# DETERMINANTS OF FOOD SECURITY AMONG SMALL-SCALE MAIZE FARMERS IN POLOKWANE LOCAL MUNICIPALITY, CAPRICORN DISTRICT, LIMPOPO PROVINCE, SOUTH AFRICA

by

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**DECLARATION**

I, Alfrida Matome Makgobokwane declare that the mini-dissertation hereby submitted to the University of Limpopo, for the degree of Master of Science in Agriculture (Agricultural Economics) has not previously been submitted by me for a degree at this or any other University. That it is my work in design and in execution, and that any information used in the study from various sources has been acknowledged.

……

**Surname & Initials**

……. …….

**Signature** **Date**

## DEDICATION

This study is dedicated to my daughter - Khensani Blessing, my siblings and my lovely parents.

**ACKNOWLEDGEMENTS**

Firstly, I give thanks to Almighty God for the mercy, love, strength and courage He has showed me throughout the course of the study. My sponsor, NSFAS (National Students Financial Aid Scheme) and NRF (National Research Foundation), I thank these organizations for the financial support they have given me throughout my studies, if it was not them, I would not have made it to this level. My sincere gratitude to my father in heaven and to my mother for their support, guidance, motivation, advice and love they showed me, your endless support is gratefully acknowledged.

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**ABSTRACT**

Food insecurity is prevalent in less developing countries and it remains a major issue in South African households, especially among those living in rural areas. Therefore, the study examined the factors influencing food security among small-scale maize farmers in Polokwane Local Municipality. The aim of the study was to assess the factors influencing food security among small-scale maize farmers. The objectives of the study were to: identify and describe the socio-economic characteristics, determine the household food security status, examine factors influencing food security of small-scale maize farmers, and identify the constraints faced by the small-scale maize farmers in ensuring food security. Primary data was collected from a sample size of 150 farmers through well-structured questionnaires, while HFIAS was used to determine the food security status and Logistic Regression model was employed to analyze the data.

The descriptive statistics showed that 56.7% of the participants were females, whereas 43.3% were males. It was further indicated that the average age of youth was 34.2%; whilst 65.8% was average age of adults and 69.3% of the farmers have attended school while 30.7% have never attended school. The HFIAS results showed that 53% of households were food secure and 47% were food insecure which include 16.0% mildly, 21.3% moderately and 9.3% severely food insecure. The logistic regression results revealed that among twelve variables included, only six variables including age of the farmer, educational level, household size, household income, farm size and access to credit were found to have significant relationship to food security status of the farmers.

The study therefore recommends that there must be provision of agricultural information that will motivate adults to continue farming. Training of farmers on improving food security should be provided through workshops as well as family planning programmes to reduce family size. Furthermore, there must be expansion of off-farm income generating activities as well as increase in farm size and enhancement in access to credit institutions such as MAFISA, Land bank and Commercial banks that will assist in improving the food security status of the respondents.

***Keywords*: Determinants, Food security, Small-scale maize farmers, Polokwane local municipality, Limpopo Province, South Africa**

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## LIST OF ACRONYMS

| | |
|---|---|
| DAFF | Department of Agriculture, Forestry and Fisheries |
| GDP | Gross Domestic Product |
| HFIAP | Household Food Insecurity Access Prevalence |
| HFIAS | Household Food insecurity Access Scale |
| IFSS | International Food Security Strategy |
| LGH | Local Government Handbook |
| MAFISA | Micro Agricultural Financial Institutions of South Africa |
| NRF | National Research Fund |
| NSFAS | National Students Financial Aid Scheme |
| RSADA | Republic of South Africa Department of Agriculture |
| SADC | South African Development Community |

# CHAPTER ONE

# INTRODUCTION

## 1.1 Background of the study

Africa continent experiences food insecurity challenge more than any other continent in the world because majority of poor countries are situated in Africa. The developmental efforts of most countries that are suffering from poverty are undermined by challenges they are facing on food security. One of the regions that is faced with food security challenges include sub-Saharan Africa, since most population that is food insecure in the world live on this region. Food security is currently more prominent on the policy program than it was in the past. Absolutely, food insecurity magnitude, scale and the measurable evidence are accountable for this prominence. Globally, the nature of inconsistency of food insecurity is a major concern, however it is not country or continent specific (Nkegbe *et al.,* 2017).

In South Africa, hunger and malnutrition are not caused by food shortage, but rather an insufficient food access by certain categories in the population such as households and individuals. Majority of citizens depend on having access to cash either directly or indirectly, since they do not grow their staple food themselves, but rather purchase from commercial suppliers (DAFF, 2006). According to Ndobo and Sekhampu (2013) a large amount of South African population, both urban and rural areas experience chronic food insecurity. Since post-apartheid era, the country has been able to provide and distribute adequate amount of food through the domestic production and from the imports. The production of agricultural products in the country is very essential as a source of extra household income generation for consumption of food mainly in rural households.

In various parts of the world, including the country of South Africa, the issue of food (in) security has remained critical. Since democracy has come into South Africa after 1994; more attention has been given to food security. Between the years 2004 to 2014, the South African government has dedicated itself to poverty reduction and food security was one of the important elements in achieving their objective. The relationship among household food security, income and poverty has not been clear; however, poor

households through their own food production might experience food security (Du Toit *et al*., 2011).

Food security becomes a key issue for concern and for possible policy intervention when it reaches a point of nutrition deficiencies and increased hunger and poverty (Kuwenyi *et al.,* 2014). According to Manyamba *et al*. (2012) food insecurity in South Africa is not regarded as failure of the production of enough food by the nation, but rather by livelihoods failure to supply sufficient cash at the household level to purchase enough food. Enough evidence is available to conclude that majority of the families of South African households have inadequate and insecure supply of food and most of them are unable to have access to sufficient amount of food. The condition has worsened as a result of poverty between individuals who live under the poverty line and are unable to meet their dietary requirements.

Subsistence farmers contribute significantly to food production, food security and employment in South Africa. However, the production output in rural areas of South Africa is poorly understood, since no production data are available (Mngqawa *et al.,* 2016). According to Altman *et al*. (2009) some of the sources contributing to incomes and savings and encouraging the diversification of food include smallholder farming as well as subsistence farming. Since food production by households is dominant, there is a need to understand the prospects, extortions, and suitable interventions that was established to support the production level of the households.

The three main sources that poor households get access to their food from include allocations from government programmes or other households, subsistence farming as well as the market. Households in rural areas mostly produce their own food, while households in urban areas mostly purchase their food. However, currently some of the studies have revealed that there is a rise of independence by households in both rural and urban areas on market purchases, approaching about 90% of the supply of food. Subsequently, expenses of food may be about 60-80% of the total income of households in various sections of sub-Saharan Africa. This might be alleviated, particularly for rural households that are exposed to food insecurity, through promoting the production of small-scale/ subsistence farmers (Baiphethi and Jacobs, 2009).

The maize produced in South Africa contains about 60% of white maize, while the remaining 40% is yellow maize. Human beings primarily uses white maize mostly for consumption, whereas yellow maize is used for animal production (DAFF, 2012). The sector of maize comprises of commercial and subsistence farmers, the latter mostly in Limpopo, Mpumalanga, Northern Kwa-Zulu Natal and Eastern Cape Provinces. The planting area used by farmers for maize in 2015/2016 was about 266 130 hectares, which includes 191 225 of white maize and 74 905 hectares of yellow maize. The production of maize decreased by 29 million tons and sorghum by 36 800 tons (26.6%) from the previous season (DAFF, 2016).

### 1.2 Problem statement

Food insecurity has remained a major issue throughout the world. The large number of the world's population suffers from hunger and vulnerability due to insufficient means to obtain the exact amount of nutritious food. Food security problem is mostly dominant in developing countries. Moreover, hunger and malnutrition mostly affect sub-Saharan regions more than others do. Agricultural production is very important to improve food security among households because most of the countries in sub-Saharan Africa are more dependent on the agricultural sector for the growth of their economies (Ndobo and Sekhampu, 2013). Food insecurity continues to be the main problem in majority of the households in South Arica. The situation is related to higher poverty level that takes place in the country, mostly in the rural households (Abdu-Raheem and Worth, 2011).

So far, South Africa has the highest Gross Domestic Product (GDP) in South African Development Community (SADC) region, it is the biggest trader of agricultural products, and it is food secure at the national level. However, there are current studies using several approaches for food security determination, indicating that chronic household food insecurity in South Africa occurs at a higher level (Manyamba *et al*., 2012). In South Africa, the issue of consumption of food is very important, considering its relationship to deprivation and poverty. Due to the necessity for increase in food security, it is important to understand the determinants of food security (Sekhampu, 2013). There is literature, which has emphasized the analysis at the broader level rather than at the household level. Altman *et al*. (2009) the huge percentage of households in South Africa is food insecure,

since there is little certainty about status of food security among the households in the country. However, the study attempted to look at the factors influencing food security at the household level among small-scale maize farmers in Polokwane Local Municipality.

### 1.3 Aim of the study

- The aim of the study is to examine factors influencing food security among small-scale maize farmers in Polokwane Local Municipality.

### 1.4 Research objectives

The specific objectives of the study are to:

i. identify and describe the socio-economic characteristics of small-scale maize farmers in Polokwane Local Municipality.
ii. determine food security status of small-scale maize farmers in Polokwane Local Municipality.
iii. examine factors influencing food security among small-scale maize farmers in Polokwane Local Municipality.
iv. identify the constraints faced by the small-scale maize farmers in ensuring food security in Polokwane Local Municipality.

### 1.5 Research hypotheses

i. Small-scale maize farmers in Polokwane Local Municipality are food insecure.
ii. Socio-economic characteristics of small-scale maize farmers in Polokwane Local Municipality do not affect their food security status.
iii. There are no known constraints faced by the small-scale maize farmers in ensuring food security in Polokwane Local Municipality.

### 1.6 Rationale

Maize production remains the leading component of small-scale farming mainly because it is a staple food to the majority of the households in Polokwane Local Municipality and the country at large (Mmbengeni *et al*., 2002). Maize also serves as food crop contributing to household's income and food security in the area of the study. The maize industry is

essential to the economy as earner of foreign exchange and as an employer, because of its multiplier effect (DAFF, 2012). Food insecurity problem has a wide diversity and various measurements ranging from the national to individual level (Beyene and Muche, 2010). According to De Cock *et al*. (2013), even though the country is food secure at the national level, majority of South African households remained food insecure. According to van der Merwe (2011), the country is experiencing extensive variety of challenges in ensuring food security. These challenges vary from concerns at nationwide to problems at household level. Vermeulen and Roux (2011) argues that South Africa has been meeting its food requirements from local sources, since it is food secure at national level. However, regardless of its status of food security, most of its citizens are experiencing food insecurity.

Food security definition clearly emphasizes that the food problem concept is a major one consisting of many aspects, even if the country is able to produce or import sufficient quality food every year in order to meet the required demand for both public and private distribution (Shahjhan *et al*., 2016). However, this may not be the same on food security at the households' level of Polokwane Local Municipality, since there are limited studies on the subject, particularly on small-scale maize farmers. The study, therefore, attempted to offer a contribution towards providing some clear insights on the determinants of food security, as well as unraveling some of the challenges facing small-scale maize farmers in terms of food security at household level and provide the policymakers with relevant information on making suitable policies to improve food security among households.

### 1.7 Outline of the study

This subsection outlines the arrangement of chapters that are discussed in the study. The study comprises of five chapters, where chapter one is based on providing general introduction and background, problem statement, rationale, aim and objectives of the study, furthermore research hypotheses that are addressed by the study are outlined. Chapter two is literature review that involve the review of previous studies that has been conducted by researchers on food security. Chapter three outlines the research methodology, which includes the study area, data sources and sampling methods and analytical techniques. Chapter four presents the results of the data collected and the

analysis of the data obtained in the study. Chapter five gives the summary, conclusion and recommendations based on the results obtained from the study.

### 1.8 Chapter summary

The chapter has provided the introduction and the background of the study. It has also highlighted the problem statement as well as the rationale of the study. The objectives of the study and research hypotheses were outlined as critical sections of the study. The ethical considerations are essential guidelines to not violating the rights of the participants in the study.

# CHAPTER TWO

# LITERATURE REVIEW

## 2.1 Introduction

Literature review is the section where researcher reviews the previous studies that have been conducted. This chapter reviews literature from different sources related to the determinants of food security among small-scale farmers as well as rural households in South Africa and other countries. It also provides an overview of food security status in South Africa as well as other countries. There are previous studies that have been conducted in various nations across the world, which provided information about determinants of food security.

## 2.2 Definitions of terms

### 2.2.1 Food security

Food security is defined as physical, social and economic access to adequate, safe and nutritious food by all South Africans at all times to meet their dietary and food preference for an active and healthy life (RSADA, 2002).

### 2.2.2 Small-scale farming

Small-scale farming comprises of crops and livestock production, at least in part to be used by a single family, with farming being an important source of their livelihood (Chomitz *et al*., 2007). Small-scale is mostly identified with undeveloped, unproductive, non-commercial and subsistence farming that we find in parts of former homelands areas (Kirsten and van Zyl, 1998).

### 2.2.3 Maize

Maize that is scientifically known by (Zea mays) is the most essential grain crop in South Africa that is produced in various locations throughout the country. In developing countries, people consume maize directly and it serves as staple diet for some millions people (du Plessis, 2003).

## 2.3 Overview of food security in South Africa

Even though South Africa is classified as being food secure, food insecurity affects a large part of the households of the country's population. Several households, which are poor experience inadequate food security. Commonly, resources by agricultural sector for solving food insecurity challenges have been discovered with a measure of achievement (Coetzee *et al.,* 2015).

Van der Merwe (2011) argued that there must be development of policies that will emphasize the achievement of adequate food security levels for all citizens in the country, rather than production of adequate quantities of food through commercial farming only. The South African government planned to increase public expenditure since 1994 as to improve household food security, mostly among those who were previously disadvantaged through various legislation and policies. The country is faced with wide variety of challenges in ensuring food security including insufficient welfare nets for the country's poor and weak disaster management systems during time of the implementation of the IFSS at the national level.

Fawole and Ozkan(2017)argued that one of the growing challenges faced by developing countries is food insecurity; especially in the Sub-Saharan Africa that if not reduced may consequently harm not only affected areas, but also people in general as a result of uncertainty that may occur. Feleke *et al.* (2003) argued that food self-sufficiency is not an essential circumstance, since imports of food from other countries can be an essential source used to strike the balance between domestic production and consumption. This is not an adequate situation, since even when a country is able to produce enough food; some of individuals in the population may still be suffering from food insecurity.

## 2.4 Review of previous studies

### 2.4.1 Food security status in South Africa

South Africa has been self-sufficient in production of food countrywide, but levels of food insecurity among households have been huge for a long period until recently. However, the average percentages of households, which are exposed to food insecurity and suffer from poverty, are still of major concern nationally. Most of the households that are poor

are mostly found in the rural areas, particularly in the former homelands. It is possible that the households that are food insecure are in rural areas, since majority of the poor live in rural areas. Therefore, agriculture is projected to play a significant part in alleviation of poverty. Household could address the food insecurity issues through subsistence production in rural areas (Baiphethi and Jacobs, 2009).

De Cock *et al.* (2013) argue that, majority of South African households remained food insecure, even though the country is food secure at the national level. The South African government has recognized numerous critical challenges of food security in the Integrated Food Security Strategy (IFSS). Yet, the country remained to lack detailed and acknowledged methods for measurement of food security and presently there is no measured system of observing the status of food security of its people. Altman *et al.* (2009) argue that the huge percentage of households in South Africa is food insecure, since there is little certainty about status of food security among the households in the country. The baseline estimate may not be accurately determined, and it is therefore impossible to observe the improvement concerning better food security currently.

According to Vermeulen and Roux (2011) food security challenges seem to be significant against a condition of South Africa being a main importer of wheat as well as domestic production of cereal that may change among the years. South Africa is obviously not food secure place for some of the people. About a billion of people (1 out of 6) are food insecure and 35% of South African population is vulnerably food insecure, regardless of decent goals of declaration in 1948. The domestic supply may result in severe deficits by the year 2030, since sources of food are under pressure.

Generally, food security situation in South Africa reflects the worldwide image in such a way that enough aggregate food availability does not transform into adequate accessibility for all individuals. Although the country is currently regarded as being food secure in terms of total availability of food, the support for the agricultural sector that is expected on the use of resources sustainably as well as empowering of local policies for trade will be required for maintenance of secure supply of food by the nation for the medium and long term (Drimie and McLachlan, 2013).

Battersby (2011) demonstrated that extremely high levels of food insecurity in Cape Town were not caused by limited availability of food, but by difficulties in accessing it. The problem of access is not simply one of limited financial resources, but it is also shaped by the structure of the urban food system. Food security policy and developments schemes tend to give attention either on expansion on production of food or direct involvement on households through social safety nets and food aid. It was further, argued that food insecurity in urban areas is not a problem of availability or one that can be resolved by scale of interventions by households. Developmental initiatives or policies need to look at the broader food system in urban areas in order to address the issue of food insecurity.

Labadarios *et al*. (2011) states that the food insecurity domination in South Africa seemed to have been decreased amongst the years 1999 and 2008. Yet, the percentage of individuals suffering from the food insecurity threat stayed unaffected. The decline was prominent both in rural and urban areas, where food insecurity reduced from 42% to 20.5% and from 62% to 33.1% respectively. Amongst all the provinces in the country, food insecurity occurred at higher levels at Eastern Cape in 1999 followed by Northern Cape, and Limpopo as well as North West province, which are all in rural areas. In 2008, food insecurity level had declined in all provinces, whereas the Eastern Cape remained at the top.

According to Abdullah *et al.* (2017) households in rural areas are the major groups that are vulnerable to food insecurity, since they purchase most of their foodstuffs rather than engaging in the production of their own food. About 22% of respondents fear that in the near future they will run out of food. This implies that they have food accessibility and the quantity for food consumption was adequate, but they have vulnerable income source. Furthermore, precisely 81% of the participants appealed that they always have adequate food with them, showing that the situation of food security is practically satisfying, and individuals have food access, however 19% claimed that they have insufficient food. It was further revealed that most of households were suffering from malnutrition and were living in extreme poverty and there was resilient connection among poverty and food insecurity.

The production of own food by households is their major source of food consumption. Majority of households are more dependent on production of crops and rearing of animals for their livelihood. The production of domestic food plays a significant character in food security. Market is the second source of food supply in the households. However, most of households are involved in agriculture, and practically all of them are net purchasers of food. Majority of the households does not yield adequate amount of food to maintain their dietary requirements throughout the season. Other households trade parts of their produce to be able to cover the expenses for production and some of the household necessities (Zakari *et al.,* 2014).

The failure by most of South Africans, particularly youngsters, to secure their suggested nutritional requirements is supported by existing information concerning individual measures of food insecurity. Between one quarter and one third of households at the national level are not able to buy food to meet their nutritional requirements of their kids at a given period. This phenomenon is most extremely felt amongst households in rural areas and in poor provinces, particularly the Eastern Cape and Mpumalanga provinces. Although farming is an essential element of food security among households and rural livelihoods, mainly for the poor, other food and income sources have come in place to play similarly a significant part (De Klerk *et al.,* 2004).

### 2.4.2 Factors influencing food security in South Africa and other countries.

There are a number of factors influencing food security in and around the world.

Oluwatayo (2009) found that the major determinants of food security are gender, household size, level of education, marital status, age, household income of the respondents, and membership of cooperatives. The age of the respondents has positive relationship to status of food security, implying that status of food security of respondents rise as the age increases. Marital status is positively related to food security meaning that respondents who are married are more food secure as compared to others. The educational level also has positive relationship to food security, indicating that respondents with high level of education are food secured. The household size is negatively related to food security status, indicating that respondents with more household members are food insecure than those with few members. Furthermore,

respondents that form part of cooperatives are more food secure as compared to those who are not members of cooperatives. This is because of members having easy access to credit facility in order to meet their needs.

According to Abu and Soom (2016) the size of the household, household income and the size of the farm have significant influence on food security of the household. Furthermore, it was revealed that the age of the household head and size of household in urban areas have negative influence on food security status of the household. Households size has negative influence because, increase in family members added responsibilities to household head mainly when they depend totally on the head of the household. It implies that families with small size of household are more food secure as compared to families with large size of household. Some of the constraints faced in achieving food security include insufficient land availability, poverty, lack of credits access, and lack of off-farm income generating activities.

Muche *et al*. (2014) revealed that educational level of the household influence food security of the household positively, indicating that households with high educational level are more food secure. This is because of the reason that household heads that are educated are more delicate to technology adoption for productivity maximization produced from activities. The family size is negatively related to household food security, this indicate that big size of the family generates extra pressure on food security of the household, because the expenditure on extra food and non-food increase. Moreover, the use of farm inputs has negative relationship to household food security, because farm inputs are expensive.

Farming is the largest employer of labour, followed by government salaried jobs, while others are engaged in the informal sector. Moreover, household distribution by secondary occupation still depend on agriculture as their secondary source of income. It was further found that number of socio-economic characteristics of the respondents influences food security status of the respondents. Male-headed, small sized and educated household heads are more food secured as compared to female-headed, large sized and uneducated households (Adebo and Falowo, 2015).

Sekhampu (2013) indicates that important determinants that affect household food security positively were found to be household income, employment status, age and gender of household head. Whereas, other variables including marital status and household size of the participants were found to have negative influence on food security. The income of the household is very important, since the spending on several household necessities is determined by it. The quality and the volume of patterns of expenditure by households depend on the household income level. Bigger size of the household needs increased expenses for food as well as rivalry for limited means. The positive impact of gender of the respondent on status of food security might be as a result of slightly smaller household size in female-headed households as compared to male-headed households.

Mannaf and Taj Uddin (2012) found that the size of the household of the farmer, age of the farmer, monthly agricultural income and expenditure on food have significant effect on status of food security of the farmers. The households that have elder farmer are less food secure, implying that rise in the age of the head results into decrease in food security. This is because of the decline in the productivity of household head, as they get older. The large family size is more likely to be less food secure than small family size. The household status of food security decreases as the size of household becomes larger. An increased income of household ensures food security, since the household will be able to have increased access to food as to meet their needs. Increase in food expenditure leads to food security in the household, since the higher the amount of food expenditure, the more food secure the household might be.

Ali *et al*. (2016) showed that size of the household, income of the household, age of the respondent and educational level of the respondent were found to be the important variables that contribute significantly to the status of the household food security. Moreover, the size of the household was found to contribute negatively to food security, as more dependents require more food within household given fixed income of the household head. The higher the household income of the participant the more the chances of the household to be food secure. Households owned by older people are more likely to be food secured as compared to those households owned by younger people. The educational level has positive relationship to status of food security among

households, because the higher the level of education, the greater the chances of getting better jobs which indirectly helps in earning higher income.

Feleke *et al.* (2003) found that factors influencing food security status of the households are adoption of technology, size of the household, size of the farm, quality of land, access to the market and total production. Adoption of technology has positive relationship to status of food security implying that food security rises with the use of agricultural technologies by the farmers. The size of the farm of the food secured households is more significant to food secure household as compared to households that are food insecure. Families that have comparatively larger productive land have higher probability of being food secure as compared to those with comparatively less productive land. The household size has negative relationship with food security, implying that food security decreases with larger family size. Aggregate production affects food security negatively, since a rise in total production increases the supply in the market and reduces prices and therefore income of the household. The income and food security status of the farmers' decrease as the price declines.

Tefera and Tefera (2014) found that determinants of food security are educational level of the farmer, size of the household, age of the farmer, size of land cultivated and non-farm income. Household owned by older household head have higher chances of being food secure. This is because; heads of household who are at old age participate in various non-farm activities and acquire income to be spent in order to improve status of food security among their households. A rise in the years of schooling by the farmer increases household food security status. The household that have larger size of the family members are less food secure as compared to those with smaller number of members in the family. Ownership of the bigger land for cultivation by the household are more likely to be food secure. The reasoning behind this is that households will have greater chances for producing sufficient food and sources of cash crops than household having small land size for cultivation. Food security increases due to increase in the non-farm income of farming households.

Kuwenyi *et al.* (2014) stated that factors that influence status of food security among households were found to be gender of the farmer, age of the farmer, and land size above

hectare as well as livestock ownership. Age has negative relationship to food security, implying that status of food security decreases, as the household head get older. Households owned by males have higher probability of being food secured as compared to households owned by female, since women do not have access to resources. The households with larger land size are food secure as land ownership is a very important factor in rural areas. It was also found that households owning livestock have higher probability of being food secured than those having no kind of livestock.

Bashir *et al.* (2012) found that the determinants of food security status of household are monthly income, age of the farmer, family size, livestock assets possession and educational level of household head. Monthly income has positive impacts, indicating that a rise in monthly income will increase probability of household being food secured. Food security status of household decrease with an increase in the age of the farmer. This is because of the reason that elder people are not strong enough as compared to the youth, since they are performing poorly in the field. Household having big size of family members are less food secure as compared to those having smaller size of family members. The probability of household being food secure increases due to an increase of animal in both small and large livestock possessions. The high level of education of the farmer increases chances of food security of the household.

Beyene and Muche (2010) discovered that the level of education of the farmer, age of farmer, non-farm income, and land size and livestock ownership are significant factors determining household food security. Age has positive relation to food security, because older households head take their time on farming activities compared to younger farmers. The education of household heads has negative association with food security, since educated household heads might not have time to use their knowledge towards achieving food security among their households. Smallholders that are dependent on farming only have insufficient household income to acquire farm inputs and accomplish their household necessities are less food secure. The cultivated land size is significantly related to food security status of households, because farmers having bigger land for cultivation produce large quantities for consumption in the household and for sale and have greater chances to be food secure than those with small land size.

The determinants of food security among households were found to be marital status, years of education, household size, farm size, off-farm activity and monthly income. Households owned by people who are not married are more likely to be food secure as compared to households owned by married farmers. This could possibly be that married household heads have larger household size and so would have to take care of many people than unmarried household heads. Food security decreases with household head spending more years in education than on the farm. Households with big family size are more likely to be less food secure a compared to households with smaller size of the family members. This is the case, since the larger the size of the household the higher the demand for food consumption. The farming households having big farm size had greater chances of being food secure as compared to those having smaller farm size. Farming households that engaged in off-farm activities have higher probability of being food secure than those who are not engaged in any off-farm activity. Higher monthly income households are more likely to be food secure than lower monthly income households do (Djangmah, 2016).

Kassie *et al.* (2012) revealed that food security of households owned by females increase with an increase in quality of land, access to extension services, and size of the farm, whereas distance to the market decrease the chances of food security among households. The farm size, age, access to extension service, access to sellers of grain, possession of farm inputs, membership of farmers' association, social security nets expectations, market access, dependency ratio and quality of land are factors which were found to influence food security. Similarly, the size of the farm, age of the farmer, farm inputs, dependency ratio, availability of adult labour, distance to the market, use of inputs, and soil fertility have significant relation to food security status of male-headed households.

Ike *et al.* (2015) concluded that households headed by single, divorced and widowed people were found to be less food secure as compared to households headed by married people. Households headed by females were less food secure as compared to households headed by males. Families having children under 18 years of age were found to be food insecure as compared to those who do not have children. An increase in the

number of years spent in formal education by the farmer increases the probability of food security in the household. Oluwatayo and Rachoene (2017) revealed that some of the determinants of food security are level of education of the farmer, farmer's age, marital status, size of the farm, amount of hired labours, kind of mechanization, as well as commercialization level. Age and marital status of the farmer has negative relationship to status of food security, indicating that there is probability of the farmers to be food insecure.

Abafita and Kim (2014) found that factors that affects food security status of the households significantly were age of the farmer, gender of the farmer, size of the household, level of education, ownership of livestock, involvement in non-farm activities and expenditure on the consumption. Households owned by older heads are less food secure as compared to households headed by younger people. The gender of the farmer influence food security negatively, implying that households headed by males are less food secured than households headed by females are. Households with large family size are less food secured as compared to those with smaller family size. Food security status of households owned by farmers with secondary education were less than households headed by uneducated, because educated households head might be challenged by other issues to use knowledge, they obtained to achieve food security efficiently. Households with possession of large livestock are more food secure.

Fawole and Ozkan (2017) showed that access to credit facilities, age, marital status, major occupation and total monthly income of household head are factors influencing household food security status. The credit facilities access by the farmer increases food security status among households. Food security status of households owned by older people is higher, because of many years of experience they acquired, particularly those who work for government and other highly paying occupations, translating to higher income to the household as well as food security. Food security of household that are headed by married persons increases, this may occur because of maybe only single individual in the household in cases where the farmer is unmarried. Households with higher total monthly income are more food secure than those with lower monthly income do.

### 2.4.3 Constraints faced in ensuring food security

The main challenge countrywide is creation of economic conditions that could favour poor households experiencing food insecurity. Majority of families have inadequate and insecure supply of food at the household level. Moreover, most of the households' abilities for producing sufficient food are very poor. Further, challenge that has fundamental problems limiting income opportunities and poor food security status is the lack of access to funding for purchasing of food. These challenges remained evident until recently and there must be improvements on both household and national levels. These issues need to be dealt with continuously by policy makers in government and the public (van der Merwe, 2011).

Ibnouf (2011) revealed that the key challenges that the farmers as food producers and providers face on ensuring household food security include lack of access to modified production systems such as credit facilities, fertilizers, improved seeds, pesticides, suitable technologies, modern farming methods as well as facilities for marketing. Mwaniki (2006) found that constraints which farmers face in achieving household food security contain unbalanced social and political environments that prevent sustainability of economic growth, war and public fights, natural limitations, gender inequality, poor health, deprived human resource base, poor educational level, natural disasters including locust infestation, floods and the lack of good governance.

Abu and Soom (2016) revealed that the constraints, which were identified as obstruction to farmers from achieving food security among their households, include factors such as soil infertility, problems of processing and storage facilities, lack of off-farm income generating activities, lack of adequate land for agricultural production, poverty and lack of access to credit facilities by the small-scale farmers.

## 2.5 Chapter summary

The chapter provided an overview on previous studies regarding food security status and its determinants. Various studies concerning determinants of food security and food security status have been conducted in South Africa and internationally. It is shown that each researcher has different results regarding the determinants of food security due to different geographical areas. The literature, which has been reviewed, indicated that most of the factors influencing status of food security among farmers are common.

# CHAPTER THREE

# RESEARCH METHODOLOGY

## 3.1 Introduction

The chapter displays the methodological approaches employed by the study. It includes the area of the study, data sources and sampling methods and description of empirical model for analysis of data. The study area is explained briefly before discussing methods and procedures for collection of data. The empirical models that were used in the study are presented consequently.

## 3.2 Study area

The study was conducted at Polokwane Local Municipality, which is a category B municipality located within Capricorn District in Limpopo province of South Africa. It is one of the four municipalities in the district, making up to just under a quarter of its geographical area. Polokwane Local Municipality accounts for 3% of the total surface area of Limpopo, however more than 10% of the population of Limpopo resides within its boundaries. The area is 5 054km $^2$ with the population of about 797127. The municipality also covers a surface area of 379 300 hectares and accounts for 17% of the Capricorn district total surface area. In terms of physical composition, the municipality is 23% urban and 71% rural. The remaining area (6%) comprises of smallholdings and institutional, industrial and recreational land (LGH, 2016).

The municipality serves as the economic hub of Limpopo and has the highest population density in the Capricorn District. It shares its name with the city of Polokwane. The municipal spatial pattern reflects that of the historic apartheid city model, characterized by segregated settlement. At the centre of the area is the Polokwane economic hub, which comprises of the central business district, industrial area and a range of social services and well-established formal urban areas servicing the wealthier residents of Polokwane. Situated on the borders in several clusters are less formal settlement areas, which are experiencing massive influx from rural-urban migration trends. The main economic activities in Polokwane Local Municipality include agriculture, both crop farming and

animal husbandry, manufacturing, trade, wholesale and retail trade, community services, transport and mining (LGH, 2016).


**Figure 3.1: Map of Capricorn District, Source: Local Government Handbook (2016)**

### 3.3 Data sources and sampling method

The study used primary data, where well-structured questionnaires were used to collect data from small-scale maize farmers in Polokwane Local Municipality. The study employed a multistage sampling for data collection. In the first stage, Capricorn district was randomly selected from five districts of Limpopo province. In the second stage, Polokwane Local Municipality was randomly selected from four municipalities under Capricorn district. In the third stage, three villages were randomly selected from Polokwane Local Municipality and a sample of 150 randomly selected respondents were interviewed for the study. The villages include Ga-Rankhuwe, Ga-Mashamaite and Ga-Piet with total population of 600, 400 and 500 respectively, where from each village the 10% of the population have been interviewed for the study. The total number of respondents who participated in the study from each village were 60, 40 and 50 respectively. From the sample size of 150, the total percentage for each village was 40%, 26.7% and 33.3% respectively.

**Table 3.1 Summary for distribution of data per location**

| **Villages** | **Frequency** | **Percentage (%)** |
|---|---|---|
| Ga-Rankhuwe | 60 | 40% |
| Ga-Mashamaite | 40 | 26.7% |
| Ga-Piet | 50 | 33.3% |

### 3.4 Analytical techniques

In order to achieve the objectives of this study, the three analytical methods used are descriptive statistics, Household Food Insecurity Access Scale and Logistic regression model.

### 3.4.1 Descriptive statistics

Descriptive statistics was used to achieve the first objective, which was to identify and describe the socio-economic characteristics of small-scale maize farmers in Polokwane Local Municipality. This included the use of tables, graphs and charts that demonstrate percentages and mean values.

### 3.4.2 Household Food Insecurity Access Scale

Household Food Insecurity Access Scale (HFIAS) was used to achieve objective two, which was to assess household food security status of small-scale maize farmers in Polokwane Local Municipality. It involves asking respondents to answer nine questions, which represents universal domains of the experience of insecure access to food. The nine questions investigate whether or not the households experienced one form of insufficient access to food in the past 2 weeks, and if yes in which frequency (1-rarely, 2-sometimes, and 3-often).

Two indicators were computed based on these nine questions. The two indicators are HFIAS score, where households have three possible categories i.e. it ranging from zero to 27, the higher the score the greater the food insecurity the household experienced. Moreover, Household Food Insecurity Access Prevalence (HFIAP), which categorizes households into four levels of household food insecurity; food secure, mildly, moderately and severely food insecure. Households are categorized as increasingly food insecure if they respond affirmatively to more severe conditions or experience those conditions more often (Coates *et al*., 2007).

### 3.4.3 Logistic Regression Model

The Logistic regression model was employed to achieve objective three, which was to analyse factors influencing food security among small-scale maize farmers in Polokwane Local Municipality. The logistic regression analysis considered outcome as dichotomous i.e. food secure and food insecure (mildly, moderately and severely food insecure) as used by (Chinnakali *et al*., 2014). The binary replication function (food secure and food insecure) was designated and estimated by the logistic procedure. The binary logistic terms are suited to models where the endogenous variable is dichotomous, which in this

case are food secure and food insecure households. Food security was quantified with the value of one representing food secure and zero representing food insecure. The logistic regression then provides a model of observing the probability of a household becoming food secure or food insecure (Ali *et al*., 2016).

General model

$$Y = In\left(\frac{Pi}{1-Pi}\right) = \beta_0+\beta_1X_1+\beta_2X_2+\beta_3X_3+\beta_4X_4+\ldots+\beta_{12}X_{12}+\mu$$

Where: $Y$ = dependent variable (Food security)

$P_i$ = the probability that small-scale maize farmers are food secure

$1-P_i$ = the probability that small-scale maize farmers are food insecure

$\beta_0$ = the intercept

$\beta_1 - \beta_{12}$ = Coefficients

$X_1 - X_{12}$ = Independent variables, $\mu$ = Disturbance term

Model specification

$$FS = In\left(\frac{Pi}{1-Pi}\right) = \beta_0+\beta_1AGE+\beta_2GND+\beta_3EDU+\beta_4HS+\beta_5HI+\beta_6MS+\beta_7WOF+\beta_8FS+\beta_9EXT+\beta_{10}CRT+\beta_{11}MA+\beta_{12}TRC+\mu$$

**Table 3.2 Description of the variables**

| VARIABLE | DESCRIPTION | UNIT OF MEASUREMENT |
|---|---|---|
| Dependent variable Y (FS) | 1if food secure,0 otherwise | Dummy |
| Independent variables | | |
| Age (AGE) | Age of the farmer | Years |
| Gender (GND) | 1 if male,0 otherwise | Dummy |

| | | |
|---|---|---|
| Education (EDU) | 1 attended school, 0 never attended school | Dummy |
| Household size (HS) | Members of the Household of the farmer | Actual number |
| Household income (HI) | Household income | Rands |
| Marital status (MS) | 1 if married,0 otherwise | Dummy |
| Work off-farm | 1 if non-farm activities,0 otherwise | Dummy |
| Farm Size (FS) | The size of the land for the farmer | Hectares |
| Extension contact (EXT) | 1if extension contact,0 otherwise | Dummy |
| Access to credit (CRT) | 1 if access to credit,0 otherwise | Dummy |
| Membership of Association (MA) | 1 if member,0 otherwise | Dummy |
| Tractor use (TRC) | 1 if use tractor,0 otherwise | Dummy |

### 3.5 Chapter summary

The chapter has provided an overview of the study area, data set as well as the methods used for data analysis. The study employed descriptive statistics, Household Food Insecurity Access Scale and logistic regression model to achieve the objectives of the study. The study intended to determine food security status, examine factors influencing food security as well as identifying challenges faced in ensuring food security among small-scale maize farmers in Polokwane Local Municipality.

### 4. Ethical considerations

The study followed the University of Limpopo rules and regulations for research. The study was not harmful to human being, animals or the environment. The respondents were participating voluntarily not under duress. The information provided was kept confidential and has been used for research purposes only.

# CHAPTER FOUR

# RESULTS AND DISCUSSION

## 4.1 Introduction

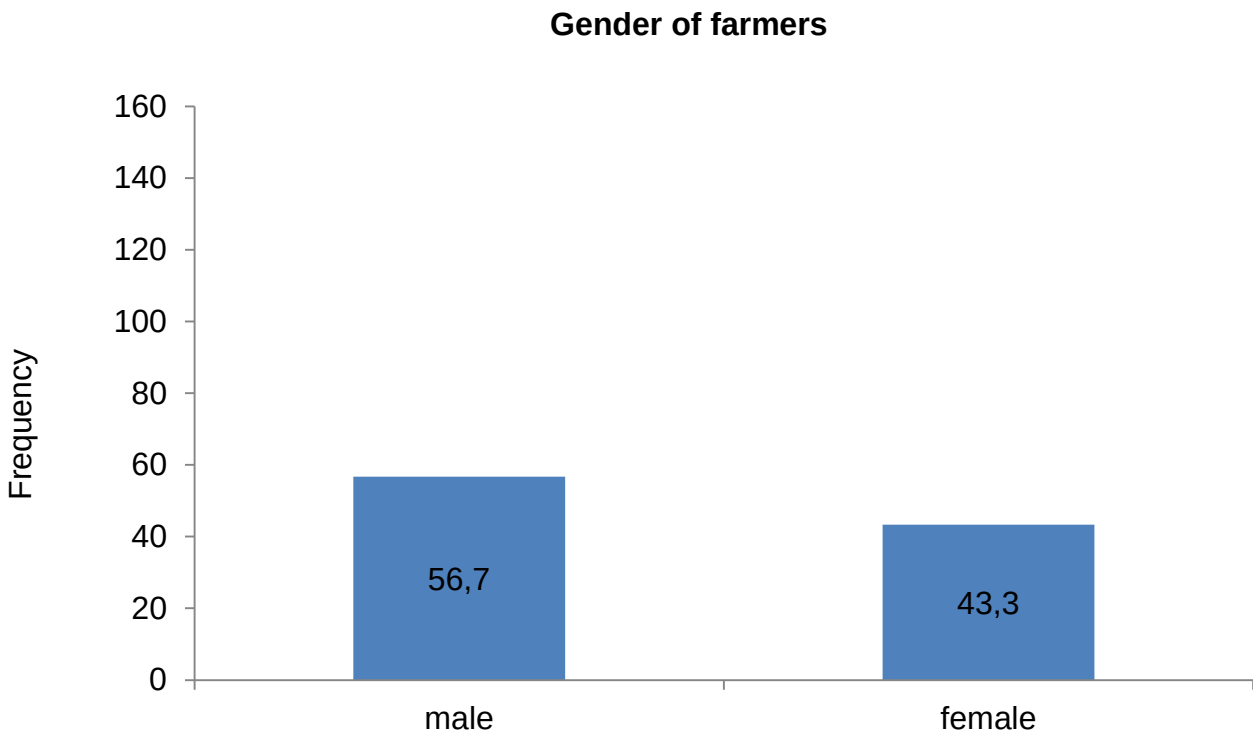
The chapter outlines the empirical results and findings of the context determinants of food security among small-scale maize farmers in Polokwane Local Municipality. Furthermore, the chapter describes the socio-economic characteristics of the small-scale maize farmers and determines food security status, as well as showing constraints faced by small-scale maize farmers in Polokwane Local Municipality.

## 4.2 Descriptive analysis of socioeconomic characteristics

The results from descriptive statistics were analysed using percentages, frequencies and graphs. These indicate the socio-economic characteristics of the small-scale maize farmers in Polokwane Local Municipality.

### 4.2.1 Gender of scale-scale farmers

Figure 4.1 shows the percentage of the gender of the small-scale maize farmers in Polokwane Local Municipality who have participated in the survey. It indicates that from sample size of 150 small-scale maize farmers, 56.7% of the participants were females, whereas 43.3% of the participants were males. This shows that most of small-scale maize farmers at Polokwane Local Municipality are females.

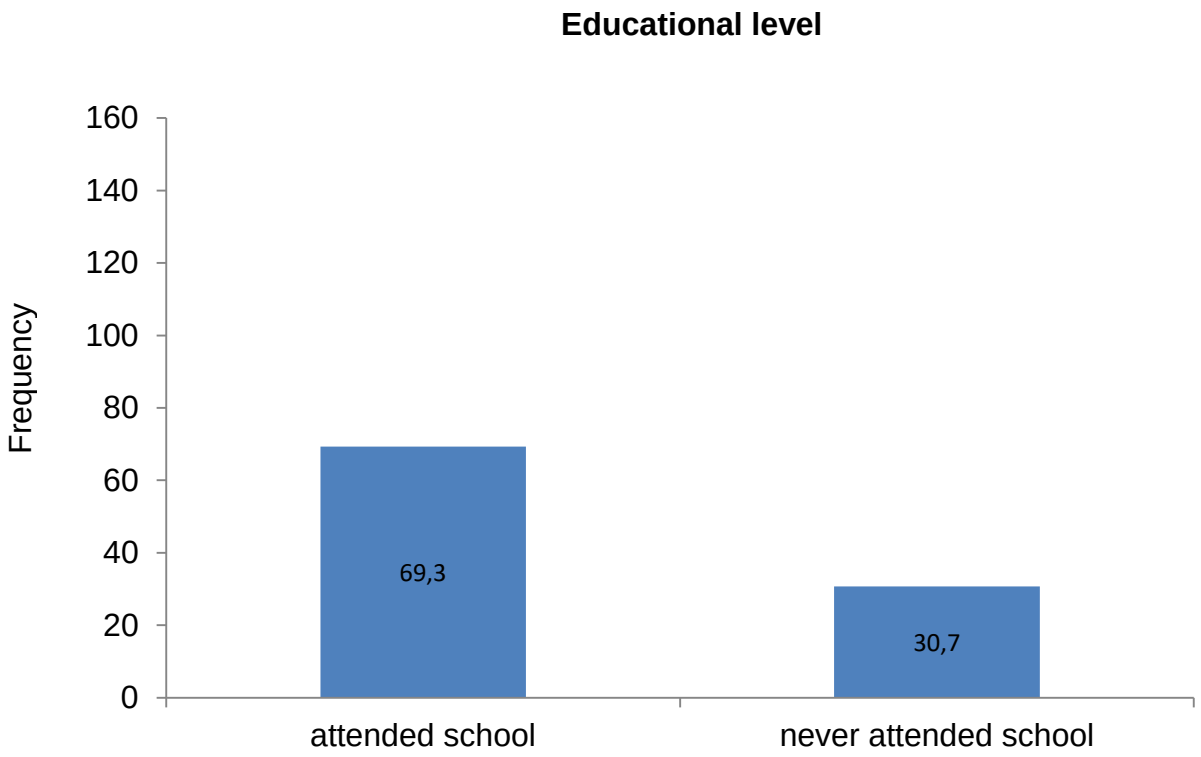



Source: Survey data (2019)

**Figure 4.1 Gender of small-scale farmers**

### 4.2.2 Educational level of farmers

Figure 4.2 shows the percentage of the educational level of the small-scale maize farmers at Polokwane Local Municipality. It indicates that from sample size of 150 small-scale maize farmers, 69.3% of the farmers have attended school including primary, secondary and tertiary education, while 30.7% of the farmers have never attended school.

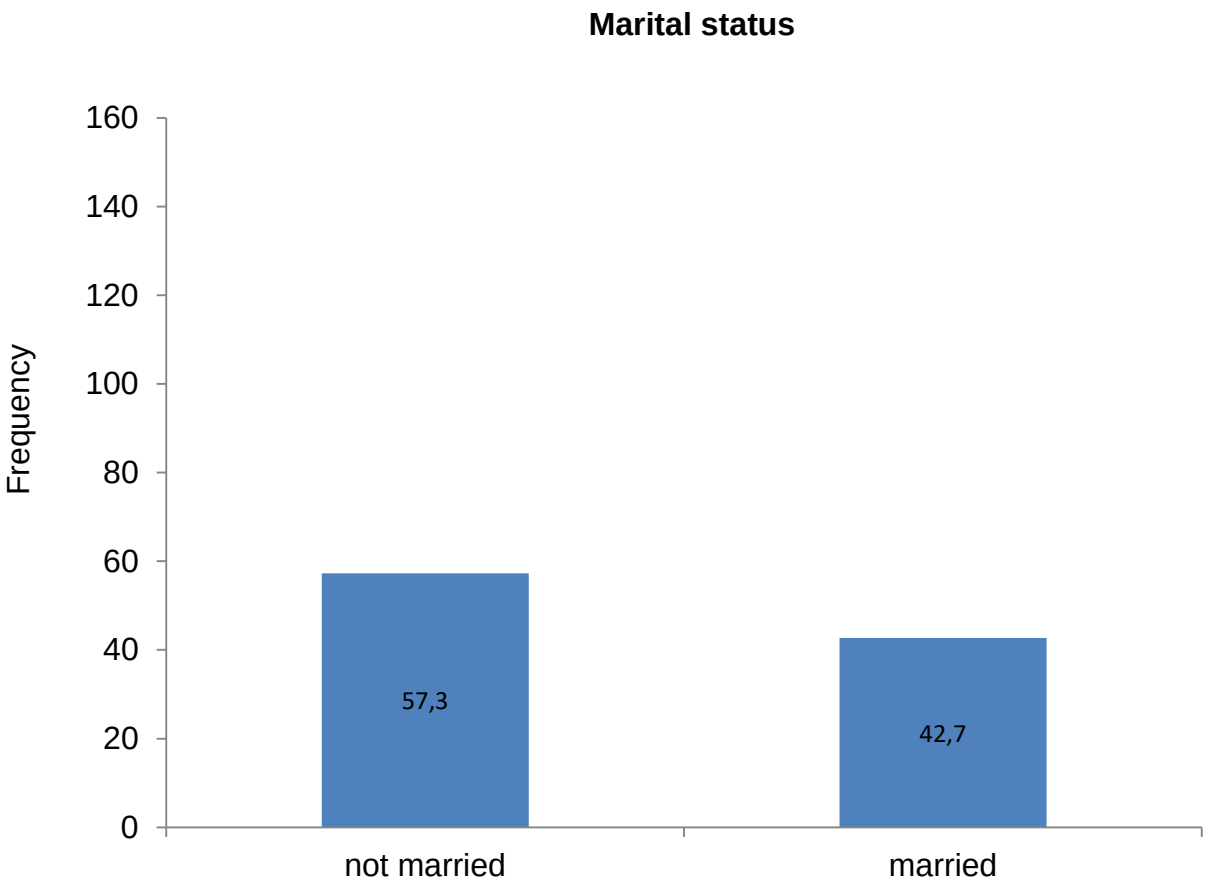



Source: Survey data (2019)

**Figure 4.2 Educational level of farmers**

### 4.2.3 Marital status of farmers

Figure 4.3 shows the percentage of the marital status of the small-scale maize farmers at Polokwane Local Municipality. It indicates that among sample size of 150 small-scale maize farmers 42.7% of the farmers were married, whereas 57.3% of the farmers were unmarried which include divorced, widowed and single.




Source: Survey data (2019)

**Figure 4.3 Marital status of farmers**

### 4.2.4 Work off-farm

Figure 4.4 shows the percentage of the small-scale maize farmers in Polokwane Local Municipality who were engaged not only on-farm activities, but also on non-farm activities. It indicates that from the sample size of 150 small-scale maize farmers, 52.7% of the participants were engaged on non-farm activities, whereas 47.3% of the participants were engaged on on-farm activities. This shows that most of small-scale maize farmers at Polokwane Local Municipality work off-farm.

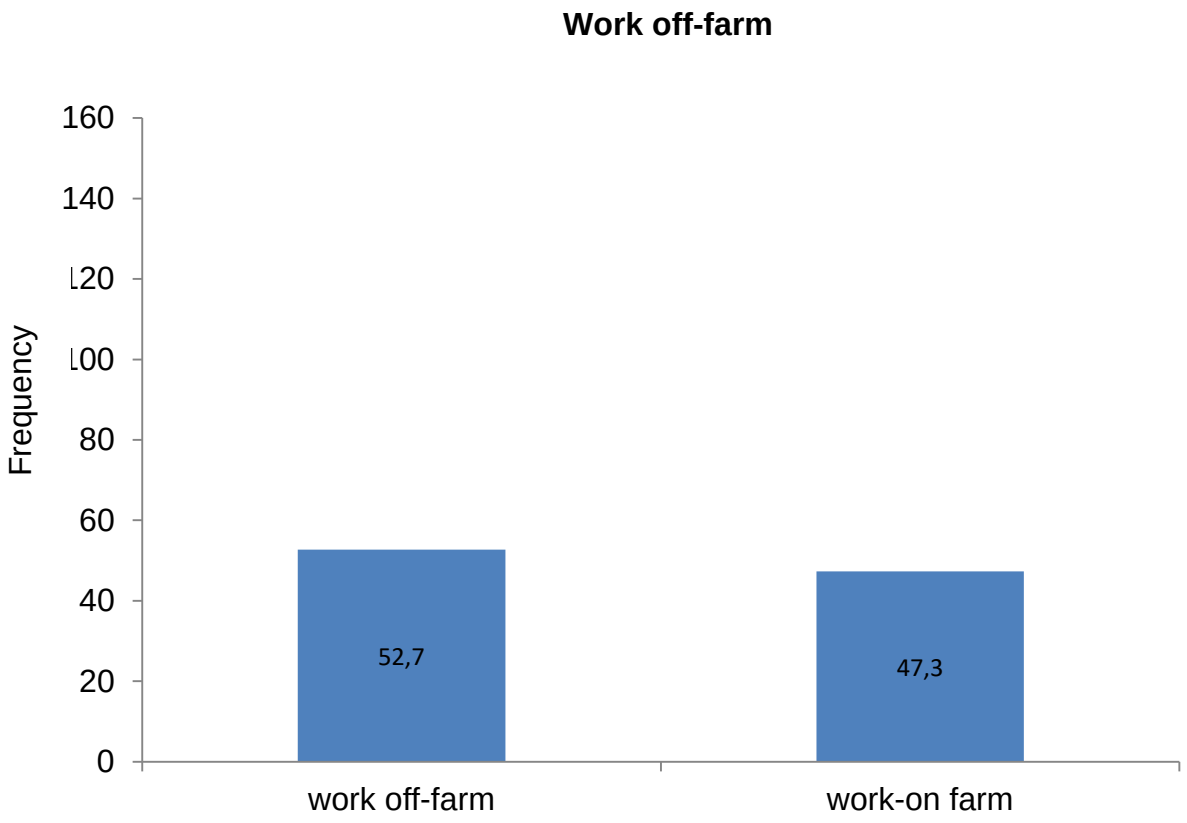
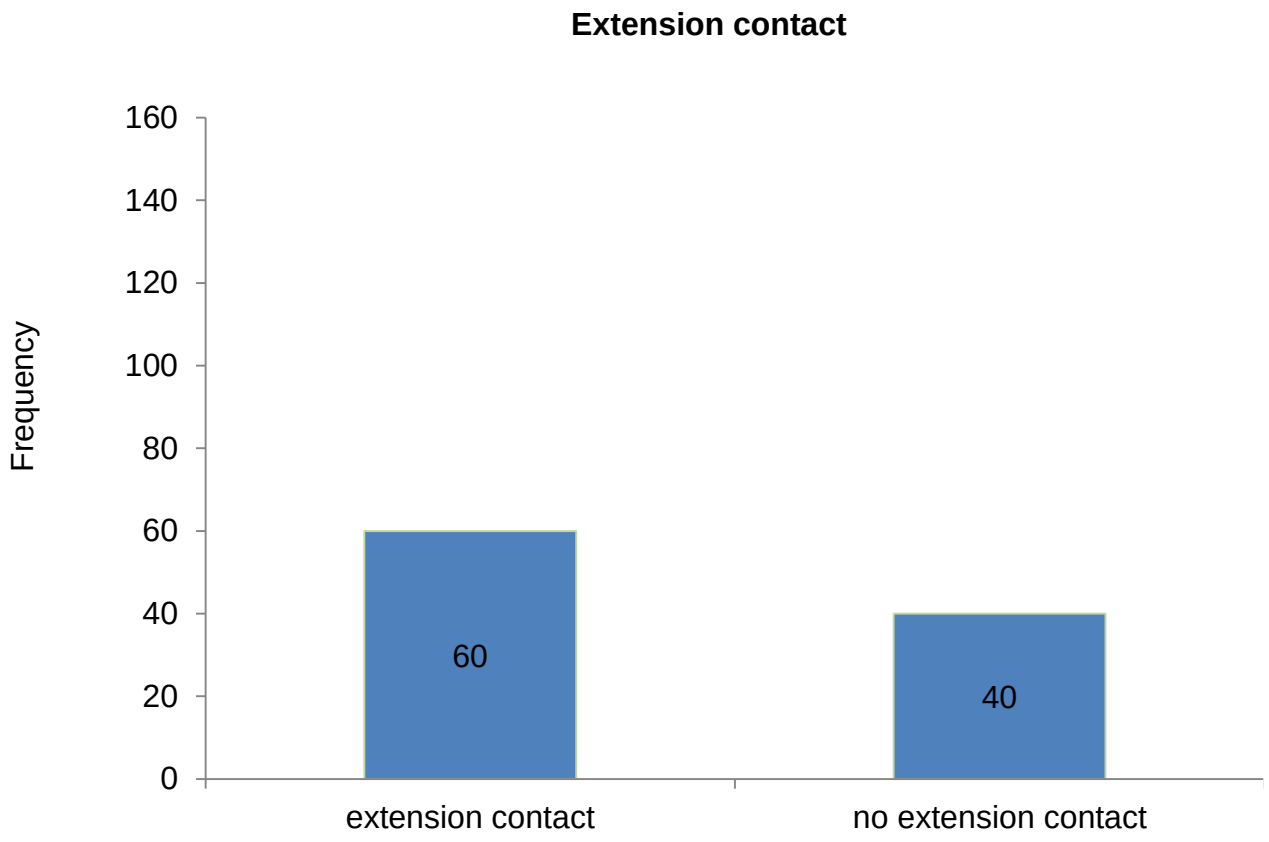



**Figure 4.4 Work off-farm**

Source: Survey data (2019)

### 4.2.5 Extension contact

Figure 4.5 shows the percentage of the small-scale maize farmers in Polokwane Local Municipality who have extension contact. It indicates that from the sample size of 150 small-scale maize farmers, 60% of the participants were found to have extension contact, whereas 40% of the participants do not have extension contact.

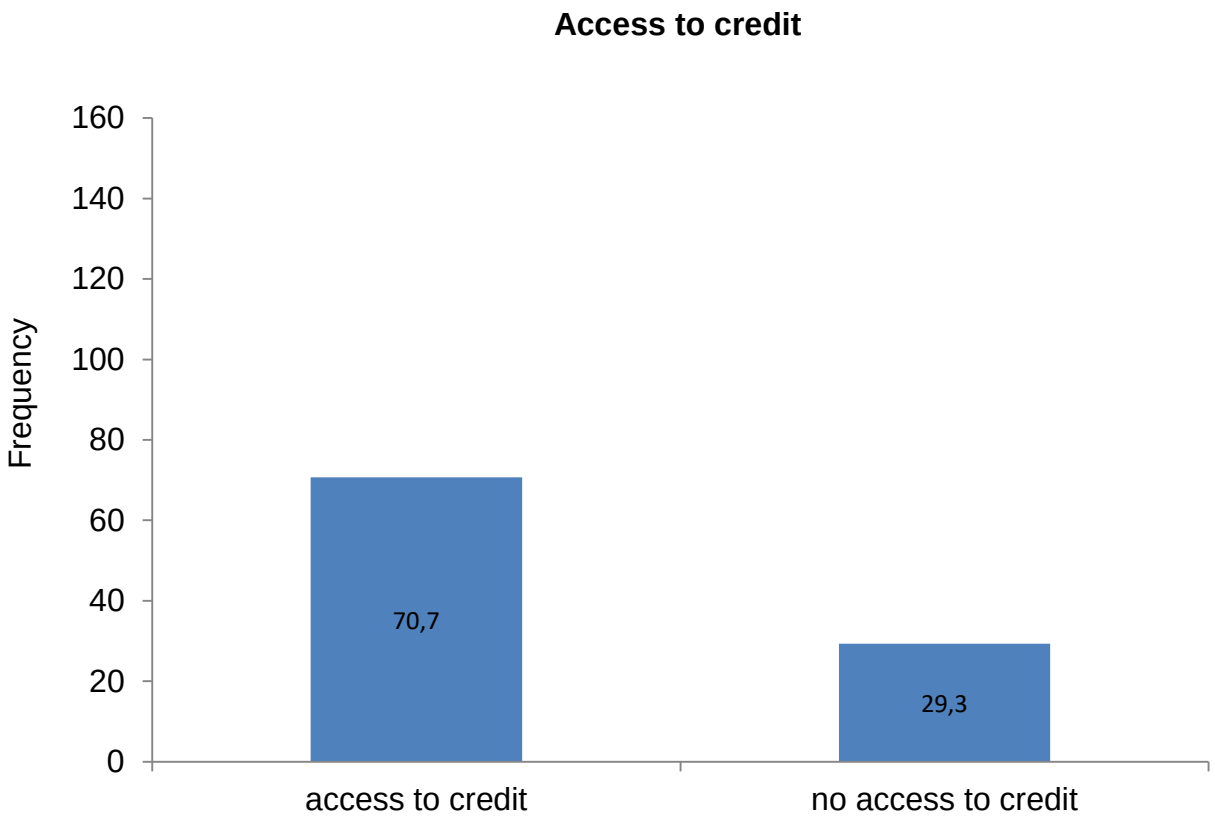



Source: Survey data (2019)

**Figure 4.5 Extension contact**

### 4.2.6 Access to credit facilities

Figure 4.6 shows the percentage of the small-scale maize farmers in Polokwane Local Municipality who have access to credit facilities. It indicates that from the sample size of 150 small-scale maize farmers, 70.7% of the participants were found to have access to credit facilities, whereas 29.3% of the participants do not have access to credit facilities.




Source: Survey data (2019)

**Figure 4.6 Access to credit**

### 4.2.7 Membership of association

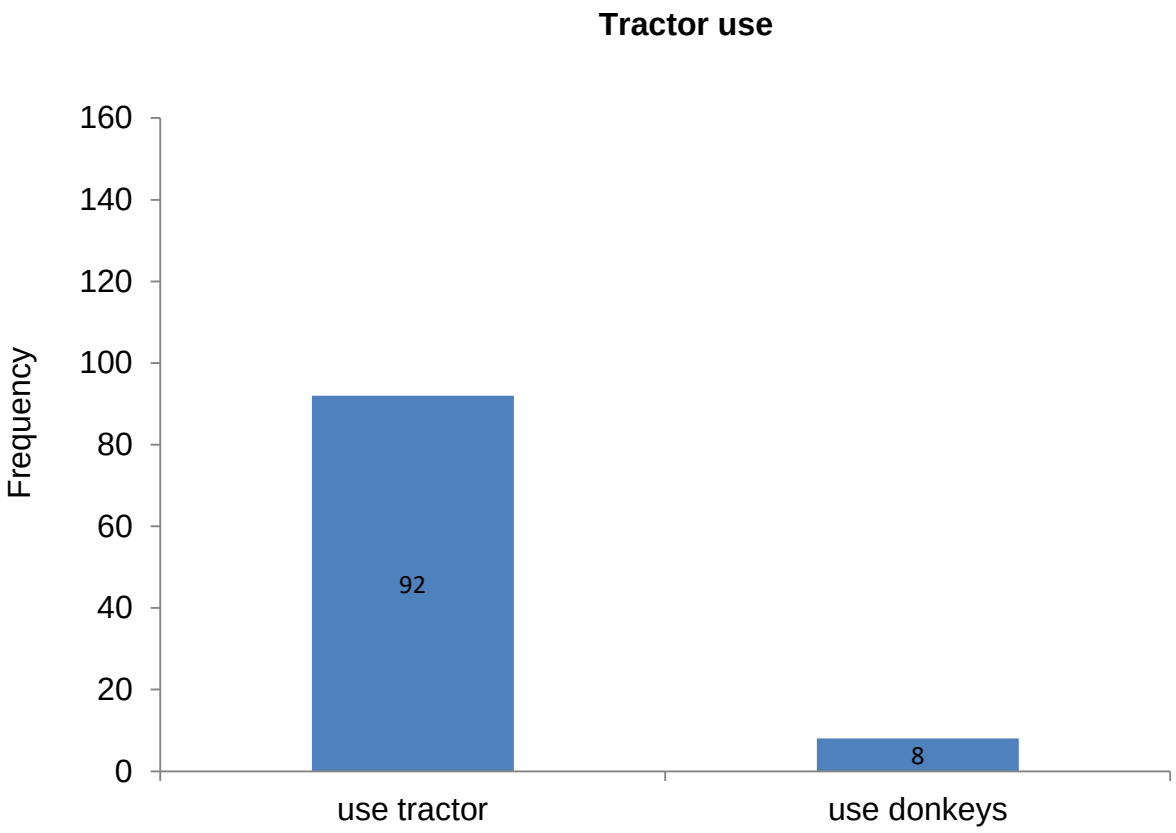
Figure 4.7 shows the percentage of the small-scale maize farmers in Polokwane Local Municipality who are members of any farmers association. It indicates that from the sample size of 150 small-scale maize farmers, 60% of the participants were found to be members of farmers association, whereas 40% of the participants were not part or members of any farmers association.


Source: Survey data (2019)

**Figure 4.7 Membership of association**

### 4.2.8 Tractor use

Figure 4.8 shows the percentage of the small-scale maize farmers in Polokwane Local Municipality who practice maize farming by using tractors. It indicates that from the sample size of 150 small-scale maize farmers, 92% of the participants were found to be using tractors for maize production, whereas 8% of the participants were using donkeys for the production of maize.




Source:Survey data(2019)

**Figure 4.8 Tractor use**

Table 4.1 Indicates that the minimum age of the small-scale maize farmers was 33 years, whilst the maximum age was 89 years. This shows that the maize farming in Polokwane Local Municipality consists of youth, adults and elderly people who receive old age grant and pensions. The mean age of the farmers was found to be 61.33 and the standard deviation of the age was found to be 14.998, this implies that the values in the data set are far away from the mean value. The standard deviation measures how the data sets concentrate to the mean value.

Furthermore, the table above shows that the minimum number of the household size of the small-scale maize farmers was one member and the maximum were found to be twelve members. The mean value of household size was 6.33 and the standard deviation was 2.229. The minimum household income was found to be R1250, while the maximum was R35000. The mean income of household was 10551.6 and the standard deviation of

household income was 6188.3. Lastly, the minimum farm size was 1 hectare and the maximum farm size was 6 hectares. The mean value of farm size was 2.75, whereas the standard deviation was 1.215.

**Table 4.1 Summary statistics of age, household size, household income and farm size of the farmers**

| Variables | Mean | Minimum | Maximum | Standard deviation |
|---|---|---|---|---|
| Age | 61.33 | 33 | 89 | 14.998 |
| Household size | 6.33 | 1 | 12 | 1.229 |
| Household income | 10551.6 | 1250 | 35000 | 6188.3 |
| Farm size | 2.75 | 1 | 6 | 1.218 |

Source: Survey data (2019)

### 4.3 Household Food Insecurity Access Scale

This section presents the results on the household food security status of small-scale maize farmers in Polokwane Local Municipality. The total numbers of food secure and food insecure households including mildly food insecure, moderately food insecure and severely food insecure households are presented. The section also displays the total percentages of food secure and food insecure households including mildly food insecure, moderately food insecure and severely food insecure households.

### Food security status of the farmers

A total number of 150 small-scale maize farmers were interviewed in the study and it was found that 80 households were food secure, and 70 households were food insecure. The food insecure households included three categories which were 24 mildly food insecure, 32 moderately food insecure and 14 severely food insecure households. The percentage of the household food security status of the small-scale maize farmers of Polokwane Local Municipality was found to be 53.3% food secure households and 46.66% food

insecure households including 16% mildly food insecure, 21.3% moderately food insecure and 9.3% severely food insecure.

**Table 4.2 Summary for categories of households' food security status**

| Food security status | Frequency | Percentage (%) |
|---|---|---|
| Food secure | 80 | 53.3 |
| Mildly food insecure | 24 | 16.0 |
| Moderately food insecure | 32 | 21.3 |
| Severely food insecure | 14 | 9.3 |

Source: Survey data (2019)

### 4.4 Logistic regression results

In this section, the results of the test for significance and non-significance of the determinants of food security among small-scale maize farmers are shown on Table 4.3 below. The table presents the socio-economic characteristics that influence food security among small-scale maize farmers. The table shows Logistic regression model results, as well as the socio-economic factors significantly and insignificantly influencing food security among small-scale maize farmers in Polokwane Local Municipality. A total number of twelve independent variables were included in the Logistic regression model. The table below shows that some of the variables, which were included in the model, were found to be significant and other variables were insignificant.

The Pseudo $R^2$ is 64.2%, which confirms that the model fits the data very well. Logistic regression model showed that out of the twelve variables included only six variables were found to be significant. The significant variables include age, educational level, household size, household income, farm size of the farmer and access to credit had influence on

food security among small-scale maize farmers. However, household size of the farmer has a significant negative influence on food security among small-scale maize farmers.

**Table 4.3 Results of logistic regression analysis on the determinants of food security of small-scale maize farmers**

| **Variables** | **Coefficient** | **Standard error** | **Wald significance** | **Significance level** |
|---|---|---|---|---|
| Age | 0.053***** | 0.030 | 3.151 | 0.076 |
| Gender | 0.081 | 0.563 | 0.021 | 0.885 |
| Educational level | 1.081** | 0.858 | 4.451 | 0.035 |
| Household size | -0.289** | 0.132 | 4.783 | 0.029 |
| Household income | 0.036*** | 0.008 | 22.501 | 0.000 |
| Marital status | 0.264 | 0.543 | 0.236 | 0.627 |
| Work off-farm | 0.037 | 0.547 | 0.004 | 0.947 |
| Farm size | 0.493* | 0.290 | 2.885 | 0.089 |
| Extension contact | 0.902 | 1.391 | 0.421 | 0.517 |
| Access to credit | 1.276* | 0.768 | 2.765 | 0.096 |
| Membership of association | 0.026 | 1.403 | 0.000 | 0.985 |
| Tractor use | 1.388 | 1.041 | 1.777 | 0.182 |

| | | | | |
|---|---|---|---|---|
| Constant | 6.591 | 2.597 | 6.442 | 0.011 |
| -2 log likelihood | | | 109.015 | |
| R squared | | | 64.2% | |
| % cases correctly predicted | | | 84.8% | |
| Number of observations | | | 150 | |

*, **, *** Significant at 10%, 5% and 1 % respectively.

Source: Survey data (2019)

### 4.4.1 Age of small-scale farmers

The coefficient of age of farmers was found to be positive and significant with 0.076 at 10% level of significance. This implies that the older the farmer the higher the probability that the household will be food secure. The value of wald indicates that one unit increase in the age of the farmer will increase the probability of household to be food secure by 3.151. This could be attributed by the fact that older farmers are likely to have more years of experience and they spend most of their time engaging on-farm activities, rather than off-farm activities as compared to younger farmers. The results concur with the findings of Oluwatayo (2009), Beyene and Muche (2010), Sekhampu (2013), Tefera and Tefera (2014), Ali *et al.* (2016), and Fawole and Ozkan (2017).

### 4.4.2 Educational level of farmers

The coefficient of the educational level of farmers was found to be positive and significant with 0.035 at 5% level of significance. This implies that the more educated the farmer the higher the probability that the household will be food secure. The value of wald indicates that one-year increase in the educational level of the farmer will increase the probability of household to be food secure by 4.451. This is because of that farmers who are educated are more likely to adapt to different technology in order to maximize the output and have greater chances of getting better paying jobs. The findings are in line with that

of Oluwatayo (2009), Bashir *et al. (*2012), Muche *et al*. (2014), Tefera and Tefera (2014), Ali *et al.* (2016) and Djangmah (2016).

### 4.4.3 Household size of farmers

The coefficient of the household size of farmers was found to be negative with 0.029 at 5% level of significance. This implies that the more the number of household members the lower the probability that the household will be food secure. The value of wald indicates that one unit increase in the member of household of the farmer will decrease the probability of household to be food secure by 4.783. This is because the demand for food consumption of household with bigger family size is higher and there is high competition for limited resources among members of the household. The results are supported by the findings of Oluwatayo (2009), Bashir (2012), Sekhampu (2013), Abafita and Kim (2014), Muche *et al*. (2014), Tefera and Tefera (2014), Abu and Soom (2016) and Ali *et al*. (2016).

### 4.4.4 Household Income of the farmers

The coefficient of the monthly household income of farmers was positive with 0.000 at 1% level of significance. This implies that the higher the income of the household of the farmer the higher probability that the household will be food secure. The value of wald indicates that a one-rand increase in the level income will increase the probability of household to be food secure by 22.501. This attributed to the fact that the patterns of quality and quantity of expenditure of the household depend on the level of income and higher income lead to increase in food access. The findings are in line with the results of Oluwatayo (2009), Bashir *et al*. (2012) Sekhampu (2013), Abu and Soom (2016), Ali et al (2016), Djangmah (2016) and Fawole, and Ozkan (2017).

### 4.4.5 Farm size

The coefficient of the farm size of farmers was found to be positive with 0.089 at 10% level of significance. This implies that the bigger the size of the farm, the higher probability that the household will be food secure. The value of wald indicates that a one-unit increase in the size of the farm will increase the probability of household to be food secure

by 2.885. This is because households with larger farm are more likely to produce in large quantities for household consumption and for sale. The results are similar to the findings of Feleke *et al*. (2003), Beyene and Muche (2010), Kassie *et al*. (2012), Kuwenyi *et al*. (2014), Tefera and Tefera (2014) and Abu and Soom (2016).

### 4.4.6 Access to credit

The coefficient of access to credit by the farmers was positive with 0.096 at 10% level of significance. This implies that the more the farmer has access to credit, the higher the probability that the household will be food secure. The value of wald indicates that a unit increase in access to credit will increase the probability of household to be food secure by 2.765. The farming households who have access to credit are able to increase their scale of production through purchasing improved farming inputs or technology in order to increase the income of household. The results concur with the findings of Fawole and Ozkan (2017) who argued that access to credit facilities by the farmer increases food security status of the household.

### 4.4.7 Gender of the farmers

The coefficient of gender of the farmers was found to be positive and not significant as expected. This implies that households headed by female farmers who were dominating at 56.7 % (figure 4.1) are the ones who were food secure as compared to households headed by male farmers. This may be as a result of most of farming in rural areas being practiced by females, while males are engaged in non-farm activities. The results contradict the findings of Oluwatayo, (2009), Sekhampu, (2013) Kuwenyi *et al*. (2014), Adebo and Falowo, (2015) who revealed that households headed by males are more food secure than household headed by females, because most of small-scale farmers who are engaged in maize farming in the study area were females.

### 4.4.8 Marital status

The coefficient of the marital status of the farmers was positive but not statistically significant as expected. This indicates that households headed by married are more likely to be food secure as compared to households headed by unmarried (divorced, widowed,

single). The results are in line with results of Oluwatayo, (2009), Djangmah, (2016), Fawole and Ozkan, (2017), Oluwatayo, (2017) who revealed that households headed by married persons are more likely to be food secure than others do.

### 4.4.9 Work Off-farm

The co-efficiency of off-farm activities was positive but not statistically significant as expected. This indicates that households that engage in various off-farm activities are more food secure than those who engage on-farm activities only. This is the case, because more household income for food consumption may be generated from various non-farm activities. The results are in line with Beyene and Muche, (2010), Abafita and Kim, (2014), Djangmah, (2016) who found that off-farm activities influence food security positively, meaning households engaged in various off-farm activities are more food secure than others do.

### 4.4.10 Extension contact

The co-efficiency of extension contact was positive but not statistically significant as expected. This indicates that households that have access to extension contact are more likely to be food secure than others do. The results are in line with the findings of Kassie *et al*. (2012) who found that food security among households increase with an increase in access to extension contact by household head.

### 4.4.11 Membership of association

The co-efficiency of membership of association was positive but not statistically significant as expected. This indicates that households heads who are members of any farmers association are more likely to be food secure than others do, this may be as a result of farmers having access to farming inputs and credits than others. The results are in line with Oluwatayo, (2009) and Kassie *et al*. (2012) who found that membership of association influence food security status positively, implying that farmers who are members of cooperatives are more food secure than others do.

### 4.4.12 Tractor use

The co-efficiency of the use of tractors for farming was positive but not statistically significant as expected. This indicates that households that use tractors for production of their maize are more likely to be food secure as compared to those who use donkeys for their production. This may be attributed to the fact that tractors take less time for ploughing, therefore enough land can be ploughed which may lead to more productivity, while donkeys consume a lot of time .

## 4.5. Hypothesis Testing and Model Fitness

The -2log likelihood ratio of 109.015 in Table 4.2 above indicates that the socio-economic characteristics of the small-scale maize farmers affect their food security status. Therefore, the null hypothesis, which states that the socio-economic characteristics of small-scale maize farmers in Polokwane Local Municipality do not affect their food security status, is rejected. The model was correctly predicted at 84.8%. This simply means that 84.8% of variations of households' food security status were explained by the included independent variables, whereas 15.2% that remained were not explained in the model due to external factors as a result of complexity in human behavior.

## 4.6 Constraints faced by small-scale maize farmers in ensuring food security

This section presents the identified constraints, which affects small-scale maize farmers of Polokwane Local Municipality in ensuring household food security. There were several constraints faced by small-scale maize farmers in ensuring food security among their households. The constraints include lower household income that reduce food expenditure and increase consumption of lower quality food by households, lack of enough land for agricultural production, insufficient access to quality food due to long distance to food market, lower level of agricultural production and higher market prices of staple food as well as unemployment status of household head or members.

## 4.7 Chapter summary

This chapter has provided an overview of the socio-economic characteristics of small-scale maize farmers through descriptive statistics. The socio-economic variables that influence food security among small-scale maize farmers were also presented in this chapter. Moreover, the food security status of the farmers was shown, as well as constraints faced by the small-scale maize farmers in ensuring food security in Polokwane Local Municipality. The following chapter will summarise, conclude and outline policy and recommendations based on the findings of the study.

# CHAPTER FIVE

# SUMMARY, CONCLUSION AND RECOMMENDATIONS

## 5.1 Introduction

The chapter summarizes the key findings of the study and makes conclusions based on the empirical results derived from the econometric analysis in chapter four. This chapter further presents the decision of the research hypotheses of the study stated earlier. Finally, recommendations were made in this chapter on how to improve food security among small-scale maize farmers in Polokwane Local Municipality based on the empirical results found during analysis process.

## 5.2 Summary

The aim of the study was to assess the factors influencing food security among small-scale maize farmers in Polokwane Local Municipality. The study had four objectives that are: (i) to identify and describe the socio-economic characteristics of small-scale maize farmers, (ii) to determine the household food security status, (iii) to examine factors influencing food security among small-scale maize farmers, and (iv) to identify the constraints faced by the small-scale maize farmers in ensuring food security in Polokwane Local Municipality. Finally, the hypotheses of the study were that (i) small-scale maize farmers in Polokwane Local Municipality are food insecure, and (ii) socio-economic characteristics of small-scale maize farmers in Polokwane Local Municipality do not affect their food security status.

The study used primary data, which was collected using well-structured questionnaires from the sample size of 150 small-scale maize farmers in Polokwane Local Municipality. Descriptive statistics was used to achieve objective one and Household Food Insecurity Access Scale was employed to achieve objective two. Lastly, Logistic Regression Model was employed to achieve objective three.

The descriptive results show that 56.7% of the farmers were females and 43.3% were males. This simply means that most of small-scale maize farmers in Polokwane Local Municipality are females and the respondents were mostly adults and elderly people, this imply that majority of youth are not involved in maize farming. It was further revealed that

69.3% of the farmers attended school, implying that most of the farmers in the study area are literate and educated. The food security status of the households was found to be 53.3% food secure households and 46.7% food insecure households including 16% mildly food insecure, 21.3% moderately food insecure and 9.3% severely food insecure.

The empirical results showed that some of the variables have statistically positive significance, while others have statistically negative significance; however, others were not statistically significant. It was indicated that only six variables were significant including age, educational level, household size, household income, farm size of the farmer and access to credit from twelve independent variables included in the model. Among all statistically significant variables, household size of the farmer was found to have negative influence on food security status. There were several constraints faced by small-scale maize farmers in ensuring household food security including lack of rain, lack of pesticides, drought, lack of insecticides, lack of fertilizers, locust infestation, lack of improved seeds and lack of finance that limit the farmers from purchasing farming inputs which are required for production.

### 5.3 Conclusion

The hypotheses of the study were that small-scale maize farmers in Polokwane Local Municipality are food insecure, socio-economic characteristics of small-scale maize farmers in Polokwane Local Municipality do not affect their food security status, and there are no known constraints faced by the small-scale maize farmers in ensuring food security in Polokwane Local Municipality. The study rejects the null hypothesis that states that small-scale maize farmers in Polokwane Local Municipality are food insecure and accept alternative hypothesis which states that small-scale maize farmers in Polokwane Local Municipality are food secure. Furthermore, the study rejects the null hypothesis, which states that socio-economic characteristics of small-scale maize farmers in Polokwane Local Municipality do not affect their food security status and accept alternative hypothesis, which states that socio-economic characteristics of small-scale maize farmers in Polokwane Local Municipality affect their food security status.

## 5.4 Recommendations

Based on the empirical results of the socio-economic characteristics of small-scale maize farmers that affect their food security status, some recommendations were drawn. Therefore, the present study recommends on various ways in which food security status of small-scale maize farmers can be improved. This study outlined some of important recommendations with regard to food security among small-scale maize farmers in South Africa. The following recommendations will assist on addressing some of the key challenges and problems faced by small-scale maize farmers, which were identified throughout the study.

### 5.4.1 Agricultural information

The age of the farmer was found to be positively statistically significant to food security status of the household, meaning that majority of adults and elders are engaged in maize farming. The study therefore, recommends that the government officials must assist adults and older small-scale maize farmers to improve their food security status. They must do so through providing them with relevant agricultural information, which will motivate them to continue practicing farming and provide them with knowledge on how they can improve their access to quality and nutritious food in order to achieve or ensure food security among their households.

### 5.4.2 Training

The educational level of the farmer was found to be positively statistically significant to food security, which implies that it increases probability of food security in the household. The government must provide agricultural training to the farmers through issuing of the farmers workshops, farmers weekly and support groups where small-scale maize farmers will be educated through improvement of their knowledge and skills on how to improve their agricultural production to ensure food security among their households through consuming proper quantity and quality nutritious food.

### 5.4.3 Family planning

The size of the household of the farmer was found to be negatively statistically significant, which means it decrease probability of food security among households. Therefore, there must be the provision of family planning programme by health officials where farmers will be educated about on how they can control birth among their households. The effectiveness of this program will result into household head having smaller number of members in the family.

### 5.4.4 Improvement in income generating activities

The household income of the farmers was found to have positive significant influence on food security status of the farmers. The government must provide the farmers with incentives and subsidies such as fertilizers, modified seeds, pesticides and insecticides that will increase the yield and improve the production of maize by small-scale farmers. This will help farmers in generating extra income for their households from the sales of surplus, which will result into households having enough income to purchase proper quality and quantity of food to be consumed in the household. Furthermore, there must also be expansion in off-farm income generating activities, which will lead to increase in the household income for food expenditure.

### 5.4.5 Increase the farm size

The farm size of the farmers was found to increase the probability of the household being food secure. Therefore, the study recommends that government officials at regional level should improve access to land for agricultural production by maize farmers, meaning to increase the farm size of the farmers through issuing of the programmes such as enlargement of land for cultivation, relocation, renovation of ruined land for agricultural production.

### 5.4.6 Financial support

The access to credit facilities by the household head was found to be positively statistically significant. The government must provide grants to farmers in the form of fertilizers, improved seeds, pesticides, insecticides and tractors so that they will be able

to improve their production that will lead to high household income as they will be selling the surplus. Moreover, the financial institutions such as Micro Agricultural Financial Institutions of South Africa (MAFISA), Commercial banks, and Land bank should be provided in order to help farmers in rural areas to have access to credit facilities in order to improve their production and ensure food security among their households.

### 5.5 Area of further research

The study focused on factors that influence food security status of small-scale maize farmers of Polokwane Local Municipality in Capricorn District of Limpopo Province. These are some of the recommendations regarding further studies, which will assist in broadening the study in the future.

This study has focused on small-scale maize farmers of Polokwane Local Municipality in Capricorn District of Limpopo Province. These farmers do not certainly represent the total population of small-scale maize farmers in South Africa, therefore generalizing the results might be impossible. A study can be conducted based on the whole district, Limpopo Province as well as all nine provinces of South Africa that have small-scale maize farmers, since the results of this study focused solely on farmers at Polokwane Local Municipality.

The study focused mostly on determinants of food security and constraints faced by farmers when ensuring food security and not strategies used to address those constraints, therefore, one may conduct a study focusing on this aspect. Furthermore, a study can be conducted on ways in which the government has introduced food security with regard to small-scale maize farmers, by evaluating policies concerning small-scale maize farmers and food security. That is policy consistency in relation to the small-scale maize farmers. The present study was not able to look thoroughly at policies, which are related to small-scale maize farmer.

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**Annexure A: Questionnaire**

**UNIVERSITY OF LIMPOPO (Turfloop Campus)**

**Faculty of Science and Agriculture**

**School of Agricultural and Environmental Sciences**

**Department of Agricultural Economics and Animal Production**

**DETERMINANTS OF FOOD SECURITY AMONG SMALL-SCALE MAIZE FARMERS IN POLOKWANE LOCAL MUNICIPALITY, CAPRICORN DISTRICT, LIMPOPO PROVINCE, SOUTH AFRICA**

Name of enumerator……..

Date of data collection……

Questionnaire number…….

**Section A: Socio-economic characteristics of the farmers**

1. Age of the farmer in years? .....
2. Gender of the farmer?

| Male | Female |
|---|---|
| 1 | 2 |

3. Educational level of the farmer

| Attended school | Never attended school |
|---|---|
| 1 | 2 |

4. Household size of the farmer (the members of the household who are staying in the house)? …….

5. Marital status of the farmer

| Married | widowed | divorced | single |
|---|---|---|---|
| 1 | 2 | 3 | 4 |

6. Do you have access to extension service?

| Yes | No |
|---|---|
| 1 | 2 |

7. If yes, what kind of service do you receive…….....
   ……..
8. Primary occupation: Farming [ ] Public salaried job [ ] Private salaried job [ ] Craftsman and artisan [ ] other [ ] specify …….
9. Household income sources: Crop income [ ] Livestock income [ ] Agricultural income [ ] Non-agricultural income [ ] Self-employed [ ] remittance [ ] other [ ] specify…….
10. Monthly household income……..
11. Do you have access to credit?

| Yes | No |
|---|---|
| 1 | 2 |

12. If yes, what is the amount of credit received?.....
13. Farm size (ha)……
14. Do you use tractor for ploughing?

| Yes | No |
|---|---|
| 1 | 2 |

15. If no, what are you using for ploughing, specify……
16. Are you a member of any farmers association?

| Yes | No |
|---|---|
| 1 | 2 |

17. What challenges are you facing when coming to ensure food security?……
……
……

**Household Food Insecurity Access Scale (HFIAS) Measurement Tool**

| No. | Question | Response options | Code |
|---|---|---|---|
| 1. | In the past two weeks, did you worry that your household would not have enough food? | 0 = No (skip to Q2)<br>1=Yes | [ ] |
| 1.a | How often does it happen? | 1 = Rarely (once or twice in the past two weeks)<br>2 = Sometimes (three to ten times in the past two weeks)<br>3 = Often (more than ten times in the past two weeks) | [ ] |
| 2. | In the past two weeks, were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources? | 0 = No (skip to Q3)<br>1=Yes | [ ] |
| 2.a | How often does it happen? | 1 = Rarely (once or twice in the past two weeks)<br>2 = Sometimes (three to ten times in the past two weeks)<br>3 = Often (more than ten times in the past two weeks) | [ ] |
| 3. | In the past two weeks, did you or any household member have to eat a limited variety of foods due to a lack of resources? | 0 = No (skip to Q4)<br>1 = Yes | [ ] |
| 3.a | How often does it happen? | 1 = Rarely (once or twice in the past two weeks) | [ ] |

| | | | |
|---|---|---|---|
| | | 2 = Sometimes (three to ten times in the past two weeks)<br>3 = Often (more than ten times in the past two weeks) | |
| 4. | In the past two weeks, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food? | 0 = No (skip to Q5)<br>1 = Yes | [ ] |
| 4.a | How often does it happen? | 1 = Rarely (once or twice in the past two weeks)<br>2 = Sometimes (three to ten times in the past two weeks)<br>3 = Often (more than ten times in the past two weeks) | [ ] |
| 5. | In the past two weeks, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food? | 0 = No (skip to Q6)<br>1 = Yes | [ ] |
| 5.a | How often does it happen? | 1 = Rarely (once or twice in the past two weeks)<br>2 = Sometimes (three to ten times in the past two weeks)<br>3 = Often (more than ten times in the past two weeks) | [ ] |
| 6. | In the past two weeks, did you or any other household member | 0 = No (skip to Q7) | |

| | | | |
|---|---|---|---|
| | have to eat fewer meals in a day because there was not enough food? | 1 = Yes | [ ] |
| 6.a | How often does it happen? | 1 = Rarely (once or twice in the past two weeks)<br>2 = Sometimes (three to ten times in the past two weeks)<br>3 = Often (more than ten times in the past two weeks) | [ ] |
| 7. | In the past two weeks, did you experience a situation of not having something to eat because of lack of resources to get food? | 0 = No (skip to Q8)<br>1 = Yes | [ ] |
| 7.a | How often does it happen? | 1 = Rarely (once or twice in the past two weeks)<br>2 = Sometimes (three to ten times in the past two weeks)<br>3 = Often (more than ten times in the past two weeks) | [ ] |
| 8. | In the past two weeks, did you or any household member go to sleep at night hungry because there was not enough food? | 0 = No (skip to Q9)<br>1 = Yes | [ ] |
| 8.a | How often does it happen? | 1 = Rarely (once or twice in the past two weeks) | [ ] |

| | | | |
|---|---|---|---|
| | | 2 = Sometimes (three to ten times in the past two weeks)<br>3 = Often (more than ten times in the past two weeks) | |
| 9. | In the past two weeks, did you or any household member go a whole day and night without eating anything because there was not enough food? | 0 = No<br>1 = Yes | [ ] |
| 9.a | How often does it happen? | 1 = Rarely (once or twice in the past two weeks)<br>2 = Sometimes (three to ten times in the past two weeks)<br>3 = Often (more than ten times in the past two weeks) | [ ] |

**Section C: Coping Strategies available for the households**

| **What do you do when you do not have enough food and do not have enough money to buy food?** |
|---|
| **1. Dietary Change** |
| a. Rely on less preferred and less expensive foods |
| **2. Increase Short-Term Household Food Availability** |
| b. Borrow food from a friend or relative |
| c. Purchase food on credit |
| d. Gather wild food, hunt or harvest immature crops |

| |
|---|
| e. Consume seed stock held for next season |
| **3.Rationing strategies** |
| a. Limit portion size at mealtimes |
| b. Restrict consumption by adults in order for small children to eat |
| c. Reduce number of meals eaten in a day |

**Consumption coping strategies response**

| Behaviours :In the past 7 days , if there have been times when you did not have enough food or money to buy food, how many days has your household had to : | Frequency: Number of days out of past seven: ( Use numbers 0-7 to answer number of days; Use NA for not applicable) |
|---|---|
| a. Rely on less preferred and less expensive foods? | |
| b. Borrow food from a friend or relative? | |
| c. Purchase food on credit? | |
| d. Gather wild food, hunt or harvest immature crops? | |
| e. Consume seed stock held for next season? | |
| f. Limit portion size at mealtimes? | |
| g. Restrict consumption by adults in order for small children to eat? | |
| h. Reduce number of meals eaten in a day? | |