, rarely (22.8%), sometimes (11.8% and often (9.8%); this usually happened when they struggled to obtain vegetables in the household. Respondents were more food secure (55.9%) regarding accessibility of food.

4.2.2.3 Food utilisation

The responses were observed in order to evaluate consumption pattern, household decision making on vegetable consumption as well as reasons behind consumption of vegetables produced from the community garden.

Figure 4.19 shows the distribution of percentage among community gardeners with the question: “*Why do you eat vegetables from your community garden?*”

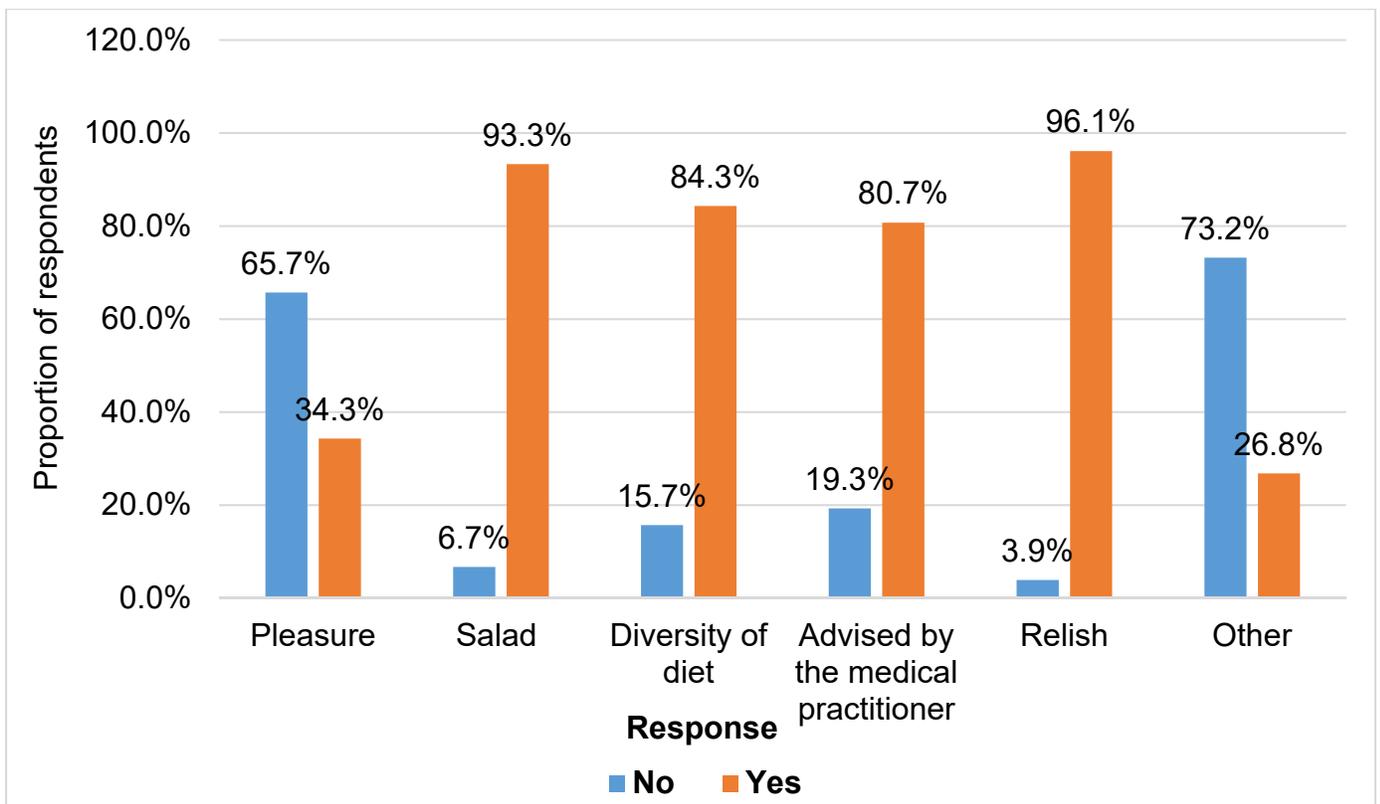


Figure 4.19: Distribution of percentage among community gardeners with the question: “*Why do you eat vegetables from your community garden?*” (n=254)

Figure 4.19 indicate that the largest proportion (96.1%) of the respondents ate vegetables as a relish, followed by those that ate it as a salad (93.3%). Of the 84.3% ate vegetables as part of a healthy diet; while 26.8% indicated they ate vegetables for other things such as getting body nutrients (vitamins and other minerals), health benefits (to be fit, boost immune system, for lowering high blood pressure, strengthen the body), snack, and for the love of vegetables. This is a clear indication that community gardeners ate vegetables mostly for health reasons and as relish.

Figure 4.20 shows vegetable consumption pattern among community gardeners with the question: *“How often do you eat vegetables produced from your community garden?”*

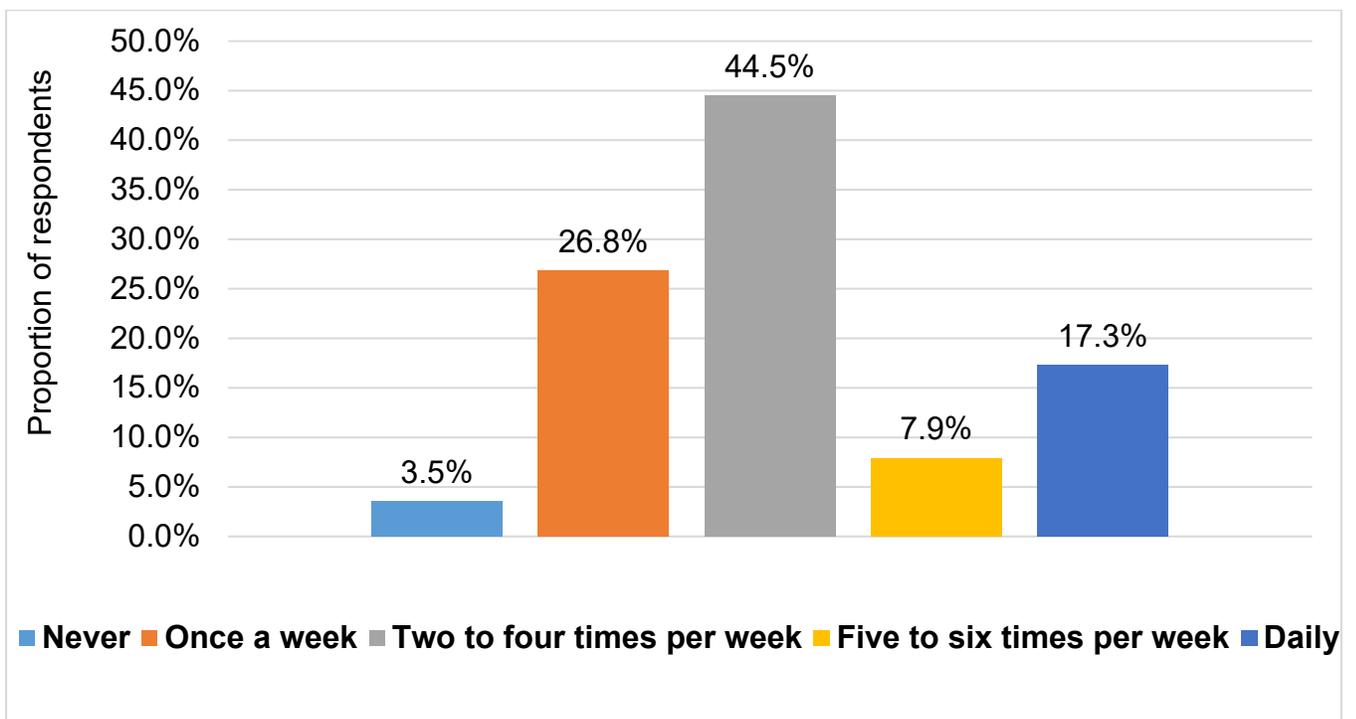


Figure 4.20: Vegetable consumption pattern among community gardeners with the question: *“How often do you eat vegetables produced from your community garden?”* (n=254)

The results presented in **Figure 4.20** show that the highest share (44.5%) of respondents consume vegetables two to four times per week, followed by those that eat vegetables once a week (26.8%). Minority (3.5%) of the respondents preferred not to eat even though they are members of community gardens.

Figure 4.21 shows vegetables intake pattern on a 24-hour day among community gardeners.

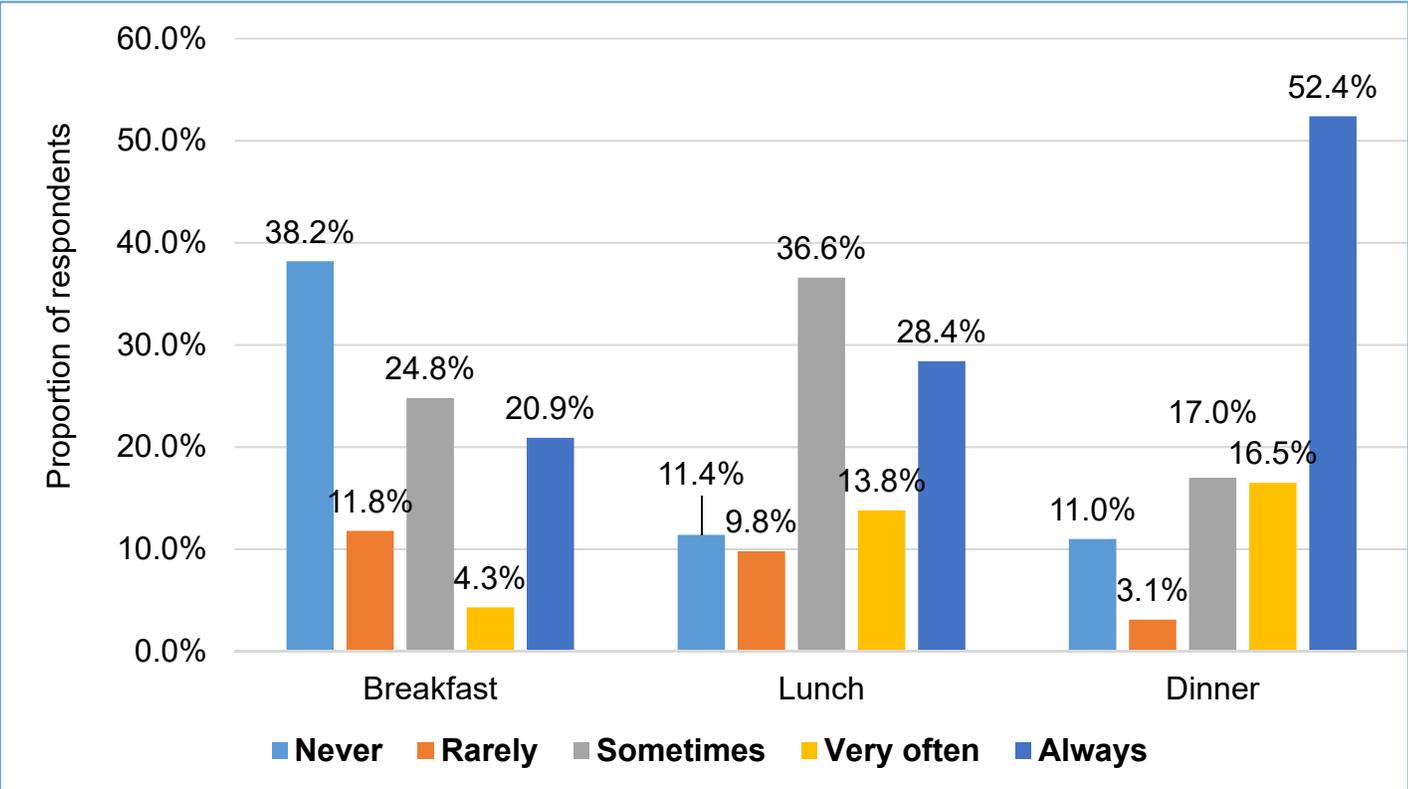


Figure 4.21: Vegetables intake pattern on a 24-hour day among community gardeners (n=254)

Figure 4.21 depict that most of the respondents (38.2%) did not prefer to include vegetables in the first meal of the day (breakfast) whereas other respondents (61.8%) preferred to rarely, sometimes, very often and always include vegetables in their meal during breakfast. During lunch period, most respondents (36.6%) stated that they sometimes preferred to include vegetables in their meal, 28.4% who always ate vegetables. In the last meal of the day (Dinner), minority (3.1%) indicated that they rarely included vegetables in their food, while more than half (52.4%) always ate vegetables. Vegetables were mostly eaten in the last meal of the day (dinner), because most respondents during the day were physically in the community garden. In the evening, most respondents or their household members would prepare and cook vegetables to be eaten as the last meal of the day.

Figure 4.22 shows percentage distribution among community gardeners with the question: *“Do you get equal share of vegetables produced from your community garden with your household?”*

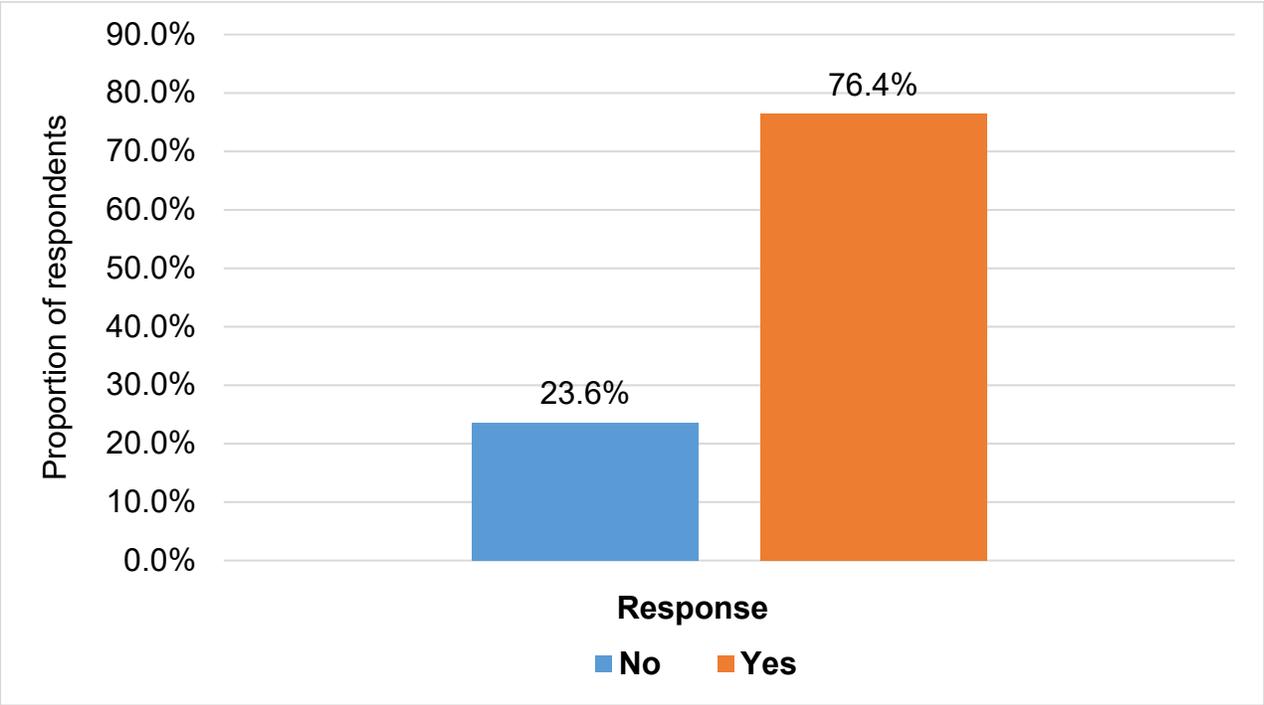


Figure 4.22: Percentage distribution among community gardeners with the question: “Do you get equal share of vegetables produced from your vegetable gardening with your household?”

According to **Figure 4.22**, most (76.4%) of the household members received an equal share of vegetables with their household members; while a small portion (23.6%) did not receive equal share of vegetables. Some of the reasons vegetables from the gardens were shared equally in the households are receiving more vegetables than expected and health reasons (respondents were of the view that vegetables regulate their blood pressure, sugar level and lowered the risk of cancer). However, there were households who did not share the vegetables equally because of cultural reasons. For example, it is common in some African tradition that adults receive a lion share whereas children receive a smaller portion of the

food. In other instances, children received small share because they did not like eating vegetables.

Table 4.10 shows household decision-making in vegetable consumption from community gardens.

Table 4.10: Household decision-making on vegetable consumption from community gardens (n=254)

Household decision- making	Frequency	Percent (%)	Frequency	Percent (%)
	No		Yes	
A person who prepares vegetables	44	17.3	210	82.7
A person who produces vegetables	44	17.3	210	82.7
A person who purchases vegetables	42	16.5	212	83.5

Source: field data (2017)

The results presented in **Table 4.10** depict that minority (17.3%) of the respondents disagreed with the notion that a person who prepares and produces vegetables decide on when to consume vegetables in the household, majority (82.7%) agreed with the statement. This shows that the consumption pattern of the vegetables was not decided by those who produced and prepared vegetables in the households, therefore all household members had their say on when to eat vegetables in the households.

4.2.2.4 Food stability

This section entails vulnerability and risk levels as well as coping strategies adopted by the respondents, knowledge and experiences that play a key role towards sustainability of vegetable gardens.

Figure 4.23 shows percentage distribution of community gardeners with the question: “Are you satisfied with the quality of vegetables obtained from your community garden?”

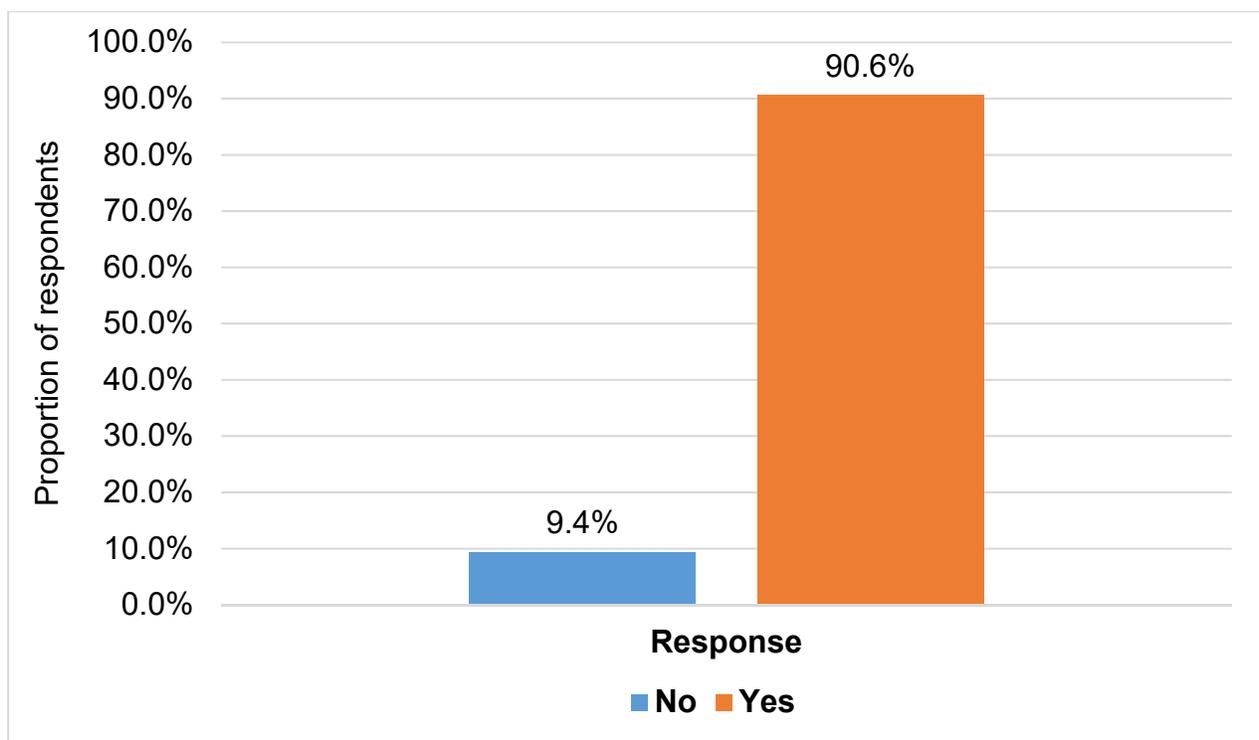


Figure 4.23: Percentage distribution of community gardeners with the question: “Are you satisfied with the quality of vegetables obtained from your vegetable garden?” (n=254)

According to **Figure 4.23**, above 90% of the respondents have agreed that they were satisfied with the quality of the vegetables obtained from the community gardens in which they belong to; whereas 9.4% were not satisfied with the quality of the vegetables. Satisfaction with the quality of vegetables was quite very high although there were minor disagreements. The respondents were mostly pleased with the quality of vegetables because they were free from defects and were uniform in size and shape; they were very much impressed with spinach because it generated more income compared to other types of vegetables. Therefore, majority of the respondents were food stable because they were satisfied with quality of vegetables from the community gardens; they were likely to consume the vegetables from community gardens and save money to purchase other types of food.

Figure 4.24 displays percentage distribution of community gardeners with the question: *“Are you satisfied with the quantity of vegetables obtained from your community garden?”*

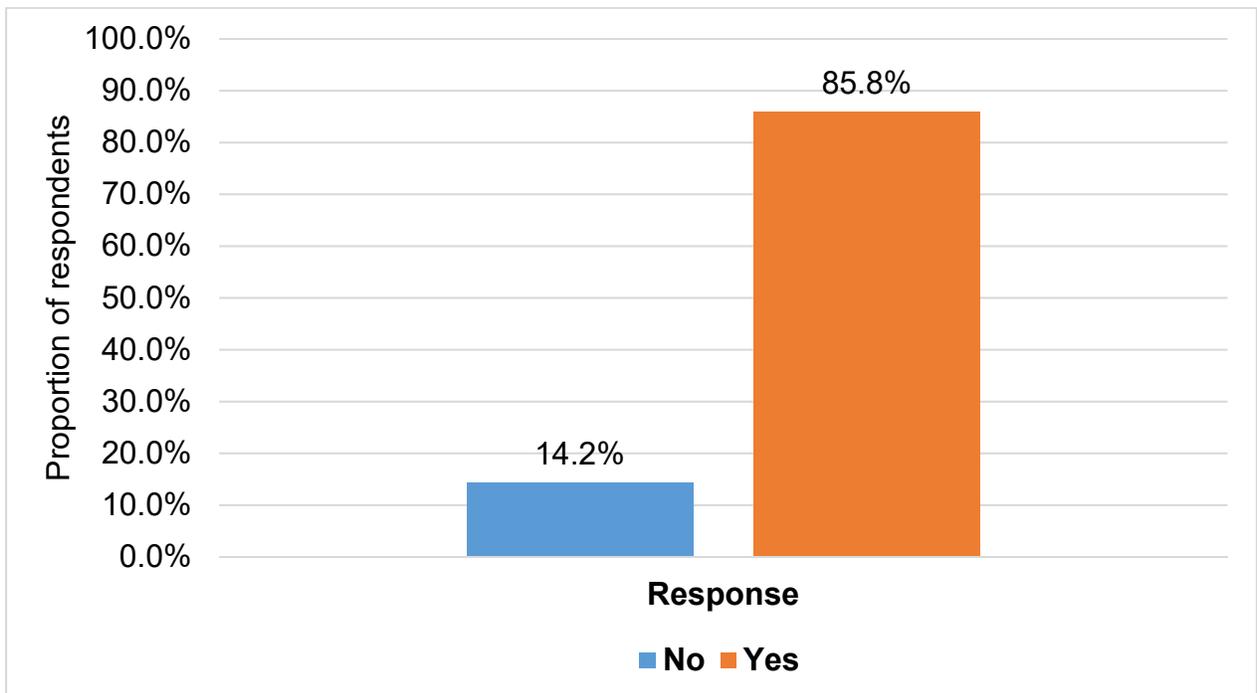


Figure 4.24: Percentage distribution of community gardeners with the question: “*Are you satisfied with the quantity of vegetables obtained from your community garden?*” (n=254)

Figure 4.24 depicts that minority (14.2%) of the respondents were dissatisfied about the quantity of vegetables obtained from the vegetable garden compared to 85.8% who were satisfied. Some of the respondents that were dissatisfied about the quantities obtained, they indicated that there were challenges with soil that was worn out and as a result the community gardens could not produce sufficient vegetables as expected. This an indication that few respondents were at high risk because they had unplanned disruptions, in attempting to meet their basic household requirements, making them vulnerable to food security. Food stability was not a concern for majority of the respondents (85.8%) meaning that most of them were food secure.

Figure 4.25 displays percentage distribution of community gardeners with the question: “Are you satisfied with the size of your community garden?”

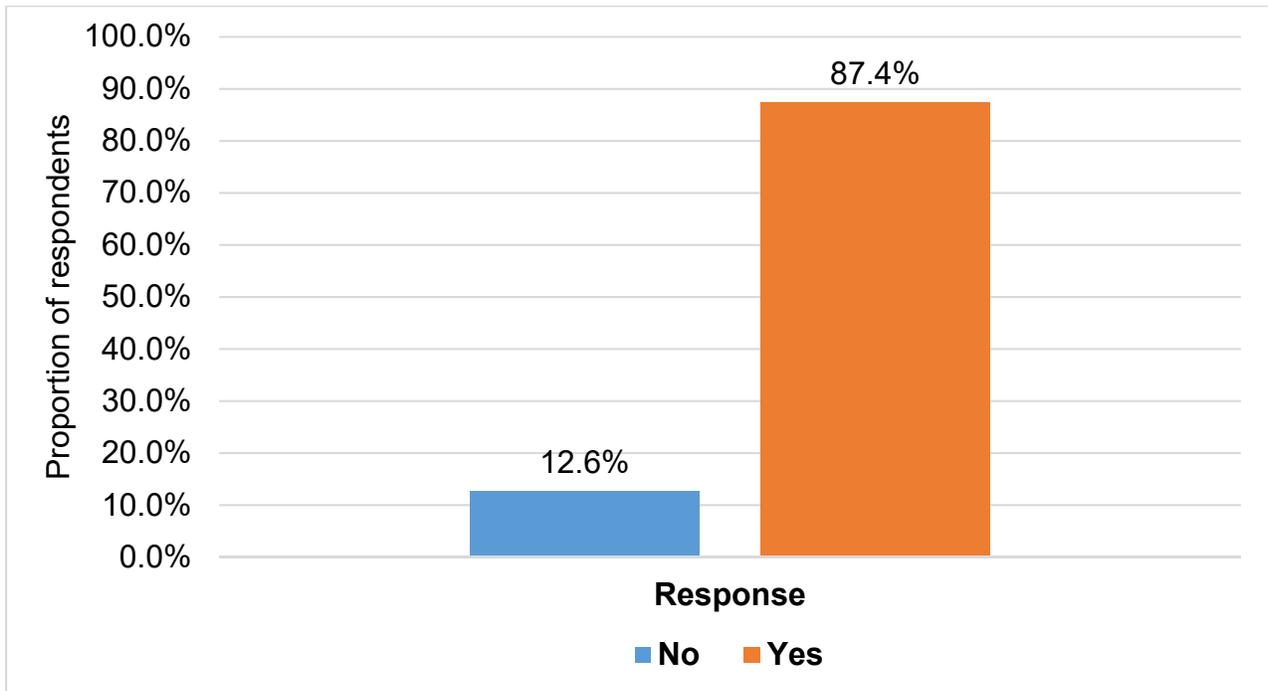


Figure 4.25: Level of agreement among community gardeners with the question: “Are you satisfied with the size of your community garden?” (n=254)

The survey results in **Figure 4.25** show that the highest share (87.4%) of the respondents were pleased with the size of community gardens that they form part of. Only a small fraction of 12.6% was not happy about the vegetable garden size. This is a clear indication that the sizes of a vegetable gardens enabled respondents to have the capacity to sell vegetables and feed their families. Respondents that were not happy that they did not have ideal vegetable garden size to provide variety of vegetables for household consumption and for

selling. Thus, they were unable to produce sufficient vegetables and they were likely to experience food instability and become food insecure.

Figure 4.26 shows percentage distribution of community gardeners with the question: “Do you practice crop rotation?”

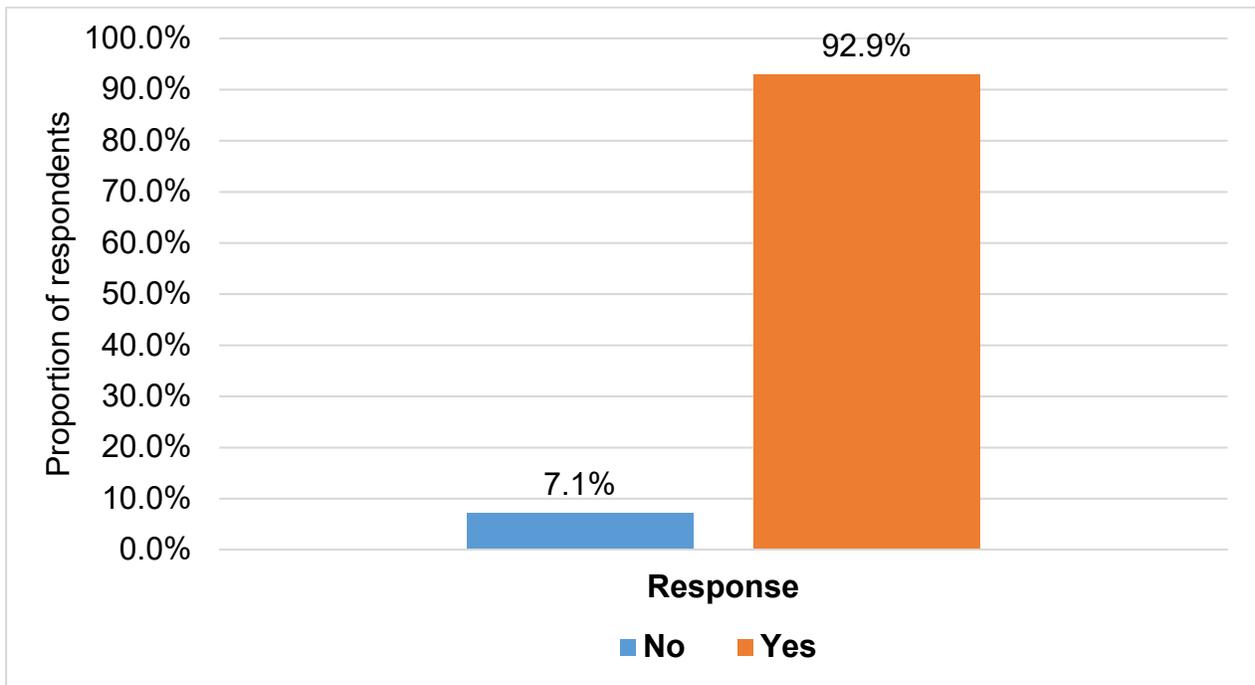


Figure 4.26: Percentage distribution of community gardeners with the question: “Do you practice crop rotation?” (n=254)

In **Figure 4.26**, the results show that majority (92.9%) of the respondents were practising crop rotation in their community gardens. Only a small proportion (7.1%) of the respondents stated that they did not practice crop rotation, therefore they repeatedly planted same crops in the same field year after year. Respondents that rotated crops stated that they benefitted because other vegetables were grown on a healthy soil and it positively affected vegetable

yield. This is a demonstration that majority of the respondents were applying crop rotation in order to break the cycle of diseases and to enhance soil fertility. This contribute to stability on vegetable gardens because they were likely to achieve better yields by rotating crops in their gardens.

Table 4.11 represent the analysis of responses of coping strategies adopted when community gardens did not produce sufficient vegetables as expected.

Table 4.11: Distribution of responses to coping strategies adopted when community gardens did not produce sufficient vegetables as expected (n=254)

Coping strategy	Frequency	Percent (%)	Frequency	Percent (%)
	No		Yes	
Do not have means of getting vegetables	178	70.1	76	29.9
Purchase vegetables on credit	126	49.6	128	50.4
Borrow money to buy vegetables	125	49.2	129	50.8
Depend on relatives, friends outside the household to get vegetables	144	56.7	110	43.3
Limit vegetable intake to ensure that children ate enough	99	39.0	155	61.0
Reduce vegetables in the daily meals	120	47.2	134	52.8
Skip the whole day without eating vegetables	155	61.0	99	39.0
Depend on government grants to purchase vegetables	185	72.8	69	27.2
Other	230	90.6	24	9.4

Source: field data (2017)

The results presented in **Table 4.11** show that 70.1% of the respondents did not have necessary means of getting vegetables while 50.4% purchased on credit. Other respondents (43.3%) stated that they relied on relatives, friends outside the household whereas other respondents (39.0%) skipped vegetable consumption the whole day when they did not have vegetables from the community garden. Most (61.0%) of the respondents agreed with the notion that they should limit vegetable intake to ensure that children ate

enough. Of the few (27.2%) indicated that they were depending on government social grant to purchase the vegetables. About 9.4% of the respondents indicated that they have had other coping strategies such as backyard vegetable gardens at home. From the observation, it is evident that some of the respondents had alternative options of obtaining vegetables while others were entirely depending on community gardens. This is a clear indication that in the event that vegetable gardens were not producing sufficient vegetable, most respondents would be at the risk of not consuming adequate vegetables.

Figure 4.27 displays percentage distribution with the question: “*How do you rate your garden skills?*”

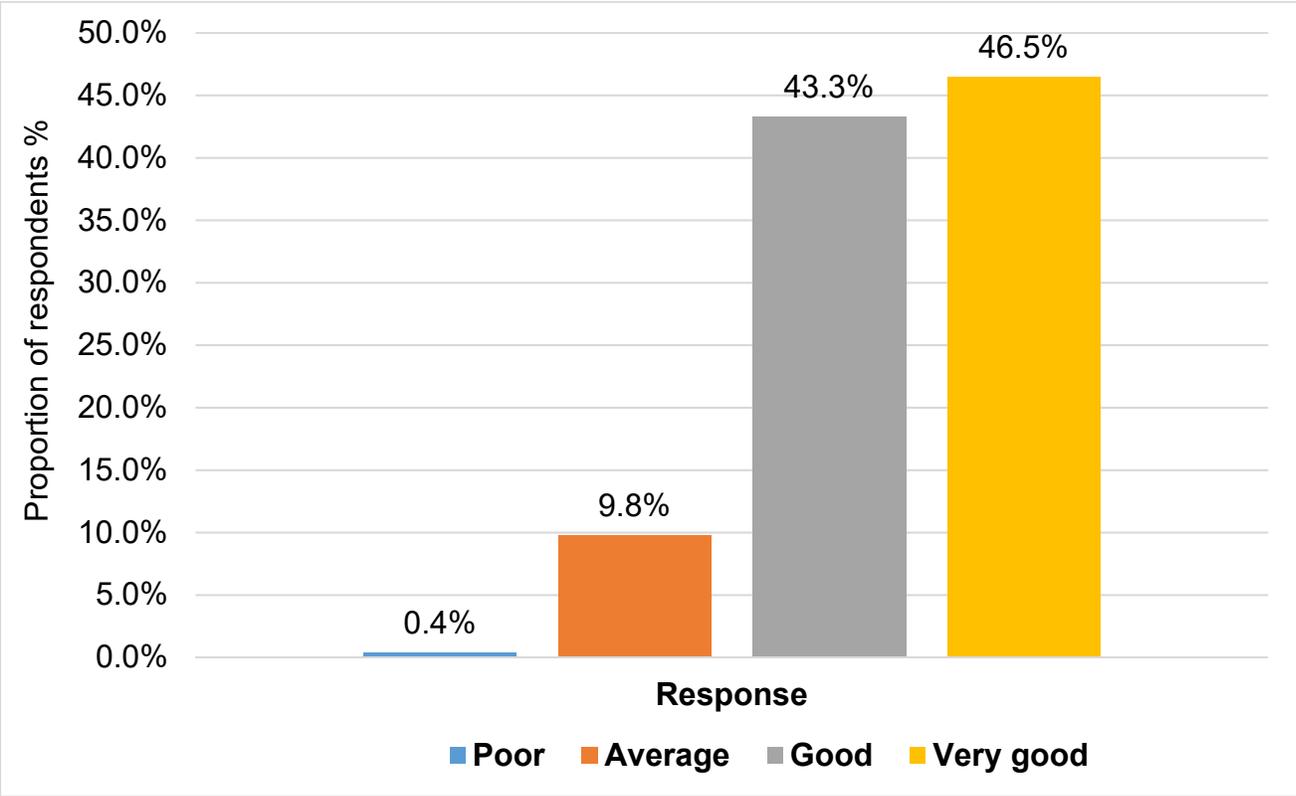


Figure 4.27: Distribution of percentage on rating scale among community gardeners with the question: “*How do you rate your garden skills?*” (n=254)

The survey results in **Figure 4.27** show that 46.5% and 43.3% of the respondents rated their garden skills as very good and good respectively. Few (9.8%) considered themselves as average when it comes to gardening skill. Therefore, over 85% of the respondents held the notion that they were familiar with gardening and can do most of the activities required. This is a positive indicator for food stability because most of the respondents had necessary garden skills to ensure sustainability of the vegetable gardens.

4.2.3 Contribution of community gardens to food security in urban area

In addition, key informants were interviewed about how community gardens contribute to the surrounding communities. This section entails reasons for producing vegetables, vegetables types grown, frequency in which vegetables were sold and category of vegetable buyers.

4.2.3.1 Reasons for producing vegetables

The reason why community gardens grew vegetables were also determined because it is key to food security in the local communities.

Figure 4.28 below shows percentage distribution of key informants in community gardens with the question: “*What is the reason for producing vegetables?*”

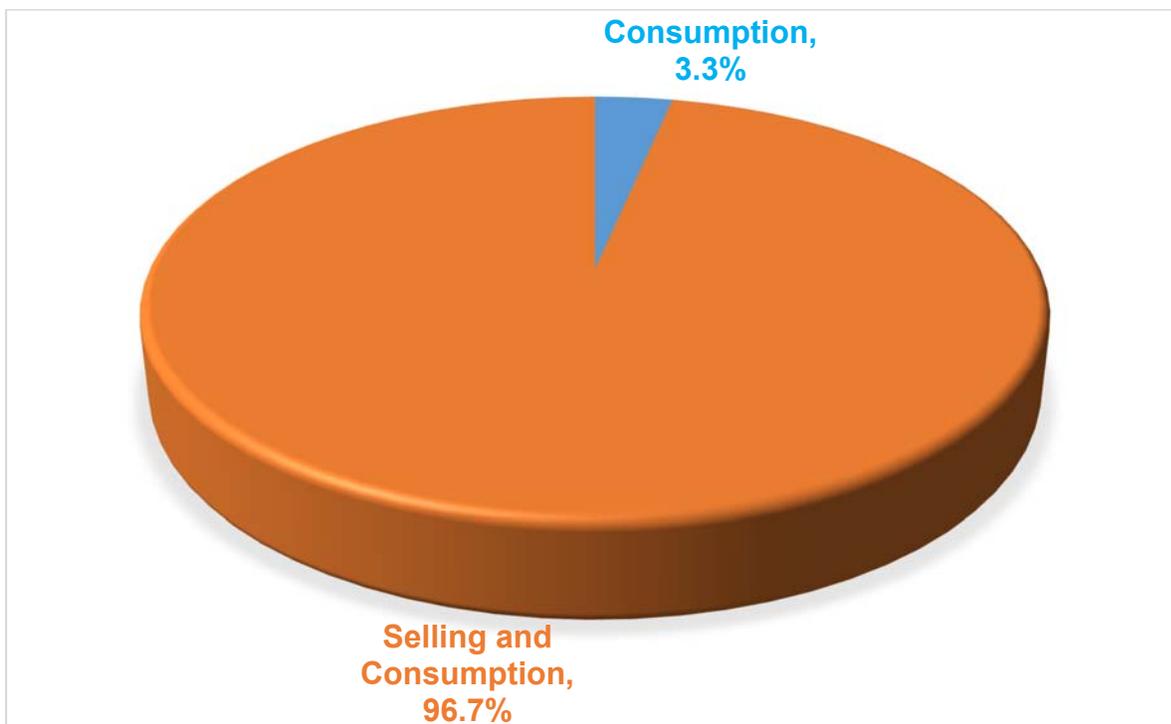


Figure 4.28: Percentage distribution of key informants in community gardens with the question: “*What is the reason for producing vegetables?*” (n=30)

As presented in **Figure 4.28**, the results show that 96.7% is for selling and consumption while only minority (3.3%) was only for consumption. This illustrate that community gardens do not only focus on being a source of fresh produce for consumption only, on the other hand help the beneficiaries to earn an income that will give them purchasing power. Vegetables from the community gardens were sold directly to the consumers in surrounding township to ensure food availability in the local communities.

4.2.3.2 Type of vegetables grown

Table 4.12 below shows vegetable types grown in community gardens in Emfuleni local municipality.

Table 4.12: Vegetable types grown in community gardens in Emfuleni local municipality

(n=30)

Vegetable type	Frequency	Percent	Frequency	Percent
	No		Yes	
Potatoes	8	26.7	22	73.3
Pumpkin	3	10.0	27	90.0
Tomato	5	16.7	25	83.3
Cabbage	5	16.7	25	83.3
Carrot	1	3.3	29	96.7
Beetroot	1	3.3	29	96.7
Lettuce	11	36.7	19	63.3
Butternut	17	56.7	13	43.3
Chinese cabbage	13	43.3	17	56.7
Green beans	3	10.0	27	90.0
Onion	2	6.7	28	93.3
Spinach	1	3.3	29	96.7
Sweet potato	21	70.0	9	30.0
Green pepper	11	36.7	19	63.3
Chomolia	21	70.0	9	30.0
Other	15	50.0	15	50.0

Source: field data(2017)

Table 4.12 presented above indicate that spinach, carrots and beetroot were the most cultivated vegetables (>95% of the respondents) in urban community gardens; while sweet potato and chomolia were the least grown crops with ≤30% of the respondents having cultivated them. Other types of vegetables cultivated by 50% of the respondents were

Chinese spinach, brinjal, kale, chili pepper and turnips. The majority of vegetables were grown in open field systems while a small amount was produced in plastic tunnels and shade nets.

Vegetables such as lettuce, spinach, potatoes and tomatoes were reported to be been grown on a raised seedbed and they responded positively. Given the number of vegetable types grown in the community gardens, there is a potential to provide a variety of fresh produced vegetables for household consumption and income generation.

4.2.3.3 Selling of vegetables

Table 4.13 below shows the average frequency in which vegetables produced in community garden were sold on monthly basis.

Table 4.13: Average frequency in which vegetables produced in community gardens were sold on monthly basis (n=30)

Months	Mean	Std. Error of mean	Std. deviation	Minimum	Maximum
January	7.67	1.350	7.397	0	20
February	8.53	1.440	7.886	0	22
March	7.53	1.386	7.592	0	20
April	7.33	1.345	7.369	0	20
May	7.73	1.385	7.588	0	20
June	6.90	1.380	7.558	0	20
July	7.20	1.598	8.755	0	29
August	6.77	1.562	8.553	0	29
September	9.27	1.835	10.051	0	45
October	10.73	1.943	10.645	0	50
November	11.50	1.646	9.016	0	40
December	11.07	1.660	9.093	0	30
Average	8.52	1.544	8.459	0	29

Source: field data (2017)

Table 4.13 indicate that on average community gardens sold vegetables 8.52 (9) times per month with August being the lowest (6.77) and November the highest (11.50). This implies that vegetables were frequently sold on monthly basis, however majority of the sales were from October to December. The minimum was zero because not all community gardens sold vegetables on monthly basis. On average, the standard error of the mean was 1.544 which is low. The standard deviation of 8.459 was also achieved on average from community gardens that participated in the study, which shows that there was a huge difference among community gardens with regards to selling vegetables on monthly basis. Zero (0) denotes that there were community gardens that did not sell vegetables, however they produced vegetables for consumption only. From the preceding results, this is evident that vegetables are available throughout the year in community gardens, however some of community gardens do not sell vegetables. This finding corroborate the results in **Figure 4.28** that shows that other respondents produce for consumption only.

4.2.3.4 Locations where vegetables are sold

Figure 4.29 below display percentage distribution of key informants in community gardens with the question: *“To whom do you sell vegetables produced from your community garden?”* (n=30)

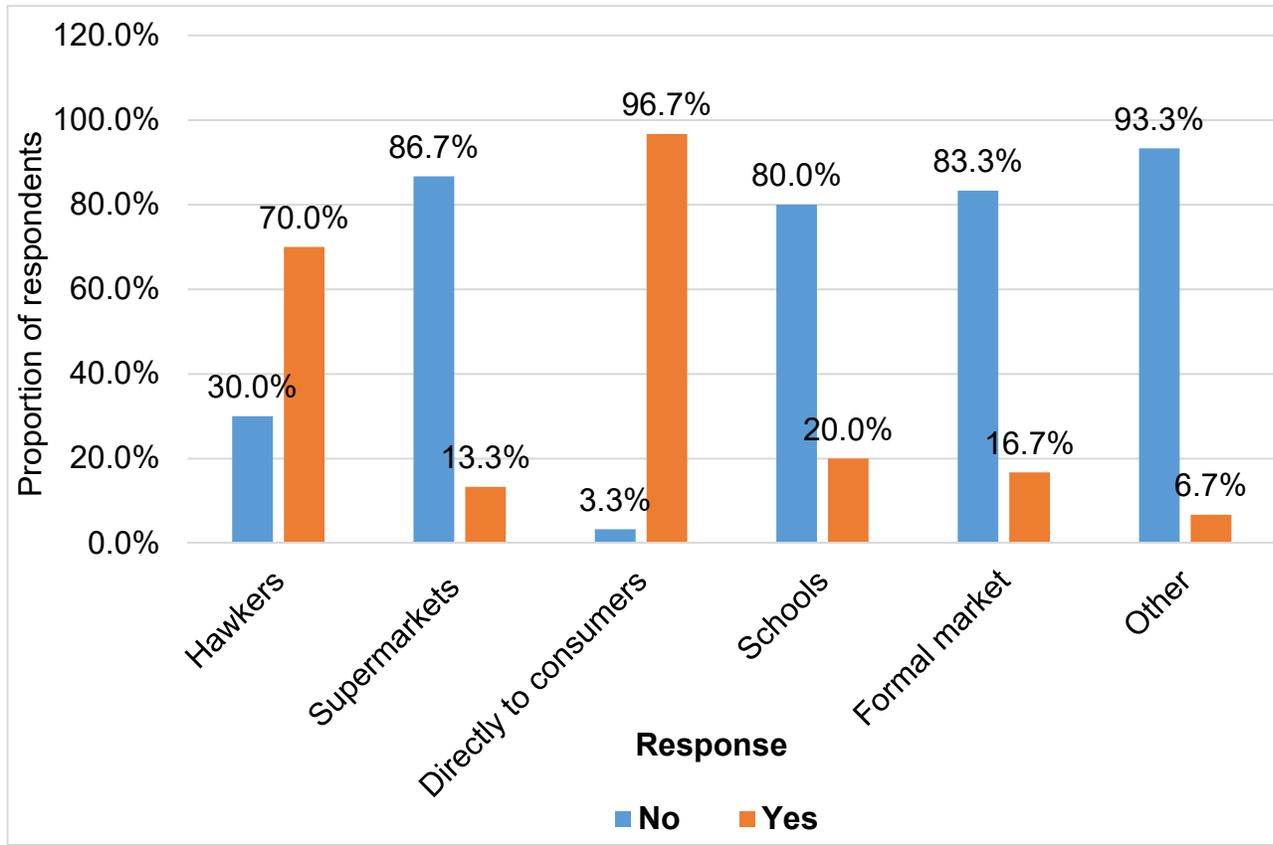


Figure 4.29: Percentage distribution of key informants in community gardens with the question: “*To whom do you sell vegetables produced from your community garden?*” (n=30)

Figure 4.29 shows that vegetables were mainly (96.7%) sold directly to consumers as compared to hawkers (70.0%), schools (20.0%). Others (6.7%) include local office of South African Police Services (SAPS) as well as South African Social Security Agency (SASSA), local multipurpose centre, large orders from big events and funerals, orphanage and disability centres. The largest proportion (83.3%) of community gardens have not being selling to the formal market. This shows that vegetables are available to the surrounding communities and are mainly sold directly to consumers. Consumers walk in to the community gardens to purchase vegetables.

4.2.4 Factors influencing food utilisation

This section presents the results of the factors influencing food utilisation with specific reference to consumption pattern of the vegetables from the community garden. **Table 4.14** below shows Model fitting information

Table 4.14: Model fitting information (n=254)

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	678.335			
Final	643.870	34.465	11	.000

Source: field data (2017)

Table 4.14 shows that the p-value is .000, which is statistically significant. This implies that the model is significant and it can therefore be used to predict the threshold.

Table 4.15 below present the results of the Goodness-of-Fit (Pearson and Deviance)

Table 4.15: Goodness-of-Fit (n=254)

	Chi-Square	df	Sig.
Pearson	987.022	1001	.618
Deviance	643.870	1001	1.000

Source: field data (2017)

The results presented in **Table 4.15** shows that the p-value is .618 for Pearson chi-square statistic from the significant level column, therefore is not statistically significant ($p > .05$). This

implies that the model used is appropriate for the data. The Deviance chi-square statistic was also not statistically significant ($p=1.000$) at 5% confidence interval. Therefore, both goodness-of-fit measures used may not produce the same results always.

Table 4.16 below depicts Pseudo R-Square.

Table 4.16: Pseudo R-Square (n=254)

Cox and Snell	.127
Nagelkerke	.136
McFadden	.051

Source: field data (2017)

Table 4.16 above shows three (3) pseudo R-squared values. There is no equivalence on logistic regression to the R-squared values in OLS regression. Given the values of R-squared does not mean exactly what OLS regression means because their analysis are of less importance.

Table 4.17 below present the results of the parameter estimates of the Ordered Logit Model (OLM) of the factors influencing vegetable consumption pattern of the respondents.

Table 4.17: Parameter estimates of the Ordered Logit Model (OLM) (n=254)

		Estimate	Std. Error	Wald	df	Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
Threshold	Never = 1	-.689	1.356	.258	1	.612	-3.347	1.970
	Once a week = 2	1.945	1.330	2.137	1	.144	-.663	4.552
	Two to four times per week = 3	4.056	1.351	9.020	1	.003	1.409	6.703
	Five to six times per week = 4	4.565	1.357	11.315	1	.001	1.905	7.224
Location	Gender	.086	.263	.107	1	.743	-.430	.603
	Age group	.310	.124	6.265	1	.012	.067	.553
	Level of education	.624	.204	9.384	1	.002	.225	1.023
	Participation period in garden	.033	.043	.589	1	.443	-.051	.116
	Family size	.085	.060	2.039	1	.153	-.032	.202
	Number of family members working	.070	.136	.266	1	.606	-.196	.336
	Working hours/day in the garden	.013	.087	.021	1	.885	-.157	.182
	Working days/month in the garden	.010	.050	.040	1	.842	-.088	.108
	Main source of income	-.699	.310	5.082	1	.024	-1.306	-.091
	Annual income from garden	3.256E-5	2.672E-5	1.486	1	.223	-1.980E-5	8.493E-5
Average		.071	.037	3.814	1	.051	.000	.143

Source: field data (2017)

The results in **Table 4.17** illustrate that 9 variables were positive out of 10 chosen ones (gender, age group, level of education, participation period in community garden, family size, number of family members working, number of working hours in the community garden per day, number of days working in the community garden per month and annual income from community garden). But only 3 variables (age group, level of education and main source of income) were statistically significant at 5% level of significance ($p < 0.05$). On the other hand, age group and main source of income were not statistically significant at 1% significance level ($p \geq 0.01$). The result implies that vegetable consumption pattern of the respondents (utilisation) increases when age of the respondents is increasing with all other factors held constant. With regards to gender, this means that males were consuming vegetables more often than women were, however the difference was not statistically significant ($p = .743$). The influence of age on vegetable consumption pattern was also positive (increase in vegetable pattern increased with increasing age with all other factors held constant), therefore older people were consuming vegetables from gardens more often than young one.

As seen in **Table 4.17** that the Logit coefficient estimate of main source of income of the respondents (utilisation) is negative and statistically significant at 5% level of significance ($p = .024$). The result implies that increase in vegetable consumption pattern of the respondents (utilisation) is not increasing with increase in main source of income with all other factors held constant. This implies the respondents whose main source of income was farming were not consuming vegetables from the community gardens more often than those with non-farming as their main source of income.

4.2.5 SWOT analysis of community gardens in the study area

This section entails factors that have an impact on the sustainability of community gardens. A SWOT (strengths, weaknesses, opportunities and threats) analysis was done in order to identify factors affecting operations of community gardens. The results of SWOT analysis are presented in **Table 4.18** to **4.21**.

Table 4.18: Strength of the community gardens in Emfuleni Local Municipality (n=30)

Strength	Frequency
Ability to feed families	6
Enough clean water	1
Donate fresh vegetables to orphanages	1
Teamwork	1
Produce fresh and good quality vegetables	1
Job creation	1
Gardening skills	1
Ability to donate vegetables to senior local citizens	1
Usage of kraal manure and earthworms to improve soil fertility	1

Source: field data (2017)

Table 4.18 reveal that 6 respondents indicated that community gardens were able to feed their families. The finding is similar with the results in **Figure 4.3** whereby a total of 49.2% indicated that they were able to feed their families. Different respondents indicated that community gardens created jobs, produced vegetables that were firm, with the same uniform size and shape, without defects, and fresh colour (good quality). This is a clear indication that good quality vegetables were available for the respondents and their household

members. It can also be seen that different categories of people such as senior citizens and school children were supplied with vegetables freely. This shows that community gardens had moderately contributed to food availability in their surrounding communities. With regard to food accessibility, vegetable garden had further made a little contribution to the local economy by job creation.

Table 4.19: Weaknesses of the community gardens identified by gardeners (n=30)

Weakness	Frequency
No shelter	3
Limited skills	1
Lack of commitment from garden members	1

Source: field data (2017)

From the observation in **Table 4.19**, one (1) respondent indicated that there was lack of commitment from vegetable garden members while 1 respondent was concerned that there were people with limited farming skills. The potential contribution of vegetable gardens was negatively affected as there were limited skills as well as lacking all necessary garden tools. Owing to weaknesses identified, vegetable gardens did not have higher vegetable production and income, as a result, contribution was not as much to food security.

Table 4.20: Opportunities of the community gardens identified by gardeners (n=30)

Opportunities	Frequency
Increased sales from spinach compared to other vegetables	11
Sell vegetables within the reach of the community	1
Local community prefer vegetables from vegetable gardens	1
Receive stipend from Extended Public Works Program (EPWP) as well as Independent Development Trust (IDP)	1

Source: field data (2017)

From the information presented in **Table 4.20**, eleven respondents reported that there was a steady increase of vegetables sales particularly spinach. However, if sales of spinach remain the main income generator, the gardens might have a challenge with food availability in the event that spinach production declines because of drought, pests, diseases, flood and others. One respondent indicated that the vegetable garden was within the community, making easy for customers to walk to the vegetable garden and purchase. The other opportunity is that respondents received a stipend from Extended Public Works Program (EPWP) as well as Independent Development Trust (IDP) and it motivated them participate in the garden especially youth. This shows that in the event when vegetables were not available in the garden, respondent who received stipend were having the purchasing power.

Table 4.21: Threats of the community gardens identified by gardeners (n=30)

Threats	Frequency
Theft of garden tools	4
Lack of proper storage for garden tools	3
Lack of borehole equipment	3
Lack of nets to cover seedbeds	2
Pests (cutworms)	2
Vegetable theft	2
Crop damage by wild animals (birds & rats)	2
Drought	2
Absence of garden tunnels	2
Snail predators (millipede and garden snail)	2
Poor soil fertility	1
Stray cattle and moles eat vegetables	1
No office space	1
No fencing around community garden	1
Low production due to climate change	1
Water restrictions	1
High temperature	1
Crop damage by hail	1
Vandalism of garden tunnels	1

Source: field data (2017)

In **Table 4.21** above, it shows that four respondents reported that stealing (theft) of garden tools is threatening crop production in their gardens; while the other 2 respondents reported that cutworms attack vegetables. Three (3) respondents have reported the absence of a borehole equipment is a huge disadvantage for community gardens. Moreover, there were three (3) respondents who reported that lack of proper storage for garden tools was a concern. Others reported that there is no fencing around the community garden, water

restrictions that applied by the local municipality and high temperatures. It is clear that there were major concerns that posed a threat to food security status of farmers in urban community gardens.

4.3 Discussion

4.3.1 Socio-demographic characteristics

The results showed that the majority (71.3%) of the respondents in the study area were females, while males represented 28.7%. A similar gender pattern was also found in urban community gardens in Emfuleni area whereby females were dominant and more involved in gardening than their counterparts (Muzawazi, 2015). This is consistent with previous empirical studies across the world which reveal that women participated more than males in urban farming agriculture (Kekana, 2006; Onyango, 2010; Adebisi & Monisola, 2012; Mudhara *et al.*, 2014; Korir *et al.*, 2015). In contrast, a study conducted in various informal settlement areas of the Cape Town Metropole, showed that community gardens had more male participants than females (Swanepoel *et al.*, 2017). This shows that gender pattern in urban agriculture varies from one area to another.

The home language of the majority of the respondents (59.4%) was predominantly Sesotho followed by other South African languages. This language statistic is consistent with Stats SA (2011) that shows that more than half (52,0%) of the population in Emfuleni local

Municipality spoke Sesotho while other African languages that are spoken include IsiZulu (13%), IsiXhosa (7.8%). This was anticipated because the study area is located in Vaal Triangle region that is a predominant Sotho speaking area. In the farming sector, age group is the most important factor that plays a significant role. The participation of youth (18 – 35) in the present study shows that it is low (23.2%). It is not clear if the youth is not interested in participating in urban farming. This showed that the future of community gardens in the study area is at risk because of low involvement of the youth. This finding is in agreement with what Douglas *et al.*, (2017) found that there was low youth participation in agricultural sector. This may be attributed to the fact that young people are encouraged by returns from business venture (Olugbola, 2017).

In **Table 4.4** it was revealed that overwhelming majority (78.7%) of the respondents relied mainly on community gardens as main their source of income. The respondents have indicated that they received stipend from Expanded Public Works Programme (EPWP) and Independent Development Trust (IDT) for their work in a community garden. Receiving stipend from EPWP or IDT is not automatic, however there are set requirements that must be met. The aim of Expanded Public Works Programme (EPWP) and Independent Development Trust (IDT) is to alleviate poverty through short-term employment incentives as well as providing development skills (Expanded Public Works Programme, 2013; Independent Development Trust (IDT), 2018). In contrast, this finding is contradicting the study conducted by De Cock *et al.* (2013) in Limpopo Province of South Africa, that concluded that most (75%) of the respondents indicated that they received social grants from the government. This shows that they relied more on social grants than farming. This

is evident that government was a major contributor in food security through support programmes such as social grant, EPWP and IDT.

4.3.2 Food security status of the respondents

Food availability

The results showed that 86.1% of the respondents were able to provide fresh vegetables at home by participating in community gardens. In arguments, the current finding is inconsistent with the findings of Harvey *et al.*, (2014) who revealed 75% of the households in Madagascar did not sufficiently produce rice to feed their households. This shows that in the current study, most households consumed fresh vegetables from the community gardens and did not rely on vegetable markets, supermarkets, spaza shops; meaning they saved on food expenditure and accessed vegetables without direct buying. Reddy & Moletsane (2009) support this view that this is good because members of community gardens can save money which they should have spent on purchasing vegetables when gardens provide them with vegetables. However, in the other study of Frayne *et al.* (2010), it was found that most of the households in 11 SADC cities (Blantyre, Cape Town, Gaborone, Harare, Johannesburg, Lusaka, Maputo, Manzini, Maseru, Pietermaritzburg and Windhoek) in eight (8) countries had largely relied on sourcing food from the supermarkets and street vendors rather than urban agriculture. In this study, respondents relied on community gardens to produce food than sourcing food from spaza shops, supermarkets and vegetable market, this makes food availability resulting in food security.

- **Anxiety and uncertainty in farming**

The findings also indicated that more than half (53.5%) of the respondents were sometimes worried that they did not know where the next day's vegetables will come from due to production that was not reliable. This finding is supported by the results of the study conducted by Masekoameng (2015), who also found that majority (66.3%) of the people in 21 villages of Sekhukhune District, Limpopo province did not know where their next day's food would come from; although the focus of the current study was solely on vegetables, however Masekoameng (2015) focused on broader scope of food in a rural setting. This shows that the level of food insecurity in poor communities was prevalent majority of the people are worried about food for the following day because of uncertainty of where food would come from. This is more likely to lead to vulnerability among the peri-urban communities because of uncertainty (Owino, *et al.*, 2014).

- **Food production in small scale setting**

In the current study, the results showed that 49.2% of respondents were able to feed their families with vegetables from community gardens. This finding differs with the results of Harvey *et al.*, (2014) who found that in a small scale setting, food security was a major problem for farmers, with 75% of the households reporting that they did not produce sufficiently to feed their households. Although in the present study, other respondents were food secure, others were food insecure with regard to availability of food. This shows that in Emfuleni Local Municipality almost 50% of households were still able to receive fresh produced vegetables from the community gardens resulting in others were food insecure and others food secure.

Fanadzo *et al.*, (2010) demonstrated that there were crops in a small-scale farm that have poorly performed and that has resulted in overall low production. As in this study, Figure 4.5 reflects that more than half (51.6%) of the respondents ate less vegetables because of low production. This is clear that some of the community gardens have not performed well and that has resulted in food insecurity from availability perspective. When individuals eat less food, it means they have less food available and they are unable to consume sufficient nutrients (Lemke, 2001). Although a high proportion of the respondents (57.1%) ate vegetables in their households because of community gardens, some did not get enough from their gardens. This is not surprising because Broca (2002) postulated that access by individuals to adequate resources for acquiring appropriate foods is not guaranteed at all. Farming is at times faced with challenges constrained by natural disasters (Deressa *et al.*, 2008).

From the foregone discussion, it is evident that in the study area, food availability was not a concern for most of the farmers or beneficiaries of community gardens in Emfuleni local Municipality. In the present study, it is therefore found that respondents had relied on community gardens as a source of vegetables.

Food accessibility

More than half (55.5%) of respondents indicated that they were uncertain and anxious about accessing vegetables in the past four weeks (**Figure 4.10**), however with varying levels. Similarly, Masekoameng (2015) concluded that majority (76%) of the respondents in Sekhukhune district, Limpopo province were always worried that their household would not

have sufficient food resulting to lack of food access. Furthermore, in Maphephetheni, KwaZulu Natal province, 89% of community gardeners were also found to have been worried about accessing enough food (Shisanya & Hendricks, 2011). Community gardeners have indicated that in some instances they lost some of the vegetables because of drought, stray animals that walk over seedbeds and high temperature and moles. Furthermore, some community gardens were in the open plan, not fenced and thus making it vulnerable to theft of vegetables (Shisanya & Hendricks, 2011). This result confirms, moderate food insecurity that was experienced compared to the two preceding studies whose level of food insecurity was severe because respondents were more worried.

The current study showed that 55.1% (**Figure 4.11**) of community garden beneficiaries in Emfuleni local municipality and their household were unable to eat preferred vegetables. This shows that food accessibility was also a concern for a certain proportion of farmers in urban community gardens because they did not grow all types of vegetables. The findings are in agreement with study conducted by Musemwa *et al.* (2013) in Eastern Cape Province that affirmed that most (68%) of the households lacked food and they could not eat the type of preferred food because they deserted their own food production. The similar patterns of accessing limited variety of food was reported by Masekoameng & Maliwichi (2014) where it was discovered that 16% had access to food without limit. This shows that in the present study respondents and their households had also received insufficient supplies of fresh quality vegetables from the community gardens, resulting to vulnerable to deficiencies of minerals and vitamins (FAO, 2005). Furthermore, according to World Health Organisation (WHO), 2.8% of deaths is caused by insufficient consumption of vegetables and fruits. They did not have the purchasing power to access vegetables from the local vegetable markets,

supermarket and spaza shop (Schönfeldt, 2003 as cited by Sakyi, 2012). The situation is common in other areas as reported by Coleman-Jensen *et al.*, (2017) that there were households in United States of America which lacked money and other resources to obtain food. This shows that in the present study there were respondents who ate vegetables that they did not prefer and they lacked purchasing power to access preferred vegetables. This confirms that more urban households were vulnerable to food insecurity due to their limited form of food access and income (Van der Merwe, 2011).

In the present study, more than one third (48.8%) of the beneficiaries of urban gardens reported that they or their household sometimes slept at night without eating vegetables (**Figure 4.17**) because community gardens did not produce sufficient vegetables consistently. The results correlate with the study of Shisanya (2008) in Kwazulu Natal that found 42% of people in the Maphephetheni Uplands have slept without food because community gardens were inadequate to noticeably produce food. This finding is in contrast with the study of Ndobu (2013) in Kwakwatsi in Free State which found that less than one third (20.4%) of the people in households have reported that they have slept without eating food because they relied income rather than farming activities.

Food utilisation

Almost all (96.1%), the respondents have stated that they consume vegetables as a relish. This corroborates the observation made by Oniang'o *et al.* (2003) as well as Smith and Ezyaguirre (2007) that vegetables in an African diet are typically regarded as a relish that is important. However, there were respondents who were consuming vegetables as a salad

and for health reasons. Urban agricultural scholar also viewed that vegetables would usually be served on its own or with meat or it can be referred to as supplement (Kepe, 2008). Within Emfuleni Local Municipality, respondents have indicated that vegetables grown from community gardening were cooked and in some instances they were consumed as raw. In their responses, participants also indicated that some vegetables allocated to adults as compared to their children would differ in terms of preferences hence allocation of vegetables is not the same in the household. Moreover, the present study showed that 82.7% (**Table 4.10**) of the people involved in urban agriculture reported that a person who prepares and produces vegetables makes a decision about vegetable consumption pattern in the household. This pattern is consistent on decision made on food production (Quisumbing & Maluccio, 2000) and issues of culture in food allocation may play a significant role (Gittelsohn & Vastine, 2003). This situation disadvantages children as compared to adults. It is researcher's opinion that in this scenario culture came into play on food allocation in the household.

The largest share (55.5%) were of the view as depicted in **Figure 4.15** that they have eaten fewer vegetables in a day because they were not enough. The finding concurs with the study conducted by Masekoameng (2015) which reported that 81% of their household or participants ate meals once a day. Rogers (2017) pointed out that there are negative effects when consuming few vegetables on the nutritional status of the individual. This shows that household member's nutritional status may have been affected because they received inadequate vegetables.

In relation to the vegetables consumption pattern, it was found in the current study that young people tend to consume less vegetables than that older people. This was found to be consistent the study conducted in England indicating that young adults (aged 16-24) consume very less vegetables (Joint Health Surveys Unit, 2008). With regards to gender, males were found to be consuming vegetables more often than women, although the difference was not statistically significant ($p=.743$). This finding is inconsistent with several studies which have found that women consume more vegetables than men (Johnson *et al.*, 1998, Hughes *et al.*, 2004). This is not a surprise when more of old people tend to consume more of vegetables, because it is completely nutritionally essential owing to the metabolic processes that happens in old age (Amarya *et al.*, 2015).

Food stability

A remarkable high number of above 90% that they were satisfied with the quality of the vegetables obtained from the community garden, therefore their food stability is not threatened when it comes to consuming healthy vegetables. This finding is in agreement with the observation made by Zavadil (2009) that water is also an important natural resource that play crucial part in growth of vegetables, and enough water has the ability to better the quality, uniformity and higher yields. This shows that if community gardens produced vegetables of good quality, gardeners as well as buyers will absorb sufficient nutrients. There will be a probability that they sell more vegetables and this will create stability as they will earn extra purchasing power.

As seen in **Table 4.11**, majority (61.0%) of the respondents reported they limit vegetable intake to ensure that children ate enough. A significant 72.8% have reported that they do not rely on government grants to purchase vegetables. This is in contrast to the results of the study conducted by De Cock *et al.* (2013) who reported that 75% of the rural households in Limpopo province, South Africa were mainly relying on social grant⁸. Furthermore, 29.9% of the beneficiaries of community gardens did not have any coping strategy. This means that they were more reliant on the community gardens, if community gardens did not produce enough, their food security status is endangered. The risk coping strategies include reducing the diversity of the diet, obtaining credit, migration, limit food intake to ensure that children ate enough (Kuchler *et al.*, 2012; Pieters *et al.*, 2013). This study found that 50.4% purchased vegetables with an arrangement to pay later. The most popular coping strategy was borrowing food from shops against future payment (48.1% of participants) and was commonly used amongst all the food security categories with the exception of the mildly food insecure class (Musemwa *et al.*, 2013).

4.3.3 Threats of availability of vegetables in the community gardens

The results presented in Figure 4.8 showed that 90.2% of the gardeners reported that pests and diseases were the main factors that caused low production in the community gardens. Similarly, Mandiriza-Mukwirimba *et al.*, (2016) revealed that pest and diseases were the contributing factor in crop failure as (93.6%) of the farmers in Gauteng province and Waterberg district in the Limpopo province were badly affected. Pests and diseases were identified to limit food crops, causing major losses to farmers and eventually

⁸ It consists of mostly old age pensions, child support grants, disability grants and veteran grants.

threatening food security. It is for this reason that Khapayi & Celliers (2016) was of the view that pests may damage the produce and in turn will negatively affect quality of the crop and resulting to yield loss.

Olawepo (2012) found that challenges in farming such as stray animals that invades gardens and destroy vegetables were a major concern in Nigeria. This was also the case in the present study whereby respondents were very much concerned about lack of fencing around some of the community gardens that resulted in cattle walking over seedbeds. Hail was also the reported to have damaged the vegetables some community gardens, the situation was not uncommon in such farming settings. For example, du Preez (2015) indicated that the storm of heavy hail has caused millions of rands worth of damage to farmer's crops in Hoedspruit, Limpopo province and it had huge impact on farming.

Moreover, high temperature, drought, climate change was reported to have serious negative consequences in vegetable production in urban areas of Emfuleni local municipality. This is confirmed by Thornton *et al.* (2014); Campbell *et al.* (2016) that high temperature has a long-term effect due to slowly adaptations of cropping systems such as droughts, flooding. Birds were also the biggest threats because they ate leafy vegetables. The finding validates the finding of Ivey *et al.*, (2012) which observed that birds are as well problematic because they have the ability to transmit pathogens over substantial distances and are difficult to control.

Food production was primarily affected by various factors that were illustrated above, resulting in instability in food availability (Campbell *et al.*, 2016). Approximately 89% of the members of urban community gardens in Emfuleni local municipality were confident about their farming skills. This implies that their food security status was not threatened because to most of them farming was a common activity. The findings were different from a study conducted by Manenzhe *et al.* (2016) in Bushbuckridge, Mpumalanga Province who found that 83% of farmers lacked farming skills; while only a minority (17%) had farming skills. As a result, it is important for farmers to be capacitated with necessary skills for sustainability and feasibility of the farm as well as mitigating factors of food insecurity. Yet in Bojanala Platinum district municipality, in North West Province, 99.5% of backyard gardeners reported that they had farming skills notably in vegetable production (Mokone, 2016). This shows that when most farmers in the community gardens had farming skills, it means they have a good knowledge about types of vegetables to be planted in different seasons. Farming skills also plays a significant role in hand-harvesting so that quality of vegetables is not damaged. This ensures that community gardens produce vegetables all year round and household members will continuously be supplied with vegetables.

4.3.4 Contribution of community gardens to food security in urban area

The present study found that the main reason the respondents produced vegetables was for selling and consumption (96.7%) while minority (3.3%) was only for consumption (**Figure 4.28**). The results of the current study are in line with finding of Mokone (2016) who found that respondents (43.1%) produced for both home consumption and for selling market purpose. This shows that in current study that there is a trend to produce the vegetables

preferred by the local communities for both home consumption and local markets. As result, there is a potential to sustainable urban agriculture. Furthermore, this study revealed that community gardens had moderately contributed to food availability by donating vegetables to surrounding communities such as senior citizens and schools. This showed that community gardens had moderately contributed to food availability in their surrounding communities. This was also found in the study of Mokone (2016) that a minority (0.5%) of respondents produced to assist the needy, the poor, feed orphans, and for home-based cares around their communities. This is clear that community gardens in Emfuleni area do not only produce vegetables for home consumption and selling, however they also contribute to the surrounding society by providing a portion of vegetables to school feeding schemes, senior citizens and orphans.

According to Tóth & Feriancová (2015) it was indicated that producers sell their yields directly to consumers. This study validates the finding of the current study which shows that 96.7% have reported that vegetables were sold directly to consumers (**Figure 4.29**). This further confirms the finding in Figure 4.9 that 94.5% who reported that community gardens are within the reach of the community, meaning consumers do not travel long distances to purchase vegetables at community gardens. It shows that the location of community gardens is very convenient to most people. By this, people will have access to affordable and cheaper vegetables from the community gardens than to be bought at vegetable markets at a higher price; and community gardeners will be able to purchase other food product.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

The chapter presents summary, conclusions and recommendations that are solely based on results of the study, to the level the objectives that were addressed. The overall aim of the study was to examine the contribution of urban agriculture in Emfuleni Local Municipality to food security of the farmers. This study was premised on the following research objectives about Emfuleni Local Municipality:

- to determine the socio-demographic characteristics of farmers in urban community gardens;
- to determine the contribution of urban community gardens to food security with specific reference to food availability, food accessibility, food utilisation and food stability;
- To evaluate the factors that influence food utilisation of the farmers in urban community gardens.
- To conduct SWOT analysis of urban community gardens.

5.2 Conclusions

The current study found that majority of the farmers in urban community gardens in Emfuleni Local Municipality were women; most of the respondents spoke Southern Sotho followed by Zulu and other South African languages, this was not surprising because the area is situated in the Vaal area which is a predominant Southern Sotho region. Participation of the youth in community gardens was found to be low compared to people over 35 years of age. This is a concern about the future of urban agriculture in Emfuleni Local Municipality. With regards to sources of income, farming was the main source of income for most of the respondents; this implies that there is a need to invest in urban community gardens because they provided employment opportunities for people in urban areas. The study also found that only 40% of the farmers in urban community gardens received stipend from Extended Public Works Program (EPWP) and Independent Development Trust (IDP) for a period of Nine (9) months after becoming members of community gardens. It can be concluded that the South African Government played a significant role by providing stipend to the beneficiaries resulting in improved food security. This means that their purchasing power was elevated.

In relation to food availability, it is concluded that community gardens contribute to food availability on regular basis for most respondents. This is mainly because most of the respondents (farmers in urban community gardens) were able to provide vegetables produced from community gardens to their families on regular basis and ate enough vegetables produced from the gardens because of high yields. This indicate that they were less dependent on spaza shops, vegetable markets and supermarkets to source vegetables.

This study had employed Household Food Insecurity Access Scale (HFIAS) to measure food insecurity levels. Level of anxiety and insufficient quantities of vegetables of urban farmers and their household were successfully identified. It was therefore found that with regard to food accessibility, an average of 47% did not experience anxiety, uncertainty and had consumed sufficient quantities of vegetables from the community gardens. This indicates that some of the community gardens produced sufficiently because they had the ability to supply sufficient vegetables to the households of the farmers (beneficiaries).

With regards to food utilisation, majority of the respondents were consuming vegetables as a relish whereas others consumed vegetables for various reason such salad, health reasons and others as presented in the results section. Moving to vegetable consumption pattern, it is concluded that gender, age group, level of education, participation period in community gardens, family size, number of family member working, number of working hours in the community garden per day, number of day working in the community garden per month and annual income from community garden influenced vegetables consumption pattern of the respondents (utilisation) in the study area. This means that males were consuming vegetables more often than women were, however the different was not statistically significant ($p=.743$). Youth consumed vegetables less than older people (> 35 years), educated people were eating more vegetables than less educated people, vegetable consumption of those who have been participating in community gardens was positively influenced. It can also be concluded that participants whose main source of income was

farming, did not consume more vegetables than those with non-farming as their main source of income.

From food stability point of view, most of the respondents adopted various coping strategies in instances where community gardens did not produce sufficient vegetables as expected. The most adopted coping strategies were reducing vegetable intake to ensure that children ate enough, purchasing of vegetables on credit, reducing vegetables in the daily meals and borrowing money to buy vegetables. Majority of the respondents were found to be content with quality and quantity of vegetables from the community gardens. In addition, most of the respondents had the necessary farming skills to sustain the production of vegetables in the urban community gardens and they practised crop rotation frequently to ensure that production of vegetables was continuous. This shows that the farmers in urban community garden had measures to ensure that they were food stable.

Factors that hinders production of community gardens were successfully identified. This include theft of garden tools and vegetables, vandalism of garden tunnels, lack of borehole equipment, lack of fencing around community gardens and they should be closely monitored in order to ensure sustainability of the community gardens. If the identified challenges are not carefully addressed, some of the urban community gardens will become dysfunctional or collapse. This is will threaten the food security status of the respondents.

5.3 Recommendations

This section present the recommendations based on the findings of the study. The recommendations are as follows:

- **More active participation of youth in community gardens should be encouraged**

The current study found that there was a low participation of the youth in community gardens. This was also echoed by Ravhura (2010) that lack of youth participation in community-based projects poses a risk to the future of community development projects. This raises a need for urban farmers to recruit unemployed youth into community gardens to ensure that urban farming is sustained beyond the current generation. This can be done by raising awareness in community meetings and other platforms aimed at youth empowerment.

- **South African government should continue with stipend payment**

The analysis revealed that the contribution of the South African government cannot be ignored as it played a pivotal role in contributing to the stability of community gardens in the study area. It is therefore suggested that the South African Government should continue to provide monthly stipend to the farmers (beneficiaries) in urban community gardens through Extended Public Works Program (EPWP) and Independent Development Trust (IDP) for a period of 9 months to attract people into urban farming. This will ensure sustainability of urban community gardens and positively contribute to food security of urban dwellers.

- **Threats to food security should be closely monitored**

Challenges such as theft of garden tools and crop produce, lack of fencing, grazing of vegetables by stray animals and vandalism of equipment hindered the sustainability of some urban community gardens, should be addressed urgently. Issues of theft and vandalism should be reported to the relevant law enforcement agencies to ensure that food security is not threatened.

In relation to community gardens that had low production due to drought, unreliable irrigation systems and water restrictions. It is recommended that government and/ other farmers support organisations should help community gardens with drilling of water boreholes and installation of irrigation systems to improve production.

A variety of drought resistant vegetable cultivars should also be introduced in order to increase vegetable production in the urban community gardens that had less or no access to irrigation water.

- **Vegetable production should be improved to ensure sustainability**

Urban community gardens should focus on increasing and sustaining their production to ensure that all the members have sufficient vegetables to feed their families throughout the year. This will ensure that urban farmers and their households have access to adequate fresh vegetables and improve their food security status throughout the year. It

will also create an opportunity for urban farmers in community gardens to gradually move into formal market and earn more income from their farming activities.

- **Training for urban farmers on various marketing strategies**

Farmers in urban community gardens should be trained on marketing to enable them to supply vegetable to local markets, supermarket, spaza shops and other formal markets because the quantity and quality are satisfactorily. This will generate more income to community gardens and will ultimately increase purchasing power of urban farmers.

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LIST OF APPENDICES

APPENDIX 1: Survey questionnaire

A. GENERAL INFORMATION

Questionnaire Number	
Date	
Name of Community garden	

B. PARTICIPANTS CHARACTERISTICS

No	Participant Demography	Code	Answer
1.	Gender	0=Female 1=Male	
2	Race	1=Black African 2=White 3=Asian or Indian 4=Coloured 5=Others (Specify).....	
3.	Age group	1 = 18 - 35 yrs. 2 = 36 – 45 yrs. 3 = 46 – 55 yrs. 4 = Above 55 yrs.	
4.	Home Language	1= Setswana; 2= Sepedi; 3= IsiZulu; 4= Ndebele; 5=Xitsonga; 6= Xhosa; 7= Tshivenda; 8=Sesotho; 9= Afrikaans 10=other(specify)	
5.	Marital Status	1= Single; 2= Married; 3= Divorced; 4= Widowed;	

		5= Cohabitation; 6=Other (specify)	
6.	Level of Education	1 = No formal education 2 = Primary education 3 = Secondary education 4 = Tertiary education 5 = Other (Specify)	
7.	Number of years/months participating in community garden	Number	
8.	Family Size (Including participant)	Number	
9.	Number of adults in the household	Number	
10.	Number of children in the household	Number	
11	Number of family member working	Number	
12.	Other Sources of Funding	0=No;1=Yes	
13.	Number of working hours in the community garden per day.	Number	
14	Number of day working in the vegetable garden per month	Number	
15	Main Source of Income	1= Farming 2=Non farming	
16	Annual income from community garden	Rand	
17.	Other sources of income	Annual Income	
17a	Full time employment	0=No; 1=Yes	
17b	Part-time employment	0=No; 1=Yes	
17c	Social grant	0=No; 1=Yes	
17d	Remittances	0=No; 1=Yes	
17e	Business	0=No; 1=Yes	
17f	Other (Specify)	0=No; 1=Yes	

C. FOOD SECURITY MEASURES

C1: FOOD AVAILABILITY

18. Please indicate your impressions of the items listed below by ticking (✓) in the block.

Since I participate in community garden...	Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly Agree 5
a) I am able to provide fresh produced vegetables at home.					
b) I do not know where the next day's vegetables will come from due to production that is not reliable.					
c) The vegetables produced are not enough to feed my family.					
d) I eat more vegetables due to high production					
e) I eat less vegetables due to low production					
f) My family is not getting enough vegetables to eat					
g) I can afford to eat fresh produced vegetables everyday					

19. Does your garden produce vegetables throughout the year? Please tick (✓) in the appropriate box.

a) No	0
b) Yes	1

20. If no in Question 19, why?

.....

21. How many times per month do you take home vegetables produced from your garden? Indicate number of vegetables in a provided space below

a) January	
b) February	
c) March	
d) April	
e) May	
f) June	
g) July	
h) August	
i) September	
j) October	
k) November	
l) December	

22. Are vegetable crops derived from gardening available within the reach of residential community? Please tick (✓) in the appropriate box.

a) No	0
b) Yes	1

23. If no in Question 22, why?

.....

24. Vegetable production in the garden is limited due to: Please tick (✓) in the appropriate box.

a) Inadequate use of land	0=No; 1=Yes
b) Insufficient water due to water restrictions	0=No; 1=Yes
c) Energy to grow vegetables	0=No; 1=Yes
d) Agricultural tools such as hand hoe, spade, fork etc.	0=No; 1=Yes
e) Poor transport infrastructure	0=No; 1=Yes
f) Changes in temperatures	0=No; 1=Yes
g) Changes in rainfall	0=No; 1=Yes
h) Other (specify)	0=No; 1=Yes

25. Vegetables in the garden are sometimes not available due to: Please tick (✓) in the appropriate box.

a) Preferences in my household	0=No; 1=Yes
b) Unfair food habits	0=No; 1=Yes
c) Damage by disease/pests	0=No; 1=Yes
d) Damage by the time they are harvested	0=No; 1=Yes
e) Other(specify)	0=No; 1=Yes

26. C2: FOOD ACCESS SCALE: HOUSEHOLD FOOD INSECURITY ACCESS SCALE (HFIAS)

NO	QUESTION	RESPONSE OPTION	CODE
1.	In the past four weeks, did you worry that your household would not have enough fresh produced vegetables?	0=No (skip to Question 2) 1=Yes	..........
1.a	How often did this happen?	1= Rarely (once or twice in the past four weeks) 2= Sometimes (three to ten times in the past four weeks) 3= Often (more than ten times in the past four weeks)	..... .....
2.	In the past four weeks, were you or any household member not able to eat the kinds of vegetables you preferred because of lack of resources?	0=No (skip to Question 3) 1=Yes	..........
2.a	How often did this happen?	1= Rarely (once or twice in the past four weeks) 2= Sometimes (three to ten times in the past four weeks) 3= Often (more than ten times in the past four weeks)	..... .....
3.	In the past four weeks, did you or any household member have to eat a limited variety of vegetables due to lack of resources?	0=No (skip to Question 4) 1=Yes	..........
3.a	How often did this happen?	1= Rarely (once or twice in the past four weeks) 2= Sometimes (three to ten times in the past four weeks) 3= Often (more than ten times in the past four weeks)	..... .....

4.	In the past four weeks, did you or any household member have to eat some vegetables that you did not want to eat because of lack of resources to obtain other vegetable type?	0=No (skip to Question 5) 1=Yes	..........
4.a	How often did this happen?	1= Rarely (once or twice in the past four weeks) 2= Sometimes (three to ten times in the past four weeks) 3= Often (more than ten times in the past four weeks)	..... .....
5.	In the past four weeks, did you or any household members have access to small vegetables than needed because there were not enough vegetables?	0=No (skip to Question 6) 1=Yes	..........
5.a	How often did this happen?	1= Rarely (once or twice in the past four weeks) 2= Sometimes (three to ten times in the past four weeks) 3= Often (more than ten times in the past four weeks)	..... .....
6.	In the past four weeks, did you or any household members have eaten fewer vegetables a day because there were not enough vegetables?	0=No (skip to Question 7) 1=Yes	..........
6.a	How often did this happen?	1= Rarely (once or twice in the past four weeks) 2= Sometimes (three to ten times in the past four weeks) 3= Often (more than ten times in the past four weeks)	..... .....
7.	In the past four weeks, was there ever no vegetables to eat of any kind in your household because of lack of resources to get vegetable?	0=No (skip to Question 8) 1=Yes	..........

7.a	How often did this happen?	1= Rarely (once or twice in the past four weeks) 2= Sometimes (three to ten times in the past four weeks) 3= Often (more than ten times in the past four weeks)	..... .....
8.	In the past four weeks, did you or any household members go to sleep without eating vegetables because there were not enough vegetables?	0=No (skip to Question 9) 1=Yes	..........
8.a	How often did this happen?	1= Rarely (once or twice in the past four weeks) 2= Sometimes (three to ten times in the past four weeks) 3= Often (more than ten times in the past four weeks)	..... .....
9.	In the past four weeks, did you or any household member go the whole day and night without eating vegetables?	0=No (questionnaire is finished) 1=Yes	..........
9.a	How often did this happen?	1= Rarely (once or twice in the past four weeks) 2= Sometimes (three to ten times in the past four weeks) 3= Often (more than ten times in the past four weeks)	..... .....

C3: FOOD UTILISATION

27. Why do you eat vegetables from your community garden? Please tick (✓) in the appropriate box.

a) Pleasure	0=No; 1=Yes
b) Salad	0=No; 1=Yes
c) Diversity of diet	0=No; 1=Yes
d) Advised by the medical practitioner	0=No; 1=Yes
e) Relish	0=No; 1=Yes
f) Other: Specify	0=No; 1=Yes

28. How often do you eat vegetables produced from your community garden? Please tick (✓) in the appropriate box.

a) Never	1
b) Once a week	2
c) Two to four times per week	3
d) Five to six times per week	4
e) Daily	5

29. Who make the decision to purchase vegetables for the household? Please tick (✓) in the appropriate box.

a) Person who prepares vegetables	0=No; 1=Yes
b) Person who produces vegetables	0=No; 1=Yes
c) Person who buys vegetables	0=No; 1=Yes
d) Other (specify)	0=No; 1=Yes

30. Please indicate your eating pattern of vegetables produced from your community garden. Please tick (✓) in the appropriate box.

On a 24 hour day, I include vegetables in:	Never 1	Rarely 2	Sometimes 3	Very often 4	Always 5
a) Breakfast					
b) Lunch					
c) Dinner					

31. Do you get equal share of vegetables produced from your community garden with your household? Please (✓) tick appropriate block. Please tick (✓) in the appropriate box.

a) No	0
b) Yes	1

32. If no or yes in Question 30, explain why?

.....

.....

.....

C4: FOOD STABILITY

33. What are good characteristics that you experienced from your community vegetable? Please tick (✓) in the appropriate box.

a) Building a community	0=No; 1=Yes
b) Spirituality, pleasure and leisure	0=No; 1=Yes
c) Existing capabilities	0=No; 1=Yes
d) Socialisation	0=No; 1=Yes
e) Response to unemployment, poverty and food insecurity	0=No; 1=Yes
f) Other (specify)	0=No; 1=Yes

34. How do you rate your garden skills? Please tick (✓) in the appropriate box.

a) Very good	1
b) Good	2
c) Average	3
d) Poor	4
e) Very poor	5

35. Are you satisfied with the quality of vegetables obtained from your community garden? Please tick (✓) in the appropriate box.

a) No	0
b) Yes	1

36. Are you satisfied with the quantity of vegetables obtained from your community garden? Please tick (✓) in the appropriate box.

a) No	0
b) Yes	1

37. Are you satisfied with the size of your community garden? Please tick (✓) in the appropriate box.

a) No	0
b) Yes	1

38. Do you practice crop rotation? Please tick (✓) in the appropriate box.

a) No	0
b) Yes	1

39. Indicate what you do when your community garden does not produce expected vegetables or you have no money to buy vegetables in the household. Please tick (✓) in the appropriate box.

a) I do not have means of getting vegetables	0=No; 1=Yes
b) Purchase vegetable on credit	0=No; 1=Yes
c) Borrow money to buy vegetables	0=No; 1=Yes
d) Depend from relatives, friends outside the household to get vegetables	0=No; 1=Yes
e) Limit vegetable intake to ensure that children get enough	0=No; 1=Yes
f) Reduce vegetables in the daily meals	0=No; 1=Yes
g) Skip the whole day without eating vegetables	0=No; 1=Yes
h) Depend on government grants to purchase vegetables	0=No; 1=Yes
i) Other (specify)	0=No; 1=Yes

THANK YOU FOR YOUR PARTICIPATION!!

APPENDIX 2: Key informant interview guide

A. GENERAL INFORMATION

Key informant interview guide number	
Date	
Name of Community garden	

1. What is the reason for producing vegetables? Please tick your answer with (✓)

a) Selling	1
b) Consumption	2
c) Selling and consumption	3
d) Other (Specify)	4

2. Indicate types of vegetables you grow in your community garden. Please tick your answer with (✓)

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

n) Green pepper	0=No; 1=Yes
o) Chomolia	0=No; 1=Yes
p) Other (specify)	0=No; 1=Yes

3. How many times do you sell vegetables produced from your community garden per month? Indicate the number in a provided space below

a) January	
b) February	
c) March	
d) April	
e) May	
f) June	
g) July	
h) August	
i) September	
j) October	
k) November	
l) December	

4. To whom do you sell your vegetables? Please tick your answer with (✓)

a) Sell to hawkers	0=No; 1=Yes
b) Supermarket	0=No; 1=Yes
c) Sell directly to consumers	0=No; 1=Yes
d) Schools	0=No; 1=Yes
e) Formal market	0=No; 1=Yes
f) Local Police station	0=No; 1=Yes
g) Local South African Social Security Agency (SASSA)	0=No; 1=Yes
h) Local multipurpose training centre	0=No; 1=Yes
i) Other (specify)	0=No; 1=Yes

5. Are members (farmers) of the community garden, beneficiaries of Expanded Public Works Programme (EPWP) or Independent Development Trust (IDT)?

a) No	0
b) Yes	1

6. If answer is yes in question 5, how many people receive stipend from EPWP or IDT?

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7. Share the strength of your community garden?

.....

.....

8. Share the main constraints of your community garden?

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.....

THANK YOU FOR YOUR PARTICIPATION

APPENDIX 3: Participant information sheet

Ethics clearance reference number: **2016/ CAES/118**

27 November 2016

Title: **THE CONTRIBUTION OF URBAN AGRICULTURE TO FOOD SECURITY IN EMFULENI LOCAL MUNICIPALITY, GAUTENG PROVINCE**

Dear Prospective Participant

My name is Thabo Phillip Modibedi, a Master of Science degree student at the University of South Africa (Unisa). My Supervisor is Dr M.R. Masekoameng and co-supervisor is Mr. M.S. Maake. I wish to invite you to participate in the activities of Master's research project, by completing the questionnaire for data collection purposes. The title of this Master's research project is: **The contribution of urban agriculture to food security in Emfuleni local municipality, Gauteng Province.**

WHAT IS THE PURPOSE OF THE STUDY?

I am conducting this study to evaluate the contribution of urban agriculture to food security with a specific focus on Emfuleni Local Municipality.

WHY AM I BEING INVITED TO PARTICIPATE?

The list of community gardens was obtained from Gauteng Department of Agriculture and Rural Development at a satellite office at Vanderbijlpark for research purpose only. You are

considered to be a suitable participant for this study as you are practically involved vegetable cultivation in community garden.

WHAT IS THE NATURE OF MY PARTICIPATION IN THIS STUDY?

You are invited to participate in a survey to evaluate the contribution of community gardens to food security. The questionnaire includes participant's characteristics and questions to measure food security. By participating in the study, you are required to sign the consent form and you are not required to provide your name on the questionnaire. To complete the questionnaire, it should take approximately 30 - 45 minutes.

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

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

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

This study will assist members of the community gardens as finding will form basis for formulating a decision making tool for years to come. It will include correcting the weakness that will be identified in order to strengthen the good practice of community gardens. It may

be used as a guideline in the production management of community gardens and will inform on good practices and areas that require improvements.

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

There are no foreseeable negative consequences/physical risks for participating in the study. Your participation will not put your membership at the community garden at risk which you belong to. There are no emotional questions or sensitive questions that will be asked.

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

Your real name will not be used in questionnaires and no one will be able to connect you to the answers. Only the researcher will know about your involvement in this research. Your answers will be given a code number or a pseudonym and you will be referred to in this way in the data, any publications, or other research reporting methods such as conference proceedings.

Your response may be reviewed by people responsible to making sure that that the research was done properly, including the transcriber, external coder, and members of the Research Ethics Review committee. Your answers may be reviewed by people responsible for making sure that research is done properly, including the transcriber, external coder, and members of the Research Ethics Review Committee. Otherwise, records that identify you will be

available only to people working on the study, unless you give permission for other people to see the records.

You are also informed that the anonymous data may be used for other purposes, such as a research report, journal articles and/or conference proceedings. Also indicate how privacy will be protected in any publication of the information. The dissertation will be submitted for publication; however individual participants will not be identifiable as pseudonyms will be used.

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

Hard copies of your answers will be stored by the researcher for a period of five years in a locked cupboard/filing cabinet in the Department of Agriculture and Animal Health at the University of South Africa in Florida Campus for future research or academic purpose; electronic information will be stored on a password protected computer. Future use of the stored data will be subject to further Research Ethics Review and approval if applicable. Hard copies will be shredded and/or electronic copies will be permanently deleted from the hard drive of the computer through the use of a relevant software programme.

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

No payment or reward will be offered for this study. Participants will not incur any costs for participating in this study.

HAS THE STUDY RECEIVED ETHICS APPROVAL?

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

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

The researcher shall visit all community gardens to provide participants with feedback based on the findings on the study. Should you require any further information or want to contact the researcher about any aspect of this study, please contact 0620694420, Modibedi33@gmail.com

Should you have concerns about the way in which the research has been conducted, you may contact Dr Mosima Masekoameng, Tel: 011 471 3102, Email: masekmr@unisa.ac.za Fax: (011) 471 2260 or Mr Matome Maake, Tel: 011 471 3103, maakems@unisa.ac.za , Fax: (011) 471 2260.

Contact the research ethics chairperson of College of Agriculture and Environmental Science Ethics committee, Prof E.L. Kempen on 011 471 2241 or email at kempeel@unisa.ac.za , if you have any ethical concerns.

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

Thabo Phillip Modibedi

APPENDIX 4: Consent form to participate in this study

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

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

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

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

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

I have received a copy of the participant information sheet.

Participant Name & Surname..... (please print)

Participant Signature.....Date.....

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

Researcher's signature.....Date.....