

ASSESSING FOOD SECURITY INDICATORS IN BA-PHALABORWA LOCAL
COMMUNITIES, MOPANI DISTRICT, LIMPOPO PROVINCE, SOUTH AFRICA

by

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ABSTRACT

This study investigated the food security indicators in the rural communities of Ba-Phalaborwa Local Municipality of the Limpopo Province. Quantitative data were gathered from five villages in the municipality using the probability proportionate to size. Data were collected from 185 households.

The analytical tools that were used in this study include: Descriptive Statistics, Food Security Indicator Measures and the Logistic Regression Model. Food security is a multidimensional concept; thus it is difficult to measure it comprehensively. Hence, three food security indicators measures, namely; the Household Food Insecurity Access Scale (HFIAS), Household Dietary Diversity Score (HDDS) and Coping Strategies Index (CSI) were combined in this study to measure food security in the study. Each indicator measure was used independently.

The Logit Regression Model was used to determine the factors affecting the status of household food security. Certain explanatory variables, namely; household size, marital status and receiving government grant, had a negative relationship with the dependent variable. On the other hand, other variables such as educational level, employment status, gender distance to the markets and health status of the household head were positively correlated with the household's food security status.

The study rejected the null hypothesis which stated that socioeconomic factors do not have influence on the households' food security status in the Ba-Phalaborwa local municipality. Out of the 11 variables, only four variables were significant, with the household size at 10%, educational level at 5%, household monthly food expenditure at 1% and distance to the market at 10%, respectively. Therefore government should direct more focus should on the introduction of feeding schemes in order to reduce the burden on the poor and at the same time, make it easier for young children to attend school to improve their educational statuses.

The households in the study area are not food secured because 65.4 % of households could not afford the food that they preferred and were depending on borrowing food from their relatives and creating debts.

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I am also indebted to my colleagues who were always eager to help me whenever I called for assistance throughout the project. I humbly extend my gratitude to all the individuals who have co-operated and assisted me in the completion of this research.

DECLARATION

I declare that Assessing Food Security Indicators in Ba-Phalaborwa Local Communities, Mopani District, Limpopo Province, South Africa mini dissertation hereby submitted to the University of Limpopo for the degree, MSC Agriculture (Agricultural Economics) has not been previously submitted by me for a degree at this or any other university; that it is my work in design and in execution, and that all material contained herein has been duly acknowledged.

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Date

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ABBREVIATION AND ACRONYMS

CSI- Coping Strategy Index

DAFF - Department of Agriculture Forestry and Fisheries

DDS- Dietary Diversity Scale

FAD - Fisheries and Aquaculture Department

FANTA - Food and Nutrition Technical Assistance

FAO - Food and Agricultural Organization

FCS - Food Consumption Score

FVS- Food Variety Score

GDP- Gross Domestic Product

DBSA - Development Bank of South Africa

HDD -Household Dietary Diversity

HFIAS - Household Food Security Access Scale

HSRC -Human Sciences and Research Council

HIV/AIDS - Human Immune Deficiency Virus and Acquired Immune Deficiency Syndrome

IFPRI - International Food Policy Research Institute

STATS SA - Statistics South Africa

SDG - Sustainable Development Goals

UNCTAD – United Nations Conference on Trade Development

USDA – United States Department of Agriculture

USAID- United States Agency for International development

WAF - World Agricultural Forum

WFS- World Food summit

CHAPTER ONE

INTRODUCTION

1.1 Background

This study looks at measures and commonalities in the experience and expression of food security across different households at Ba-Phalaborwa local municipality. Despite the fact that enough food is produced to feed the rapidly growing population globally (Holt-Giménez *et al.*, 2012), about 805 million people are estimated to be extremely underfed (FAO *et al.*, 2014). The World Food Programme (2019) indicated that the proportion of households that cannot afford to buy the required nutritious food constitute a high percentage in most countries. This indicates that food security is continuing to be a major concern for most countries. Policy makers must urgently come up with working interventions in order to overcome the food shortage pandemic. Allen *et al.* (2019) and Ansari *et al.* (2018) concurred that food supply chain interventions to improve nutrition do not always achieve the desired results.

The study conducted by Power (2005) indicated that within the household, food insecurity often affects the more vulnerable members of the family, namely; children and women. Thus, the costs associated with food-insecurity at the intra-household level relate to slow educational development (often of female children). Prices are the main channel through which food supply chain interventions change diets (Thurlow *et al.*, 2018; Breisinger *et al.*, 2019). A majority of poor countries are characterised by food prices which serve as a barrier to the consumption of healthy and nutritious food. This is because the price of nutritious food tends to be higher than the price of less nutritious food (Headey and Alderman, 2019). A country with a majority of food insecure citizens can lead to a lower Gross Domestic Product of the country, making food insecurity an economic challenge (FAO, 2012). To achieve the goal of hunger eradication in a justifiable manner, as proposed in the (SDG) Sustainable Development Goals (United Nations Department of Economic and Social Affairs, 2014), there is a need for indicators that will provide appropriate information on food security measurements (D' Haen and De Haese *et al.*, 2011).

The lack of consistent measures that can be used as a benchmark for satisfactorily observing of food security conditions is still a challenge (Jones *et al.*, 2013). It is also very difficult to find a comprehensive indicator that incorporates all the dimensions captured in the standard international definition of food security. The study conducted by Nathalie (2012) and FAO (2013) emphasised the use of two or more complementary indicators that measure different dimensions of food security to achieve a more comprehensive food security status measurement. Maxwell and Coates (2012) indicated that the focus of improving food security measurement should be on understanding how the food security indicators, especially the commonly used ones (HFIAS, DDS, and CSI), complement each other, and their application to the different levels of food security (global, national, community, household and individual).

Measures like consumption and income are considered by many to be the gold standard and proxy indicators of an unobservable underlying phenomenon (food insecurity) that cannot be measured directly. These types of data also fail to capture the key components of vulnerability to food insecurity and household strategies for managing risk. Households with restricted financial resources tend to have a lesser likelihood of owning private vehicles, making it challenging for these households to capture the dimension of food security accessibility because households without reliable transports are likely to experience difficulties in accessing food stores (Ma *et al.*, 2017).

1.2 Problem statement

Food insecurity is a major challenge that plays that affects the physiological, environmental and economic development of a country. According to the United States Department of Agriculture (USDA) Economic Research Service (2017), food security is defined as access by all people at all times to enough food for an active and healthy life. In South Africa, conditions of food insecurity are believed to affect all household members, although not necessarily in the same way. The Food and Agriculture Organisation (FAO) (2017) and Drysdale & Moshabela,(2021) pointed that the current increase in the number of food insecure households is linked with violent conflicts, climate-related issues and socio economic characteristics .The Ba-Phalaborwa local

municipality is one of the municipalities where a couple of different chiefs lead the areas. A majority of rural households in the study area are characterised by low levels of education and largely depend on agriculture as their main source of income. Furthermore, rural farming is often characterised by small farms with low incomes and low production mainly for subsistence which leaves little marketable surplus. Since the commencement of the national lockdown which was necessitated by the Covid-19 pandemic in South Africa, households with low levels of educational attainment and high dependence on labour income not only experienced a massive income shock, but also had their food security jeopardized since they were unable to obtain their staple food because some of the informal businesses where they purchase groceries were closed down (Channing, Rob and Sherwin 2020). Access to hired labour in agricultural sector have been disturbed.

Moreover because prospective workers are unwilling to travel to work sites, or because prohibitions on movement mean that workers cannot travel or because strict enforcement of social distancing regulations restricts the number of workers who can work together (Devereux, Béné, and Hoddinott, 2020).

Studies by Nathalie (2012) and D'Haese *et al.* (2011) combined six measures of the food security situation in the Limpopo Province of South Africa to capture all the dimensions because none of the measures can singularly capture all the dimensions. Pérez-Escamilla *et al.* (2017) indicated that intellectual food security indicators are needed to properly monitor and address food security across countries. This can also assist policy makers to develop relevant interventions. The challenge of food insecurity is persisting due to the point that people are reluctant to express the deprivation that they experience because of embarrassment, among other issues FAO, UNICEF and WHO *et al.* (2018), the concept of food security is broad. This makes its measurement complex. It is for this reason that this study combined the three food security measures to ensure that the four dimensions, namely; affordability, adequacy, availability and accessibility were adequately captured.

From the foregoing, this study intended to answer the following research questions:

1. What are the socioeconomic characteristics of the rural households in the study area?
2. What are the food security indicators in the study area?
3. What are the determinants of food security in the Ba-Phalaborwa Local Municipality?
4. What are the available coping strategies employed by food insecure households?

1.3 Rationale

Household food security is a major determinant of nutrition security that can only be fully understood through a multi-level analysis taking into account global, national, as well as local, household and individual-level factors. Crush *et al.* (2012) highlighted that the problem of food security must be analysed and assessed from different perspectives. According to Mohapatra *et al.* (2010), it is often difficult to identify appropriate methods of measuring food security at a household level since the concept is based on households' behaviours because some people can be food insecure and still not see it as a challenge because they are used to the situation. This essentially results in the literature gap on food security studies at the household level. Statistics South Africa (STATA SA) (2017) has shown that South Africa is food secure at the national level but food insecure at the household level, as not all households have access to adequate food. According to Boatemma, Drimie & Pereira, (2018) despite the interventions put in place by government, food insecurity in South Africa has persisted due to gaps in and contradictions among policies and the lack of coordination in policy development and implementation, especially across sectors. Richardson (2010) confirms that hunger and malnutrition remain a severe problem in developing countries. According to Channing and Rob (2020), despite the official lockdown measures put in place, in developing countries where food insecure households receive no or very limited support, households tend to make a choice between generating income to prevent food shortage and accepting the risk of becoming infected by Covid-19. This emanated from the reductions of hours worked by labourers, particularly those with only primary school education. The study aimed to assist in the enhancement of the wellbeing of households in the study area. The International Food Policy Research Institute (IFPRI) (2017) indicated that food insecurity

contributes immensely to the prevalence of issues such as hunger, rural migration and congestions in urban areas. A majority of rural households are still unable to secure their food despite the huge efforts put forward by both public and private sectors to assist poor households in achieving food security (Channing and Rob, 2020).

Thus, this study sought to address the important gap in the literature by analysing the common food-security indicators. It was envisaged that this will assist in the formulation and implementation of more relevant food policies and programmes.

1.4 Aim of the study

The aim of this study was to examine food security indicators in the Ba-Phalaborwa communities.

1.5 Objectives of the study

The objectives of the study were to:

- i. Identify and describe socioeconomic characteristics of rural households in the study area.
- ii. Evaluate the food security indicators in the study area.
- iii. Assess the determinants of food security in the Ba-Phalaborwa Local Municipality.
- iv. Identify the coping strategies employed against food insecurity in the study area.

1.6 Hypothesis of the study

- i. Socio-economic factors do not have influence on the household's food security status in the Ba-Phalaborwa Local Municipality.

1.7 Organisational structure

The study is organised into five chapters. The first chapter includes the background, problem statement, research questions, rationale, aims, objectives, and hypothesis as well the layout of the study.

Chapter two of this study is literature review, which covers the introduction, definitions and the challenges faced by the world in terms of food security. The chapter also covers the review of local and international studies on food security. The third chapter is research methodology; it describes the study area, data collection method, sampling method and procedure, and the analytical tools used in data analysis. The fourth chapter comprises

the presentation of the results and the discussion of the findings. The last chapter consists of the summary, conclusions and policy recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter constitutes the theoretical overview of the 'food security' concept. The chapter also pays particular attention to the concept 'food security' by defining it and providing different methods of its measurement. It also provides reviews on the history of food security in South Africa and internationally. Food security is a national and international discourse for politicians, academics, and civil society.

2.2 Historical review of food security

There are various interpretations on what food security really means and, over the years, the 'food security' has been regarded as a flexible concept (FAO, 2003). Notwithstanding, the definition of food security has evolved over time, reflecting an increasing appreciation of the complexity inherent in the concept. In the 1970s, the focus was on global and national food supplies as food availability was thought to be synonymous with food security (Maxwell and Smith, 1992).

The importance of investigating food security has been highlighted by the recent financial crises (McDonald, 2010). Shonika (2011) indicated that over the years, the rise in the cost of food prices, natural disasters and poverty all contributed to household food insecurity, particularly in developing countries. Coates, Webb and Houser (2003) and Nord *et al.* (2002) purported that the occurrence of certain behaviour may indeed characterise different experiences of food insecurity and this level of detail should not be lost when the item responses are dichotomised before analysis.

According to Sarlio-Laehteenkorva and Lahelma (2001), the association between past and present economic disadvantages and food insecurity is poorly understood. There are three main reasons for this: first, most studies of food insecurity and hunger are cross-sectional in nature; second, recall of past behaviour is notoriously difficult to measure and validate; third, disentangling recent experience from current status is problematic, especially where questions about food security are based on recall over twelve months.

Tesfaye and Tirivayi (2018) revealed that in Ethiopia, improved storage technology use was associated with lower child stunting in crop-producing households.

2.3 Definition of food security

Food is one of the basic physical needs for human survival. Food is a critical determinant of health because the quality and quantity of food that is consumed has an effect on health (Ostry, 2010). An individual can access food by producing, consuming and obtaining it through food aid (Madziakapita, 2008). According to Mc Carthy and Uysal (2018), food security is both a multifaceted and challenging issue, which makes it difficult to resolve since it can neither be categorised or limited by geography nor defined by a single grouping such as demography, education, geographic location or income.

Hoddinott (2001) opines that relevant literature provides about 200 definitions of food security. This is further corroborated by Nathalie (2012) who reported that there are about 250 definitions and 450 indicators of food security. This has brought as much knowledge as it did the difficulties in the measurement of the concept. The most common definition of food security used today was provided by the World Food Summit in 1996. The definition has become a general understanding of what food security entails (FAO, 1996a). The definition identifies four fundamental elements of food security; food access, availability, adequacy and affordability. According to FAO, UNICEF and WHO (2018), food security is defined as access by all people at all times to enough food for an active, healthy life. Thus, food security includes at a minimum: (1) the ready availability of nutritionally adequate and safe foods, and (2) an assured ability to acquire acceptable foods in socially acceptable ways (e.g., without resorting to emergency food supplies, scavenging, stealing, or other coping strategies) (FAO, 1996a).

The four dimensions of food security are important to consider in this study. Food access implies that households should have access to sufficient resources in order to obtain healthy and nutritious food at all times. Food accessibility is determined by two factors, namely; the economic and physical access (FAO, 2013). According to Barrett *et al.* (2010), economic access is determined by disposable income, food prices and accessibility of social support. Physical access, on the other hand, depends on the physical infrastructure that aids access. The indicators of physical access include levels

of physical infrastructural development like paved roads, railways, electricity, irrigation facilities etc., while those of economic access include domestic food price index, disposable income and expenditure survey (FAO, 2013). The purchasing power of households is the most important determining factor of food access and according to WFP (2007), the household's purchasing power depends on various pricing policies and market conditions. The study conducted by Nord *et al.* (2009) revealed that a majority of rural households are unable to access sufficient food because of the distance they have to travel to the markets to buy food. This dimension reveals the demand side of food security and highlights uneven household food distribution and socio-cultural limits on food choices.

Food utilisation, as a dimension of food security, is related to the nutritious part of the food consumed by the households, safety of food and preparation of food. Staatz *et al.* (2009) indicate that the preparation of food and health status of a person has a direct influence on food security. The common measure of this dimension is the HDDS. Jones *et al.* (2013) aver that the utilisation of food is also related to the allocation of food within a household, which is not always equal across household members either due to being a lower quantity and quality or because household members' health status differs affecting their ability to use nutrients. Food utilisation is limited by several factors such as loss of nutrients during food processing, inadequate sanitation and lack of proper care.

Food stability, as a dimension of food security, considers the stability of the other three dimensions over time and is thus not a standalone dimension, but incorporated into other dimension indicators Ansah, Gardebreek, and Ihle, (2019). Food stability, as a concept, highlights that every individual should have access to sufficient food at all times. According to FAO (2006), the concept of stability is interrelated with the elements of both access and stability. Stability also relates to the loss in resources due to income shocks and insufficient reserves. The loss in resources may either be temporal or permanent (Schmidhuber and Tubiello, 2007).

The food availability dimension reflects the supply side of the food security concept. It includes average dietary energy supply; average value of food production; share of dietary energy supply derived from tuber, cereal and root crops; and average protein

supply from animal origin. FAO (2013) asserts that the measurement of the dimension food availability usually occurs at the national level where food security data is sourced from food balance sheets, which relate total food output to total national food consumption. According Benson (2004), the challenges linked with food supply in a country include several factors such as political instability, war and riots, and an inefficient market structure. According to Maxwell (1996b), there are three overlapping paradigm shifts when thinking about the concept of food security. These shifts range from the global and national levels to the household and individual levels.

2.3.1 Definition of food security levels

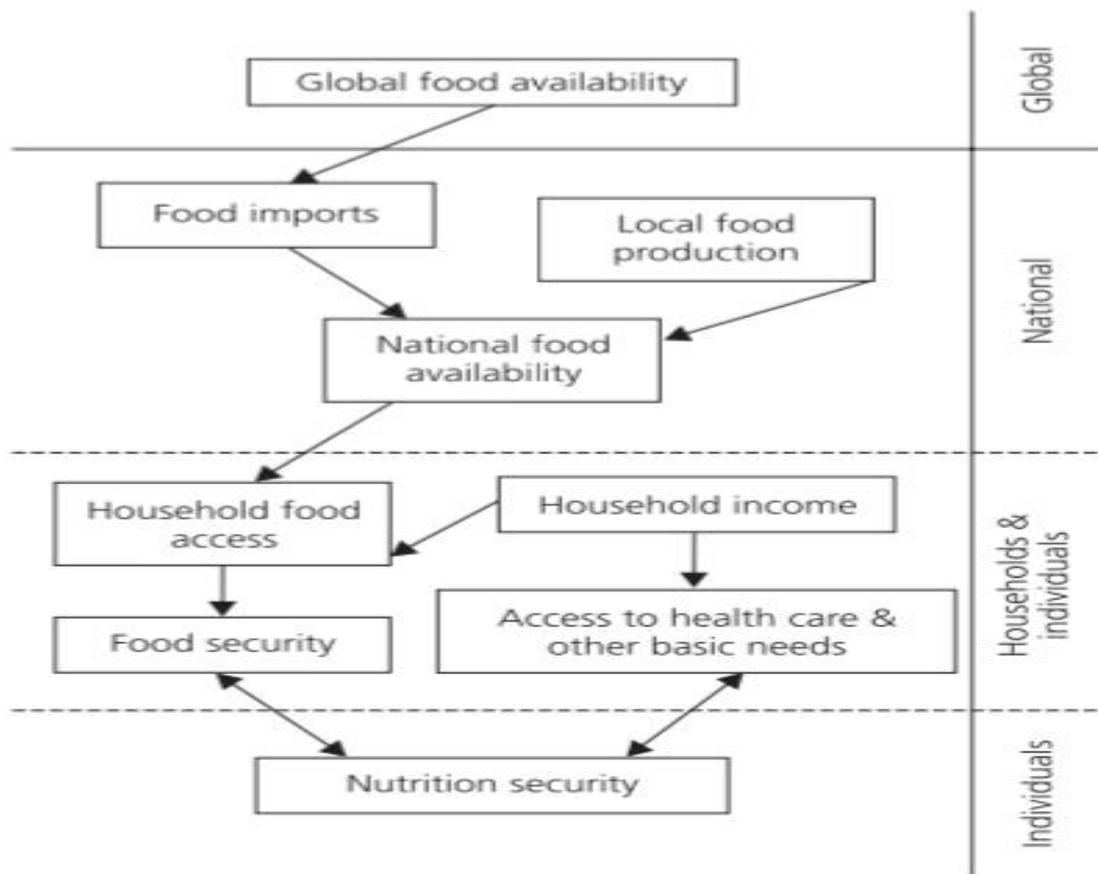


Figure 2.1 Food and Nutrition Security Distal, Intermediate and Proximal Determinants

Source: Frankenberger *et al.* (1997)

2.3.1.1 Global food security

Global food security means sufficient food is produced globally to make it possible for national and sub-nationals to have access to sufficient food worldwide (Smith *et al.*, 1992). It focuses on issues which affect the supply and distribution of food both domestically and internationally (Ecker and Breisinger, 2012).

2.3.1.2 National food security

Smith *et al.* (1992) discussed national food security within the perspective of national food self-reliance. A country is said to be food secure if that country is able to produce and distribute food that is needed by all its citizens in terms of the four dimensions of food security. According to Reddy (1999), being food secure at a national level does not assure food security at a household level because food security is no longer regarded as a problem of food supply but rather as a deprived livelihood because of inadequate access to acquire food (Devereux and Maxwell, 2001).

2.3.1.3 Community food security

Gottlieb (2002) defined community food security as a condition where all community residents have access to sufficient and nutritious food obtained through sustainable food systems. According to Allen (2004), policy makers within a community are responsible for the quality of nutritional food for its society. Cook (2009) also added that in order to ensure community food security, food systems should be operated efficiently and within sustainable environments.

2.3.1.4 Household food security

According to FAO (2010), household food security refers to the situation where a household has access to safe, affordable and nutritious food as needed by all members of the household at all times. Andersen (2009) mentioned that a household's food security does not guarantee food security for all its members because the intra-household distribution of the food may not meet the needs of each individual member of a household.

2.4 Measures of food security

Given the multidimensional nature of food security, practitioners and policy makers have long predicted the need for a variety of means of measurement (Kennedy, 2002; FAO,

2013). According to Coates and Maxwell (2012), even though there were developments of many different indicators in the past decade, none of them covers all the dimensions or meets the criteria of the food security. USAID’s 1995 Food Aid and Food Security Policy Paper pointed out that “an important constraint in evaluating the food security impacts of food availability and access interventions is the lack of meaningful and informative indicators”. Nathalie (2012) and FAO (2013) agreed that the use of two or more complementary indicators that measure different dimensions of food security can be used to achieve a more comprehensive food security status.

Barrett (2010) indicated that food security hardly needs to be re-defined and that the renewed emphasis should be on finding new approaches to measures and addressing of constraints to food security. This will allow the search for accurate, rapid, and consistent indicators of food security because a number of food-insecure individuals is underestimated when single measures are applied that are incongruent with a more holistic food-security definition (Coates, 2013).

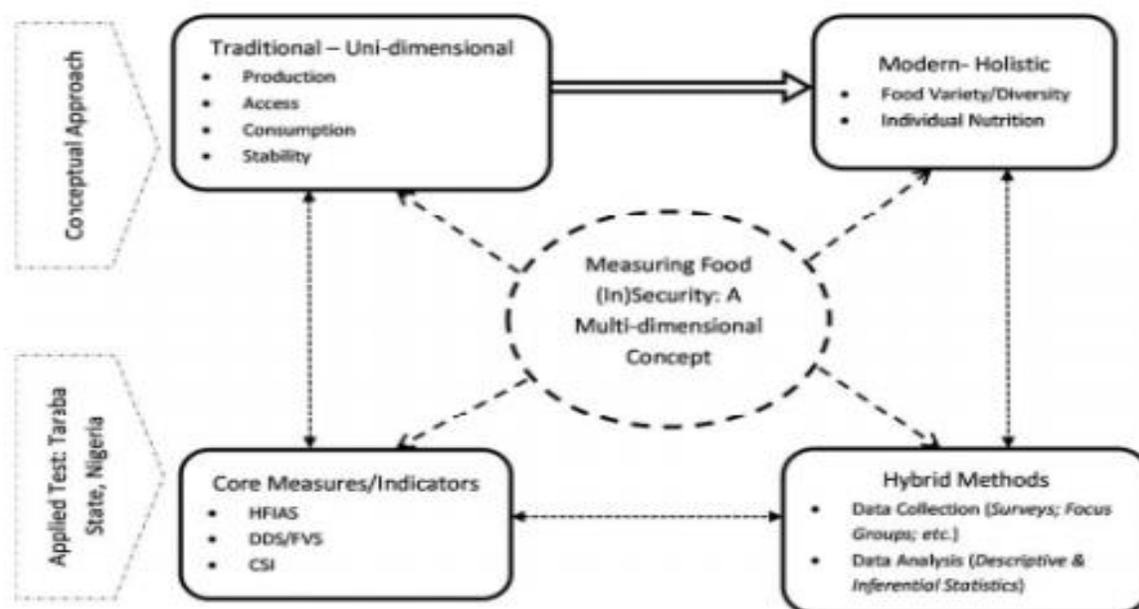


Figure 2.2: Food Security Measurement: A Schematic Overview

Source: Chinweoke (2015)

The importance of measuring food security at a household level gives a better understanding of how individual households are affected by the condition of food insecurity and how they respond to the conditions related to food insecurity (Qureshi, 2007). Modelling variability at the household level directly, using household survey data in combination with spatially explicit environmental and socio-economic data, provides a direct estimate of the variability and predictability of welfare indicators at the most relevant scale and permits evaluation of the significance of explanatory variables at the household level (Wichern and van Heerwaarden *et al.*, 2018).

2.4.1 The Coping Strategies Index

Daniel Maxwell (1996) came up with the Coping Strategies Index as an attempt to develop a proxy indicator of food consumption as part of his dissertation research in Uganda. The Coping Strategy Index is estimated by measuring behaviour, that is, things that individual households do when they experience food shortages (Maxwell *et al.*, 2003). Thus, the coping strategies observed are usually linked to food practices in the short-term (Maxwell, 1995).

2.4.2 The Household Food Insecurity Access Scale (HFIAS)

The HFIAS is a continuous measure for inspecting the incidents of household food insecurity in the previous month (Coates *et al.*, 2007). According to Deitechelr *et al.* (2011), the HFIAS highlights three broad aspects of household food insecurity access, which involve; worrying about the likelihood of food insecurity, inadequate quality and inadequate food supplies. Mohammadi *et al.* (2011) indicated that the HFIAS method produces accurate results because of its internal consistency, criterion validity and reliability for analysing household food insecurity.

2.4.3 Household Dietary Diversity

The Household Dietary Diversity Score (HDDS) is related to the FCS, but a version with a 24-hour recall period without frequency information or weighted categorical cut-offs has been widely promoted by the UN Food and Agriculture Organization and USAID (FAO, 2010). Nutritional status is determined by many factors, with food security being only one (Boatemma, Drimie, and Pereira, 2018). According to FANTA (2006), HDDS captures the

quality and diversity and although FCS is calibrated to capture an element of quantity as well, its components, however, are clearly more correlated with each other.

2.5 Review of previous studies

2.5.1 Review of local studies (South Africa)

The political shift in 1994 resulted in South Africa being independent in the supply and distribution of adequate food, although the situation at a household level did not change as anticipated (Department of Agriculture, 2012). According to DAFF (2002), food security is part of the Section 27 of the Constitutional rights of South African citizens. On these rights, the Constitution states that every citizen has the right to have access to sufficient food and water, and that “the state must by legislation and other measures, within its available resources, avail to progressive realisation of the right to sufficient food”. Studies have shown that there is a strong relationship between food insecurity and living conditions. A study conducted by Naicker, Mathee and Teare (2015) in an informal settlement in Johannesburg, South Africa, found that there is an association between food insecurity and the urban poor that live in informal settlements.

Watkinson and Makgetla (2002) revealed that the poorest of the poor in South Africa devote over 50% of their monthly income to food. Income inequality has played a major role in increasing household food insecurity among the African population thereby making access to resources and, by extension the purchasing of inadequate food (Van Braun, 2007:3). Slow job creation and the increasing number of unemployed people are some of the factors contributing to food insecurity, hence they limit access to the means to purchase food (Adubu-Raheem and Worth, 2011).

Thompson (2012) indicated that women continue to be responsible for producing household food for consumption through agricultural labour. However, they are most likely to be vulnerable to food insecurity and hunger. This was further explained in the study conducted by Jacobs and Aphone (2010) which noted that vulnerability to food insecurity has gender dimensions because the results showed that an average number of women lives in poverty than men. Therefore, these results show that there is a large percentage of female-headed households who are food insecure, especially in rural areas. Webb and Lapping (2002) comment on the important role that women’s health and education can

play in food security though they also stress that their influence varies depending on time, place and social group. Neves *et al.* (2009) pointed out that social grants improve the wellbeing of many recipients in the country, providing minimal standards of living and a source of income for many people (Gertler and Boyce, 2001).

Food is lacking in South Africa, as evinced by 1.5 million children who suffer from chronic malnutrition and an estimated 14 million people who are vulnerable to food insecurity (DAFF, 2012). Earl (2011) notes that hunger and malnutrition are still prevalent in South Africa and this contributes towards the inequalities in accessing productive land and the current urbanisation patterns. According to Palitza and Kuno (2009), food security and rocketing food prices are occurring as a result of production policies that the food producers are faced with such as high taxes, the costs of fuel and the cost of other factors of production.

Food security is a national and international discourse for politicians, academics, and civil society. At a national level, the South African government has clearly set strategic objectives to either reduce or eliminate poverty and malnutrition in the country (Barr, 2004). However, the impact of the South African government's interventions which are aimed at addressing malnutrition and hunger, amongst other economic and social plights, have often gone unnoticed by the public because there is no delivery to be noticed (Senefeld and Polsky, 2005).

In South Africa, when the price of a staple food rises, it leads to the poor households being forced to spend more of their households' income on these basic food items. This in turn reduces people's ability to access the food that they really prefer. Agriculture is an important aspect in overcoming food security since it provides good access to food for the poorest of the poor, and for the stable poor. It serves as a source of income and good quality food at a low cost (DAFF, 2002). The Western Cape Province in South Africa was hit the hardest by drought in 2018 (Masante *et al.*, 2018). The city of Cape Town and surrounding areas have been receiving below average monthly rainfalls since 2015, which led to imposing water restrictions through water cuts and rationing. The drop in agricultural production in the country also contributed mainly to the contraction of the GDP

in 2018. A 2006 survey by the Development Bank of South Africa (DBSA) highlighted the complicated relationship between food security and land in an era. The land reform programme is battling to meet its targets of redistribution, satisfactorily provide post settlement support and present win-win solutions for private land owners with constitutional property rights and land reform beneficiaries who may not share the same agribusiness interests.

2.5.2 Review of international studies

The international development literature recognised the term food security in the 1960s (Osman, 2002). During the 1970s, the United Nations defined food security in terms of sufficient production and supply of food at the global and national level (Clover, 2007). According to WB (2018), the transformation from food subsidies to a voucher-based system has provided Egypt with a means to respond to inflation and its shocks. These reforms are benefiting poor and rural households, preventing approximately 4.2 million Egyptians from falling below the poverty line.

FAO (2002) reported that about 800 million people in the world were under-nourished between the period of 1998 to 2000, and out of this figure, about 771 million were said to be from developing countries. Ruel *et al.* (1998) also pointed out that in Sub-Saharan Africa, food insecurity affects the urban poor more than the rural poor the conclusions were based on the organization around a conceptual framework that identifies food insecurity, inadequate caring behaviors, and poor health as the primary causes of malnutrition. It discusses current knowledge in eight areas that require the special attention of policymakers, development practitioners, and program administrators who wish to improve urban food and nutrition security. The reason behind this is that the majority of the rural poor are engaged in agricultural activities and this enables them to produce their own food and sell surplus to generate income (Pendleton *et al.*, 2012). A study conducted by Clover (2003) estimated that almost 30 million people receive food aid every year in Africa. Same results were noted by Perkins *et al.* (2018) in Uganda, further indicating a positive relationship between severe food insecurity and the adjusted risk of depression among women and men.

A study by Danilo and Briones (2012) used both quantitative and qualitative data to analyze the impacts of natural disasters, particularly typhoons, floods, and droughts, on agriculture, food security, and the natural resources and environment highlighted that within the South-East Asian region, the Philippines are mostly vulnerable to natural hazards, especially floods and droughts because their agricultural sector is negatively affected by these natural disasters. This contributes to food insecurity for low-income households. A study conducted by Sarwar, and Hussain (2020) indicated that high food prices undermine the poverty reduction gains, as food expenditures comprise a large share of the poor's total expenditures and food price hikes severely erode their purchasing power.

In Europe, a review of literature to develop an original analytical framework of the diversity of farming systems and agriculture models that deal with these limits was undertaken and results indicated that food system in Europe is characterised by the leading role of industrial farming and processing, the prevalence of global capital, and the integration of supply chains into corporate structures (Therond *et al.*, 2017). Thus, European small farms play important and diverse roles in the production and availability of food within food systems. This shows the need of focusing on improving and developing agricultural systems as a whole (including both smallholder and commercial farmers) in order for the country to become a country that is food secure.

Oyalemi (1998) conducted a study on food security in Nigeria. In the study, 53.1% of the respondents identified poor and inadequate transportation facilities. Hence, high costs of food transportation are the most serious and high contributors to food insecurity. Food marketing problems were considered a major source of food insecurity in Nigeria. The study also indicated that government policies are particularly important to the food security situations in a country, but climatic factors as well as the quantity and quality of natural resources endowment are also key determinants of food security. Also, the food security status of a particular household would probably improve if the income in that household increases.

The study conducted by Daphne (1996) in Mozambique identified factors underlying food insecurity. The study provided quantifiable indicators that can be used to monitor changes

in the household's food security status. The results of surveyed households taken as a whole, showed that improving households' livelihoods and food security status tends to do with improved higher education and residing in the area for the longest time. Thus, households in a relatively good position, which simply means stable and improved agriculture, will make them more secure. For target households in need (at risk and chronic), improved agriculture will lessen their food insecurity.

Lamidi (2019) collected data using a questionnaire for 813 households from the six geopolitical zones in Nigeria and ordinal logistic regression model and the outcome was that in Nigeria, higher risks of severe food insecurity occur among households with children and those with elderly persons living with a disability. Thus, intervention programmes aimed at addressing food security issues should target households that contain the above two groups of people.

According to Sachs (2018), rural women throughout Asia make critical contributions to household production and consequently to household and national food security. Rural women's role in household production is considered in terms of farm production, home production, off-farm production and community production. Increments in non-agricultural activity have created formal and non-formal employment opportunities in the export-led industrial market which relies heavily on low wage female labour. This low wage female labour results in food insecurity in women-led households than in men-led households. UNCTAD (2015) mentioned that a majority of the rural households in Sub-Saharan Africa, agriculture contributes a substantial part of their livelihood. A study by Fisher (2004) using explanatory case study method to present a framework for better understanding of food security concluded that the activities of the wealthy, who are most likely to participate in timber extraction activities, pose a greater ecological threat to poverty and food security, leaving poor households vulnerable to the degradation and depletion of forest resources.

In US, food insecurity affects 1 in 8 households and has clear implications for population health disparities. A person-centered and multilevel framework helps in understanding how individuals living in food-insecure households cope with inadequate access to safe and nutritious food (Seligman and Berkowitz, 2019). Bahiigwa (1999) using Uganda

Demographic and Health Survey (UDHS) mentioned that in Uganda, food security varies from one season to the next, depending mainly on the weather pattern. Household food security also varies across regions, agro-ecological zones and districts. It has also been indicated that the three main causes of household food insecurity in both periods were inadequate rainfall, pests and diseases, and excessive rain, in that order. Other significant contributors to household food insecurity mentioned included inadequate labour, inadequate land, not growing enough food during the season and soil infertility, with varying importance in both seasons.

According to Adebayo (2005), a large number of the Ethiopian rural population is badly affected by the chronic food insecurity. Regular drought, degradation of natural resources and rapid population growth are among the main causes of food shortage. The government has intervened to resolve nutrition and household food security problems in the rural households through the improvement of agriculture, health, education, water and sanitation. First priority was given to female-headed households, since their households are the ones that are mostly affected by the malnutrition, which occurs because of food insecurity. The intervention also promoted health and prevented diseases through improvements in diet, access to safe drinking water and sanitation. Regardless of the interventions, the report revealed that Ethiopia remains one of the world's most food insecure country, where approximately one in three people live below the poverty line (FAO, 2005). Knueppel *et al.* (2009) indicated that in Tanzania, lower levels of educational attainment are directly linked with high food insecurity this was done according to the scheme recommended by the HFIAS indicator guide, the continuous score were categorized into food secure and food insecure.

2.6 Literature review on household food security determinants

2.6.1 Gender

Gender diversity plays a huge role in food security status. This is further proved by Gupta *et al.* (2019) who posit that in India, women's empowerment in agriculture tends to improve women's nutrition because women who are empowered in their agricultural decisions have significantly higher dietary diversity scores relative to women who are disempowered of such decisions. In history studies (Macht, 1999; Rime and Giovanni,

1986), it was highlighted that men and women may experience hunger differently. Historically women from better-off households may also be increasingly independent and engage in other income generating activities without their husband's awareness (Webb, Coates and Houser, 2002), although Kumar and Mitra (2019) indicated that nowadays majority of that better-off households especially women headed households are more likely to borrow to finance to maintain their families. According to Carter *et al.* (2010), incidents of food insecurity are much higher in female-headed households compared to male-headed households because females are most likely to take care for their extended families, and will usually sacrifice their food intake to feed other members of their household.

2.6.2 Household size

A study conducted by Olayemi (2012) indicated that household size and food security are negatively correlated. This is because, as household size decreases, food security increases. If a majority of household members are inactive in terms of labour productivity, the burden for active members in provision of food also increases, which in turn results in an increased likelihood of food insecurity (Amaza *et al.*, 2009).

2.6.3 Educational level

According to Bashir *et al.* (2012), in Nigeria, there is a positive relationship between the levels of educational accomplishment of a household head and household food security, meaning the lower the level of education, the lower the possibility of food security in the household. Education increases the chances of obtaining better job opportunities, especially for farm workers who live in rural areas (Heidhues, 2009).

2.6.4 Age

The review of interventions to improve food security by Down and Demmler (2020) indicated that children's external food environments are remarkably different from those of adults because three-quarters of the world's children attend school and many of them eat much of their day's food either at or close to school (UNICEF, 2019). This implies that the provision of free meals at schools make children to be less affected by food security issues than adults. According to Allen and De Brauw (2018), civilising children's access

to safe and nutritious foods at scale need approaches that take into consideration broader food supply chain, helps combat occurrences of food insecurity.

Omonona *et al.* (2007) conducted a study in Nigeria and found that the occurrence of household food insecurity increases with age. Food insecurity is likely to occur in households where household heads above the age of 60 because, at such an age, households are usually retired. Majority of these households are characterised by large household size, and low income since most of them depend on social grant as their main source of income. This increases the likelihood of their food insecurity. Young people are economically active than old people and can operate in challenging jobs within the labour market and thus are able to generate more income to take care of their needs.

2.6.5 Household income

Low-income households are more likely to suffer from food insecurity as compared to middle income and wealthier households. Jacob, Aphane and Dzivakwi (2009) and Carter *et al.* (2005) indicated that disposable income had a direct influence on food security. There have always been higher chances that low-income households end up in debt because of insufficient income to buy healthy, safe and nutritious food at all times (Omonona *et al.*, 2007). Households that depend solely on farming tend to get lower farm income because they do not have farming opportunities like commercial farmers such as exporting. They do not even have access to certification which can help them benefit from useful activities (e.g., trainings, processing facilities, or management skills of cooperative employees that can improve their income (Minten *et al.*, 2018). According to Tarasuk (2001), there is evidence to suggest that very low-income households possess significant food knowledge and skills, and employ multiple strategies with the aim of feeding the family nutritious foods. Low income/food insecure households are no less likely than their wealthy counterparts to express a desire to consume healthy food.

2.6.6 Participation in agriculture

Samberg and Gerber (2016) indicated that smallholder farming is the basis of living for many of the most vulnerable, especially in rural communities of developing countries. For the majority of the rural households in Sub-Saharan Africa, agriculture contributes a substantial part of their livelihood and there is a strong link of smallholder farming with

poverty, malnutrition and hunger of the rural population (UNCTAD, 2015). According to Guarin *et al.* (2020), different types of farms contribute differently to regional food availability. According to Pingali (2012), improved agricultural research as a historic source of increased food supply or infrastructure reduces the main driver of food security issue which is poverty (Allen and De Brauw, 2018; Sheahan and Christopher, 2017).

Targeting interventions at smallholder farming is important for achieving Sustainable Development Goal 2 (Zero Hunger) of the United Nations. Subsistence agriculture does not guarantee food security for low income households, it does, however, help them generate extra income (Altman *et al.*, 2009). Although smallholder farmers sometimes reach full capacity of production, it is often difficult for them to sell their entire production within certified markets because of quality issues, limited processing capacity, and/or oversupply of certified products, which results in low income (Vellema *et al.*, 2015).

According to Nordhagen (2020), increased agricultural production generally increases food availability. This results in decreased food prices and improves the consumption patterns among the poorer households. If the production of food is higher, the food prices will eventually go down and even the low income households will be able to afford safe, healthy and nutritious food at all times

2.7 Global challenges on food security

Na *et al.* (2019) analysed the 2014-16 GWP data from 39 Sub-Saharan African countries and found relationships between poor mental health outcomes across the continuum of FI levels and low-income countries. According to Heidhues and von Braun (2004), the lack of a commonly accepted and comprehensive measure of food security at an international scale has been identified as one of the barriers to the eradication of hunger and malnutrition. The Food and Agriculture Organization of the United Nations (FAO) State of Food Insecurity (2010) stated that nearly 1 billion people are estimated to be undernourished, representing almost 16 percent of the population of developing countries. Moradi, Arghavani and Issah *et al.* (2019) found that mild food insecurity and moderate food insecurity households' heads are significantly linked to risks of anaemia among young children and their mothers.

In situations where food security interventions are not put in place, rural populations tend to migrate to urban areas, and by so doing, they start increasing pressure on cities where food prices and unemployment are already high (Simmons, 2017). This results into a situation where even food prices become higher because the demand will be outstripping supply. Altman *et al.* (2010) indicate that presently, it is crucial to monitor progress towards the achievement of greater food security. The need to monitor the progress is tied to the fact that food insecurity is not seen as a failure of food production at the worldwide but as a livelihood failure (Joala, 2013). Many people around the world do not have enough and safe nutritious food and this has had a negative effect on their livelihood (McDonald, 2010). The FAO (2002) reported that about 800 million people in the world were undernourished between the period of 1998 to 2000, and out of this figure, about 771 million were said to be from developing countries. Many of the world's food-insecure and undernourished people are smallholder farmers in developing countries, especially African countries. There is thus an urgent need to improve smallholder agriculture and food systems (Sibhatu and Qaim, 2017).

2.8 The impact of Covid-19 on food security

According to Béné (2020), Covid-19 has not only affected the lives of the people, it has also seriously inflicted threats on their health and food security. The pandemic has shown instability on food systems on both local, national and international levels. This in turn increased the global challenge of food security. Davies, Sherwin and Harris, (2020) indicated that despite the official lockdown measures put in place during the Corona Virus outbreak, in developing countries where food insecure households receive no or very limited support, the households tend to make a choice between generating income to prevent food shortage and accepting the risk of becoming infected by Covid-19. It was also indicated that the severe shocks imposed by the Covid-19 pandemic show the value of having in place transfer policies that support vulnerable households in case of shocks. At the macro-level (i.e. global and national), COVID-19 has not only compromised food availability, but raised concerns about the observed behaviour of some countries to reduce their food exports to protect national supplies. In some countries, the agricultural sector has been excused from lockdown restrictions, in order to ensure continuity of food production to prevent starvation (Devereux and Béné, 2020).

2.9 Summary

The above literature shows the food security status of South Africa in particular and the world in general. The concept of food security is broad because of its levels. However, the most common definition entails that all individuals ought to have both physical and economic access to the food they need and aspire to maintain an active and healthy lifestyle. This study described the three household food security measures: Household Dietary Diversity Score (HDDS), Coping Strategies Index (CSI) and Household Food Insecurity Access Scale (HFIAS). Food security is currently a worldwide challenge and is rapidly increasing at an alarming rate. This study sought to identify the most common food security indicators and analysed the socio-economic characteristics of the Ba-Phalaborwa local communities.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1. Introduction

This chapter elucidates the research methodology adopted in this study. Research methodology entails giving a detailed description of the methods used to carry out the research. It gives a full description of all the research instruments used in data collection, an overview of sampling methods and sampling procedures used in data collection and analysis. This chapter also provides information such as the location, population and main economic activities of the study area.

3.2 Description of the study area

Ba-Phalaborwa Local Municipality is a Category B municipality consisting of two townships (Namakgale and Lulekani) and nine villages (Mashishimale, Maseke, Ga-Selwane, Ben Farm, Majeje 3, Khurhula, Prieska, Makhushane and Humulani) that is located in the Mopani District of the Limpopo Province, South Africa. It is the largest of the five municipalities in Mopani district, making up over a third of its geographical area. It is situated in the northeastern part of the district, just less than 1km away from the Kruger National Park border. It is 220km away from Polokwane (previously Pietersburg) and Mbombela (previously Nelspruit), and serves as a central gateway to the Greater Limpopo Transfrontier Park through the Giriyondo Border. It is an entry and exit point to the Mozambican side of the Xai-Xai beaches. The area is 7 489km² with two towns, namely; Gravelotte and Leydsdorp. Its main economic sectors include mining, agriculture, manufacturing and tourism.

3.3 Research design, sampling procedure and data collection method

3.3.1 Sampling method and type of data

Primary data was collected for the study using a structured questionnaire. A simple random sampling was used to sample 185 households from five villages. 185 households were interviewed using the probability proportionate to size (which was 2% of the households in each village). The data was collected from five villages, namely; Selwane, Mahale, Nondweni, Mashishimale and Makhushane with the following number of households: 1350, 502, 244, 3666 and 3471, respectively. The number of households

that were interviewed was 27, 11, 5, 69 and 73, respectively. Sekhamphu (2004) used similar sampling techniques. This study used the quantitative research method to achieve its objectives.

3.3.2 Data collection techniques

A total number of 185 survey questionnaires was randomly administered to households in the five villages from the study area. For this study, a household survey was undertaken to gather information on the socio economic characteristics and food security status of individual households. The survey used structured face-to-face interviews where the interviewer asked the respondents the same questions in the same way in order to maintain data accuracy. Reviews of journal articles, books, government publications, the Internet, previous research studies and conference papers were used to provide a theoretical perspective on food security.

3.4 Analytical techniques

Qureshi (2007) pointed out that measuring food security at a household level offers a better understanding of the food security status of single households and the coping strategies employed by food insecure households. The first section of the questionnaire was on the socio-demographic information of the respondents. This section was constructed to include the social status of the households in terms of gender, age, household size, employment and marital status. The HFIAS measure was correlated with the socio-economic factors to analyse their relationships.

The second part of the questionnaire encapsulated the information needed to estimate the food security status of the sample. In this study, the analytical techniques that were used are:

1. Descriptive Statistics, which included the use of tables, frequencies, charts to analyse, summarise and describe the socio economic characteristics (objective one and three).
2. Household Food Insecurity Access Scale (HFIAS) and Household Dietary Diversity (HDD) were used to analyse objective two.
3. Coping Strategy Index (CSI) analysed the fourth objective.

Following Agresti (2007), this study derived two instead of four HFIAS, HDDS, CSI categories, as the other categories were merged due to the small sample size contained in them. The Household Food Insecurity Access Scale (HFIAS) was used to examine household food security status. The Household Food Insecurity Access Scale (HFIAS score) was used to determine the occurrence of food situations that investigated the availability and accessibility. The HFIAS score was calculated using the nine-occurrence frequency questions. The scores were categorized as 0= never, 1=sometimes and 2=often. The highest score was equal to 18 because two categories were used for the dependent variable and then the scale factor of 9 was used, which was $18/2=9$. The household with the lowest score (0-9) was categorised as food secure and the highest score (10-18) simply meant that the household was food insecure (Coates *et al.*, 2007). Household food security status was measured as:

Table 3.1: HFIAS score

Food security status	Category	Score
Food secure	1	0-9
Food insecure	0	10-18

Source: Coates *et al.*, 2007

Household dietary diversity (HDD)

The HDD measure captured the food security dimension called ‘adequacy’ through the analysis of high quality diets, factors associated with the risk of chronic, and undernourishment. The study used twelve food groups by means of a series of ‘yes’ or ‘no’ questions and the one with the highest score was regarded as food secure. A dietary diversity increased the chances of a household becoming food secure (FAO, 2007).

Table 3.2: HDD score

Household food security status	Category	Score
Food secure	1	7-12
Food insecure	0	0-6

Source: Ruel, 2002

This study employed the Logit Model to examine the determinants of food security (3rd objective).

Babatunde *et al.* (2007) and Kassie *et al.* (2012) used the regression model to discover factors affecting household food security. The following explanatory variables were included as their socio-economic characteristics:

Logit Model specification:

$$HFSS = \beta_0 + \beta_1HHS + \beta_2GND + \beta_3AGE + \beta_4EDCL + \beta_5EMPDS + \beta_6PAA + \beta_7HMI + \beta_8 RGG + \beta_9 HMFE + \beta_{10} DMST + \beta_{11}HLTH + + \mu$$

Table 3.3: the socioeconomic characteristics of household heads

Variables	Description of variables	Units of measure
Dependent variable		
HFSS (Household food security status)	1= food secure 0= food insecure	Dummy
Independent variables		
HHS	Number of people in the household	Number
GND	Gender of household head 1 if the household is male, 0 otherwise	Dummy
AGE	Age of the household head	Years
EDCL	1 if the head has tertiary education, 0 otherwise	Dummy
EMPDS	Employment status 1 if the household head is employed 0 otherwise	Dummy
PAA	Participation in agriculture 1 if household is engaged in agric activities, 0 otherwise	Dummy

HMI	Household monthly income	Rands
RGG	Receiving gov grant 1 if household receive grant, 0 otherwise	Dummy
HMFE	Household monthly food expenditure	Rands
MDST	Distance to the market	Km
HLTH	Household health status 1 if the household head has chronic , 0 otherwise	Dummy

Source: Gujarati & Porter, 2010

Coping Strategy index (CSI)

This indicator analysed the coping strategies employed for food security in the study area (objective 4). The indicator captured the pillar of food security affordability. The approach used thirteen generic consumption coping strategies.

The coping strategies observed were frequently linked to food practices in the short-term (Maxwell, 1996). The questions used the relative frequency of all the time (every day) =3, pretty often (3-6/week) =2, hardly at all (1-2/ week) =1 and never 0/week=0. The household with the lowest score, that is, below average score was classified, as food secure, and the household with the highest score was classified as food insecure.

Table 3.4: CSI score

Food security status	Category	Score
Food secure	1	0-15
Food insecure	0	16-30

Source: Maxwell, 1996a

3.5 Ethical Considerations

The researcher sought ethical clearance from the TREC at University of Limpopo prior to conducting the study. The ethical clearance was sought to ensure that none of the respondents' cultural beliefs and norms were not dishonored throughout the interviews.

3.5.1 Permission

TREC granted the researcher permission to conduct the study prior to the commencement of this study.

3.5.2 Inform consent

The researcher and enumerators informed the respondent that the study was for academic purposes and that participation was voluntary. The respondents were informed that they were free to withdraw their participation, if they felt uncomfortable. To affirm their willingness to participate in the study, the participants were asked to sign consent forms before they participated in the study.

3.5.3 Confidentiality and Anonymity

This study complied with the law and interests of the participants such as confidentiality and anonymity. The information provided by the respondents was strictly used for the purpose of this study.

3.5.4 Protection from harm

The participation of the respondents in the study was out of their own will and the information collected will remain confidential. The respondents' rights and dignity were also respected as required by Turfloop Research Ethics Committee (TREC) rules and regulations.

3.6 Significance of the study

The study will help to assess how well the key food security indicators capture the four dimensions of food security and how those indicators complement each other. This study will add insight(s) to the provision of a better definition of food security whilst emphasising that such a definition is based on the geographic location since factors affecting the household food security status are specific to different areas. The study will also contribute to literature on the subject under scrutiny.

3.7 Summary of the chapter

The study was conducted in five villages, namely; Selwane, Mahale, Nondweni, Mashishimale and Makhushane with the following numbers of households that were interviewed: 27, 11, 5, 69 and 73, respectively. The study used primary data and structured questionnaires. The research design constituted the quantitative research method. A random sampling technique was used to collect data. A self-administered questionnaire was distributed in the area through face-to-face interviews by the researcher and the enumerators. The three measures of household food security, namely, HDD, HFIAS and CSI were used to capture the four dimensions of food security. The HFIAS has been shown to measure food insecurity with an acceptable standard in a few developing countries 'and again several studies have used the coping strategy index to measure the extent of household food insecurity and examine the things that individual household do when they cannot acquire sufficient food (Maxwell (1996a) . The study used a logistic regression model since it also caters for a non-continuous dependent variable and the model also recognized the influence of several independent variables on the dependent variable (Menard, 2010) and it. Eleven explanatory variables were chosen since they best fit in the model.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

This chapter sets out to evaluate the food security status of the sampled households in the Ba-Phalaborwa local communities. The results of the study were classified into two categories: the analysis of household food security using the food security measures, namely, the HFIAS, HDD and CSI and the regression analysis. The categories were preferred because they are widely used and validated compared to other food security indicators (Maxwell and Coates, 2012). The Logit Regression Model was used to pinpoint the main determinants of household food security in the study area. The regression analysis determined the impact of demographic and socio-economic variables (gender, age, household size, marital status, educational achievement, employment status, household income, participation in agriculture, grant and health) on household food security. There was correlation between the explanatory variables and the food security measures (HFIAS). According to Miles and Shevlin (2001), correlation analysis is used to measure the degree to which the dependent variable and the independent variable are linearly linked. The HFIAS was significantly linked with the explanatory variables and those variables include; gender, household size, marital status, household income, educational attainment, distance to the market, health, employment status and agricultural participation.

4.2 Socioeconomic characteristics of the respondents

4.2.1 Summary statistics of respondents' socioeconomic characteristics

Table 4.1 shows that the average age of the household head in the study area is 50, the minimum age is 19, and maximum age is 91. This denotes that the majority of the household heads in the study area were aged around 51. In this study, household size referred to the number of individuals who lived in the same house. The table below shows that the household size mean was 5 which indicates the average number of household members. The minimum household size was 1 and the maximum was 14. The minimum household monthly income is R200.00, the average is R3123.135 and the maximum household income is R19 000.00.

Table 4.1: Summary statistics of age, size and household monthly income

Variable	Mean	Min	Max
Age	50.7027	19	91
Hhs	4.827027	1	14
Hmi	3123.135	200	19000

Source: Survey, 2020

Marital status of the respondents

From the results obtained, a large percentage of the sampled household heads were single and only a few were married. This is notable in figure 4.1 which shows that 38.92 % of the household heads were married, 32.43% were single, 13.51% were divorced and 15.14 % were widowed.

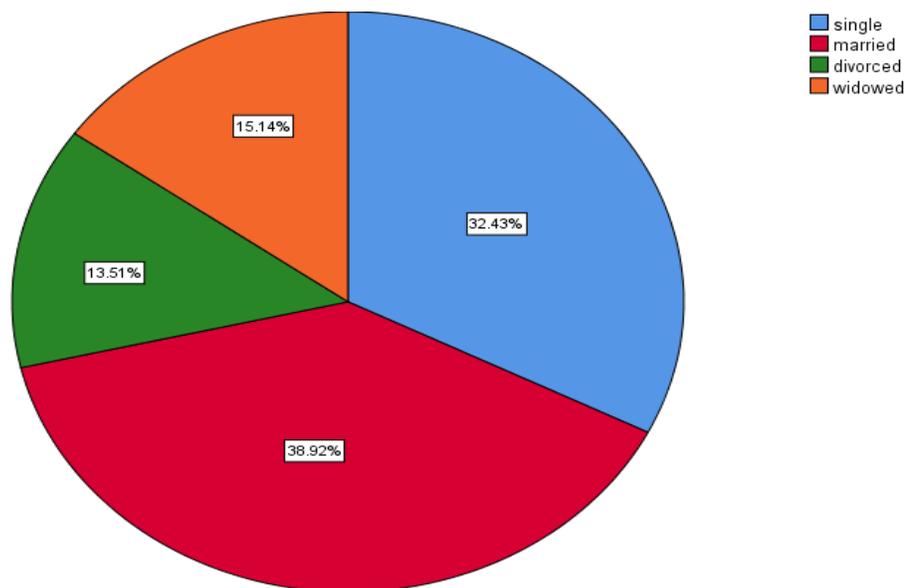


Figure 4.1 Marital status of household head

Source: Survey, 2020

Gender of Household Heads

Figure 4.2 indicates the gender percentage of the household heads in the study area. In the survey, females accounted for 58.38% of the household heads over men who only comprised 41.62%. This indicates that the area is female-dominated.

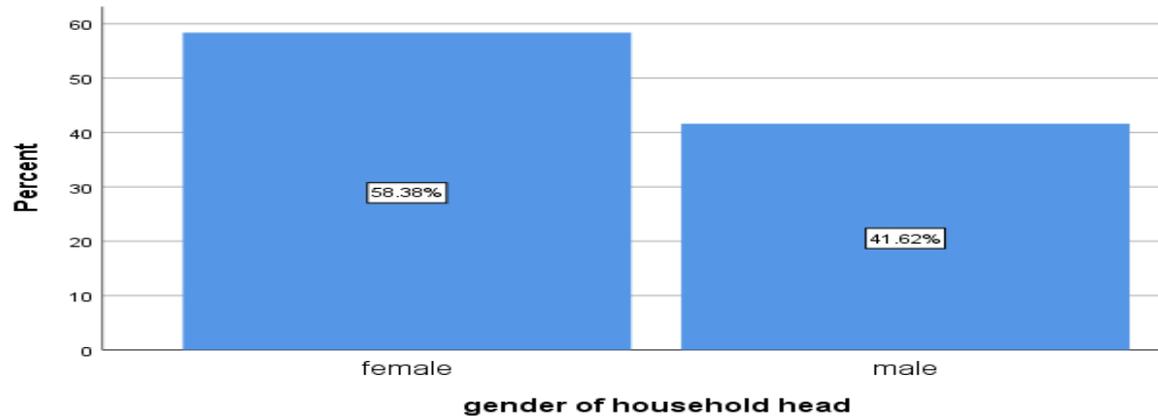


Figure 4.2: gender of household heads

Source: Survey, 2020

Educational level of Household Heads

The results have revealed that a larger percentage of the household heads had obtained high school education and quite a few people managed to go to tertiary. Figure 4.3 shows that 10.8% obtained only primary education, 32.4% managed to obtain secondary education, only 14.1% obtained tertiary education and 42.7% has no formal education at all.

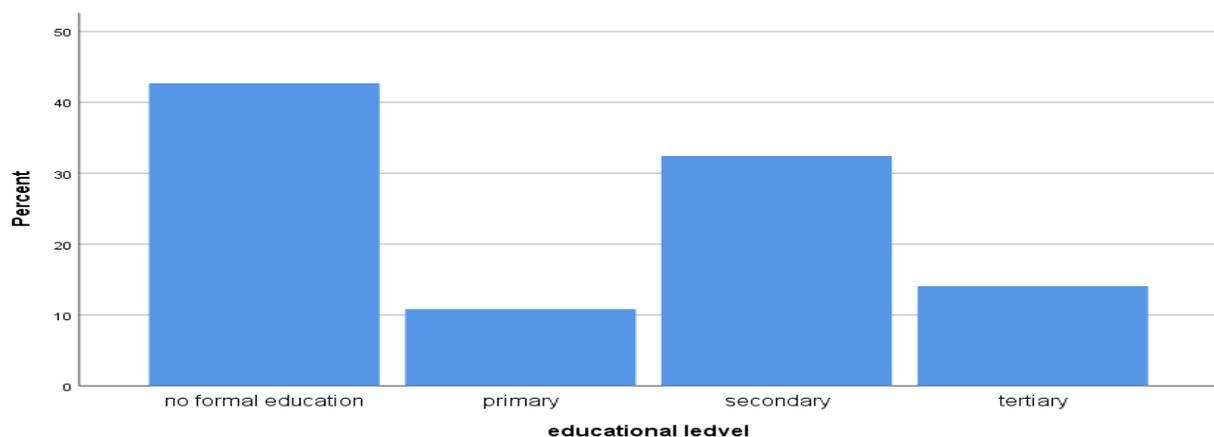


Figure 4.3: education levels of household heads
Source: Survey, 2020

Employment Status of the respondents

The survey results revealed that a majority of the respondents were unemployed. This is indicated by figure 4.4, which shows that 30.27 % are employed and 69.73 % of respondents were either retired, unemployed or retrenched.

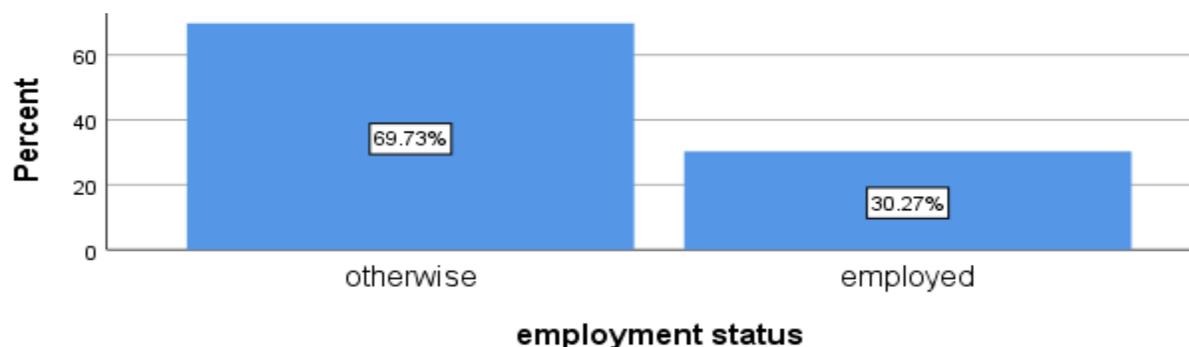


Figure 4.4: employment status of the household heads

Source: Survey, 2020

Respondent's participation in Agricultural activities

In this study, participation in agricultural activities referred to the ability of the household to engage in farming with the objective of improving their food security status. Figure 4.5 below shows that only 24.86 % of the households do not participate in agriculture. 75.4% of the households participate in agriculture and 49.4% are engaged in crop production,

15.4% in livestock, 6.49% are engaged in poultry and 3.78% are engaged in other agricultural activities.

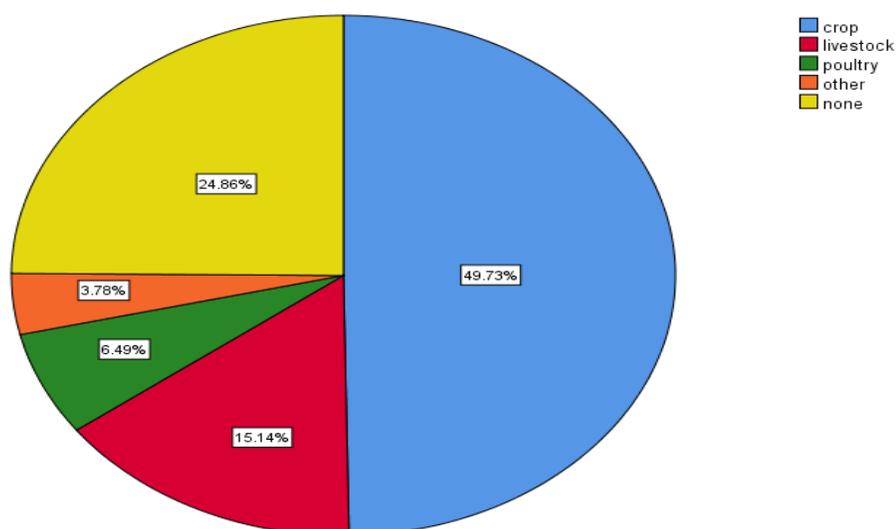


Figure4.5: Participation in Agriculture

Source: Survey, 2020

4.2.2 Food security measures

4.2.2.1 Household Dietary Diversity

A Household Dietary Diversity questionnaire was constructed on a set of food group questions and was utilised to capture the food security dimension called adequacy and to discover a HDD score by categorising different types of food based on the nutrients they comprise (Swindale and Bilinsky, 2006). The dietary diversity score is measured by adding the number of food and food groups consumed over a given reference period (Ruel, 2002). A rise in the dietary diversity increased the chances of a household becoming food secure (FAO, 2007).

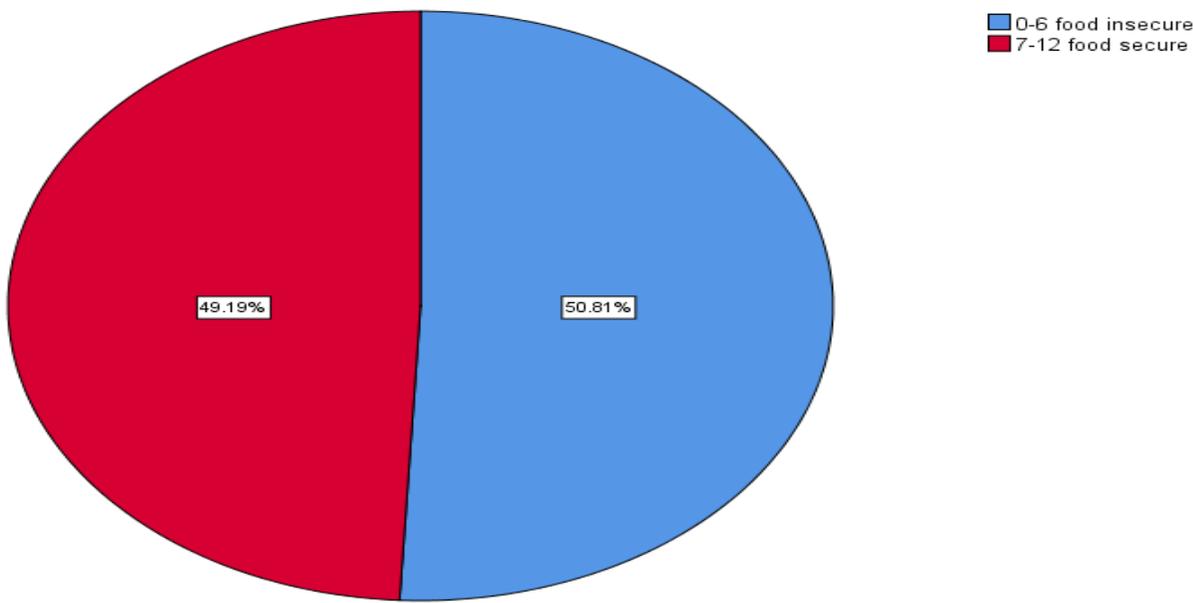


Figure 4.6: HDD score results

Source: Survey, 2020

The results revealed that 49.19% of the households were unable to eat a healthy and balanced diet and only 50.81% of the households were able to access adequate food at all times.

4.2.2.2 Coping Strategy Index

This measure helps to understand the strategies that each individual household uses when they cannot obtain sufficient food (Maxwell *et al.*, 2003). Coping strategies observed were frequently linked to food practices in the short-term (Maxwell, 1996). The result showed that 34.6% of the households were able to afford food and 65.4 % of households could not afford the food that they preferred and were depending on borrowing food from their relatives and creating debts.

Table 4.2: CSI score results

Coping Strategy Index	16-30 food insecure	121	65.4%
	0-15 food secure	64	34.6%
Overall total		185	100.0%

Source: Survey, 2020

4.2.2.3 Household Food Insecurity Access Scale

This measure was employed to determine if the households had access to safe and nutritious food and to check if the food that the households preferred was available. The scale was founded on the idea that the occurrence of food insecurity can be established, quantified and analysed by classifying individual households using the food insecurity level (Swindale and Bilinsky, 2006). The results revealed that only 43% of the households were food secure in terms of both availability and accessibility because they rarely experienced anxiety about not having enough food. All the food secure households were able to have full meal three times in a day without food running out in the past 30 days (Coates *et al.*, 2007). 57 % of the households were unable to access the food they wanted due to the fact that the food was not available or they could not access it because of the distance they had to travel to the market.

Table 4.3: HFIAS score results

Household food insecurity access scale	10-18 food insecure	106	57%
	0-9 food secure	79	43%
Overall total		185	100.0%

Source: Survey, 2020

4.2.3 Factors affecting food security status (Correlation results)

The HFIAS was used as a proxy to measure food security status of the study area. According to Miles and Shevlin (2001), correlation analysis determines the degree to which the dependent variable and the independent variable are linearly linked. The HFAIS score was significantly linked with the explanatory variables, which include; gender, household size, marital status, household income and the household monthly food expenditure.

Table 4.4: Logit Regression Model

HFIAS	COEF.	STD. ERR.	Z
Gnd	.06107	.4158787	0.15
Hhs	-.1762501*	.0952904	-1.85
Age	.0331954*	.0203077	1.63
Mrsts	-.3914298	.3914387	-1.00
Edcl	1.318821**	.5510808	2.39
Hmi	.0000607	.0000919	0.66
Rgg	-.0903578	1.038368	-0.09
Hmfe	.0020536***	.0005204	3.95
Hlth	.8503733	.5351517	1.59
Mdst	.0362373*	.021069	1.72
Emps	.2524353	.3965424	0.64
Paa	.013548	.1274453	0.11
_cons	-5.453903	1.535436	-3.55

Significance levels: *** at 1%, ** at 5%, * at 10%

Source: Survey, 2020

The variable gender was positively linked with the Household Food Insecurity Access Scale and was not significant. Gender is an important determinant of household food security. Male-headed households are least affected by food insecurity than female-headed households. According to Gebre (2012), there is an increased vulnerability to food insecurity in households headed by females in Ethiopia. De Cock *et al.* (2013) indicated that women-headed households experience food insecurity than men-headed households. Sekamphu (2004) stated that solutions devised and fulfilled by the people in need are far more likely to prove successful than those imposed from outside, meaning that woman are not involved in the decision-making processes. This is why they are more likely to be affected by food insecurity.

Household size negatively influenced Household Food Insecurity Access Scale and was significant at 10%. This implies that an increase in household size results in the decrease in the HFIAS score, meaning that the HFIAS score varies with the household size. These results are similar to those of the study conducted by Mitiku *et al.* (2013), which revealed that there is a significant and negative relationship between household food security and household size. This only occurs if the household member is unable to contribute to the household income. It is not always the case, however, that an additional member cannot contribute to the household monthly income.

The positive sign of the coefficient indicates that an increase in age leads to an increase in the probability of a household being food secure and the variable is significant at 10% level. The results correspond to the studies conducted by Olagunju *et al.* (2012) and Bogale and Shimelis (2009) which indicated that the likelihood of food security increases with an increase in age because older people have better experience in subsistence agriculture and are able to accumulate better wealth.

There is a negative relationship between the marital status of the household head and the Household Food Insecurity Access Scale. This means that the household heads who are married are likely to be food insecure as compared to single-headed households. This can occur because of the joint decisions and the sharing of household responsibilities by the couple, which means if the couple is employed, household income will likely increase since the household expenses will be shared among the couple and that will increase the probability of the household being food secure. The variable marital status is not significant. These results are similar to the study conducted by Oesi *et al.* (2013) which found that food security was associated with the marital status of the household head.

Educational status and Household Food Insecurity Access Scale have a positive relationship and it is significant at 5%. This means that the people with higher educational levels tend to be more food secured because their qualifications enable them to get proper jobs with better incomes, and this enables them to have access to safe and nutritious food at all times. According to Badat (2009), education is an effective tool for improving social and economic development. Thus, the higher the educational level of the household head, the higher the food security of the household. Boatemma, Drimie and

Pereira, (2018) indicated that improved households' food security levels are those that have higher education levels and consequently households in a relatively good position, which simply means stable and improving agriculture, will make them more secure.

Employment status of the household head has a positive relationship with the household food security status and is not significant. The implication is that if the household head is employed, whether in the informal or formal sector, it increases the likelihood of the household to become food secure. Mokoena (2001) regards unemployment as one of the major determinants of poverty within the geographical demarcation of the study. Arene and Anyaeji (2010) indicated that household heads that are employed experienced high levels of food security when compared to those who are unemployed.

There was a positive relation between the household income and the Household Food Insecurity Access Scale score. The positive correlation denotes that an increase in the household monthly income corresponds with an increase in the Household Food Insecurity Access Scale score, although it is not significant. Thus, the household can still have lower monthly income but still become food secure because of the household size. Jacobs (2009) indicated that low-income households are more likely to experience low levels of food security than middle-income households. Frongillo *et al.* (2001)'s study in Burkina Faso (Zondoma Province) pointed out that food security varies substantially across and within villages, and was consistently associated with socioeconomic variables like income and livestock and equipment ownership.

Government grant is not significant and it has a negative relationship with the Household Food Insecurity Access Scale. This denotes that household heads that receive grants tend to be food insecure because only unemployed people are allowed to receive grants, which are not enough to feed the whole family. The implication is that if one member is receiving the government grant, there is the likelihood that the household will be food secured since the member is able to contribute to the household food expenditure. However, this variable is not relevant since the household can depend only on the government grant and there is a probability that the money cannot cover all the household expenses. A study conducted by Kisaka (2007) in the rural areas of Kwa-Zulu Natal

revealed that single female-headed households depend more on the government grant as their sources of income. The grant is low and leads to food insecurity.

Household monthly food expenditures have a positive relationship with household food security status and is significant at 1%. The implication is that the more the household monthly food expenditure increases, the higher the chances of the household to become food secure. Zeller *et al.* (2001) defined the proportion of food expenditures in light of the total household expenditure as a benchmark for poverty, arguing that food expenditure is one component that remains stable over time while increasing proportionally with household spending.

Health status of the household head is not significant and has a positive relationship with the Household Food Insecurity Access Scale because a majority of people with chronic diseases tends to receive the government grant and a majority of them are the old aged with lower household sizes, which tends to be enough to support their small families. WHO (1995) concluded that wasting, for example, caused by acute starvation or disease, indicates hunger in the short-term whereas stunting is a chronic indicator being the result of a recent or more remote shock.

Distance to the market has a positive relationship with the Household Food Insecurity Access Scale the variable is significant at 10%. This simply implies that being situated closer to the market does not guarantee household food security because one can stay closer to the market but still have little money to support their families. Thus, accessibility does not guarantee affordability.

The variable participation in agriculture was found not be significant and had a positive relationship with the household food security status. This implies that participation in agricultural activities increases the likelihood of the household to be food secured. According to FAO (2013), agricultural production in the form of fruits and vegetables is central to securing access to food for low-income households. In order for a particular rural household to overcome rural food insecurity, participation in productive agricultural sector activities should be increased as it is their main source of income (DAFF, 2012).

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter summarises the findings of the investigation, conclusions are provided on the basis of the research findings that were derived from the regression analysis, and suggestions about food security are outlined in the recommendations.

5.2 Summary of findings

This study analysed the food security indicators affecting the rural communities of Ba-Phalaborwa local municipality. It analysed the socio-economic factors influencing the household's food security status in the study area. The researcher identified that a majority of female-headed households experience more hunger than male-headed households. Hence, the aim of this study was to examine food security indicators in Ba-Phalaborwa communities.

The study had four objectives, namely; to identify and describe socioeconomic characteristics of rural households in the study area; to evaluate the food security indicators in the study area; to assess the determinants of food security in the Ba-Phalaborwa Local Municipality, and to identify the coping strategies employed against food insecurity in the study area. The need to conduct this study was motivated by the fact that a majority of rural households are still unable to secure their food despite the notable efforts of both public and private sectors to assist poor households in achieving food security and this is further proven by Von Grebmer et al. (2017) who indicted that globally, hunger and malnutrition persist in spite of the countless efforts and technical expertise that have been directed at eradicating them.

The literature review focused on the key ideas and fundamentals of food security. The aim was to review and gain an in-depth understanding of the concept 'household food security', its dimensions, its measurements across different locations, global challenges of food insecurity, analysing the history of food security and how other factors are influencing the household's food security status.

Data analysis was executed using the IBM SPSS Statistics 26 and Stata 14. Descriptive statistics were applied to describe the socioeconomic characteristics of the sampled households. The Logit Model was used to analyse the socioeconomic characteristics of the people in the study area using HFIAS as a proxy of food security status. Furthermore, HDD and CSI were used to analyse the dimension adequacy and to understand the strategies that each individual household used when it could not obtain sufficient food.

Descriptive statistics, which included the use of tables, frequencies, charts to analyse, summarise and describe the socioeconomic characteristics (objective one and three) was used. The Household Food Insecurity Access Scale (HFIAS) and Household Dietary Diversity (HDD) were used to analyse objective two. The Coping Strategy Index (CSI) analysed the fourth objective.

The Logit Regression Model was to discover factors affecting household food security in light of the following explanatory variables: gender, age, marital status, household size, monthly income, monthly food expenditure, educational level, employment status, participation in agriculture, receiving government grant, distance to the markets and the health status of the household head, which were correlated with the household's food security status. Out of these 11 variables, only five variables are significant, with the household size at 10%, age at 10%, educational level at 5%, household monthly food expenditure at 1% and distance to the market at 10%.

5.3 Conclusion

The study surveyed 185 households in the Ba-Phalaborwa local communities. Descriptive statistics were used to identify and describe the socioeconomic characteristics of the households in the study area which included gender, age, marital status, household size, monthly income, monthly food expenditure, educational level, employment status, participation in agriculture, receiving government grant, distance to the markets and the health status of the household head. The use of Household Food Insecurity Access Scale measure (HFIAS) as a proxy for measuring the food security status of the rural communities of Ba-Phalaborwa local municipality has successfully identified the level of food security for each individual household in the study area. The socio-economics and demographic characteristics affecting household food security were established.

Household food security is indeed a major determinant of nutrition security that can only be fully understood through a multi-level analysis taking into account global, national, as well as local, household and individual-level factors. According to Coates and Maxwell (2012), even though there were developments of many different indicators in the past decade, none of them that covered all the dimensions or met the criteria of the 'food security' concept. Regardless of global policies that are available to address the issue of food security, the concept still remains a serious problem and that is why more empirical studies are needed to address the issue.

The results from this project provide strong evidence that the experience-based food security information acquired by administering a questionnaire, are valid for capturing the four food security dimensions. The food security status in the study area is influenced by several factors, which include socio-economic factors, economic factors and political factors. The households with lower incomes always have to worry about food because of lower available income to spend on food. The study conducted by Allen and De Brauw, (2018) indicated that improved households' food security levels are those that tend to have higher education levels and consequently households in a relatively good position, which simply means stable and improved agriculture will make them more secure. Therefore, this study confirms the significance of gaining an in-depth understanding of household food security and it again rejects the null hypothesis that states that socioeconomic characteristics do not influence the household's food security status.

5.4 Recommendations

5.4.1 Recommendations based on the findings of the study

The recommendations of this study, which are based on the findings of this study are:

Improving educational system

The government policy of access to education for all must be effectively implemented. This can be done through proper monitoring of this policy and its strategies. For example, more focus should also be put on the introduction of feeding schemes in order to reduce the burden on the poor and at the same time, make it easier for young children to attend school.

Encouraging the use of contraceptives

The government should ensure that all birth control measures are made available to everyone who wants to use them. This will help to control the number of children in the families because it is well-known that the higher the household size, the lower the chances of the household being food secure, especially if the additional household member does not have any means of income.

Improving the livelihoods of the youth

All the development projects stakeholders, including rural beneficiaries need to be involved at each stage of the project. This means that even the youth and elders, including women, must be the ones identifying the problems they face, determining ways to overcome them, designing realistic plans to achieve these goals, and carrying them out. This is because youths are the ones faced with unemployment and cannot benefit from the government grant as a source of income.

5.4.2 General recommendations

To combat the prevalence of food insecurity, there is a need for the:

- Development of new food security measures. More food security measurements tools need to be developed to help researchers understand the similarities and differences of how people experience food security across different locations.
- Use of food security questionnaires. The government and private organisations must use food security questionnaires to assess, evaluate, or monitor the availability and access components of household food security since they are cost-effective, easier to develop and implement. The information in the questionnaire can also help to support, project, plan, target, and implement food security programmes by identifying possible interventions, points of entry for services, and subgroups desperately in need or who might most benefit.

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FACULTY OF SCIENCE AND AGRICULTURE
SCHOOL OF AGRICULTURAL AND ENVIRONMENTAL SCIENCES
DEPARTMENT OF AGRICULTURAL ECONOMICS AND ANIMAL
PRODUCTION

ASSESSING FOOD SECURITY INDICATORS OF BA-PHALABORWA LOCAL COMMUNITIES, MOPANI DISTRICT LIMPOPO PROVINCE, SOUTH AFRICA

The aim of this study is to examine food security indicators in Ba-Phalaborwa communities.

RESEARCHER : RALEFATANE MOYAGABO ELIZABETH
ENUMERATOR :.....
RESPONDENT :.....
CONTACTS :.....
DATE OF INTERVIEW :.....
QUESTIONNAIRE NO :.....

1. SOCIO-ECONOMIC CHARACTERISTICS

1. Household size
2. Gender of household head

1 male	0 female
--------	----------
3. Age of household head
4. Marital status

1 married	0 Otherwise
-----------	-------------
5. Educational level

No formal education	primary	secondary	tertiary
---------------------	---------	-----------	----------
6. Employment status

1 employed	0 otherwise
------------	-------------
7. Participation in agriculture

1 participate	0 otherwise
---------------	-------------
- Type of agricultural activity

crop	Livestock	poultry	Other:
------	-----------	---------	--------
8. Household monthly income

R0-R2500	R2600-R5000	Above R5000
----------	-------------	-------------
9. Receiving government grant

1 receive grant	0 otherwise
-----------------	-------------
- Type of grant

Child support	social	Old age
---------------	--------	---------
10. Household monthly food expenditure
11. Distance to the market

KM

12. Household head health status

1 chronic	0 otherwise
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2. HOUSEHOLD FOOD INSECURITY ACCESS SCALE (HFIAS)

The HFIAS score will be calculated using the answers based on the nine frequency-of-occurrence questions. In the study, the head of each household was asked if the condition presented in each question had ever occurred in the previous month.

0= NEVER, **1= SOMETIMES** (3-10X in the last 4 weeks) and **2= OFTEN** (more than 10X in the last 4 weeks)

	NEVER	SOMETIMES	OFTEN
1. In the past four weeks, did you worry that your household would not have enough food? (if answer is No, skip to Q2)			
2. In the past four weeks, were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources? (if answer is No, skip to Q3)			
3. In the past four weeks, did you or any household member have to eat a limited variety of foods due to a lack of resources? (if answer is No, skip to Q4)			
4. In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of			

<p>food (if answer is No, skip to Q5)</p>			
<p>5. In the past four weeks, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food? (if answer is No, skip to Q6)</p>			
<p>6. In the past four weeks, did you or any other household member have to eat fewer meals in a day because there was not enough food? (if answer is No, skip to Q7)</p>			
<p>7. In the past four weeks, was there ever no food to eat of any kind in your household because of lack of resources to get food? (if answer is No, skip to Q8)</p>			
<p>8. In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food? (if answer is No, skip to Q9)</p>			
<p>9. In the past four weeks, did you or any household member go a whole day and night without eating anything because there was not enough food?</p>			

TOTAL SCORE=

3. HOUSEHOLD DIETARY DIVERSITY

This will be used to measure food security indicators (adequacy)

In order to better understand the quality diet, different food groups consumed by household is calculated. Dietary diversity score (DDS) of the household head is used as a proxy measure of the nutritional quality of household diet.

Questions will be asked to you about the types of foods that you or anyone else in your household ate yesterday during the day and at night.

The following set of 12 food groups is used to calculate the HDDS:

0= NO and 1= YES

FOOD GROUPS QUESTIONS	SCORE VALUE
A. Any LOCAL FOODS, bread, rice noodles, biscuits, or any other foods made from millet, sorghum, maize, rice, wheat?	
B. Any potatoes, yams, manioc, cassava or any other foods made from roots or tubers?	
C. Any vegetables?	
D. Any fruits?	
E. Any beef, pork, lamb, goat, rabbit wild game, chicken, duck, or other birds, liver, kidney, heart, or other organ meats?	
F. Any eggs?	
G. Any fresh or dried fish or shellfish?	
H. Any foods made from beans, peas, lentils, or nuts?	

I. Any cheese, yogurt, milk or other milk products?	
J. Any foods made with oil, fat, or butter?	
K. Any sugar or honey?	
L. Any other foods, such as condiments, coffee, tea?	

TOTAL SCORE =

4. COPING STRATEGY INDEX (CSI)

Every day = 3, Pretty often= 2 (3-6/week), Hardly at all= 1 (1-2/week) and Never=0 (0 /week)

QUESTION	SCORE
A. In the past month, how often has the HH had to rely on less preferred or less expensive food?	
B. In the past month, how often has the HH had to borrow food, or rely on help from a relative?	
C. In the past month, how often has the HH had to purchase food on credit	
D. In the past month, how often has the HH had to gather wild food, hunt, or harvest immature crops?	
E. In the past month, how often has the HH had to consume seed stock held for next season?	
F. In the past month, how often has the HH had to send HH members to eat elsewhere?	
G. In the past month, how often has the HH had to send HH members to beg?	
H. In the past month, how often has the HH had to limit portion size at mealtimes?	

I. In the past month, how often has the HH had to restrict consumption by adults in order to allow children to eat?	
J. In the past month, how often has the HH had to reduce the number of meals eaten in a day?	
K. In the past month, how often has the HH had to skip entire days without eating?	
L. In the past 30 days, how often did you or any HH member have to eat a smaller meal than you felt like you needed?	
M. In the past 30 days, you couldn't feed the children a balanced meal because you couldn't afford that?	

TOTAL =

THANK YOU!!!!!!!!!!!!