

A comparative analysis of alternative food security indicators, using farm workers in the Northern Cape Province as a case study

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of

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**UNIVERSITY of the
WESTERN CAPE**

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2019

Declaration

I, ZONA NDONDO, declare that this dissertation on *A comparative analysis of alternative food security indicators using farm workers in the Northern Cape Province as a case study*, is my own work and has not been submitted by me or anyone else to this or any other University. I further declare that all the sources that I have used or quoted have been acknowledged by means of complete references.

Signed:

.z.ndondo.....

ZONA NDONDO

Date:

20/11/19.....



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Dedication

*I dedicate this work to my late mother, **Nomboniso Pasiya Nondo** and my late grandmother,
Nophumzile Pasiya*



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Acknowledgements

I take pleasure in acknowledging the contribution of various persons, without whom this study would not have been accomplished.

Firstly, I thank my supervisor **Professor Stephen Devereux**, for constant priceless guidance and patience.

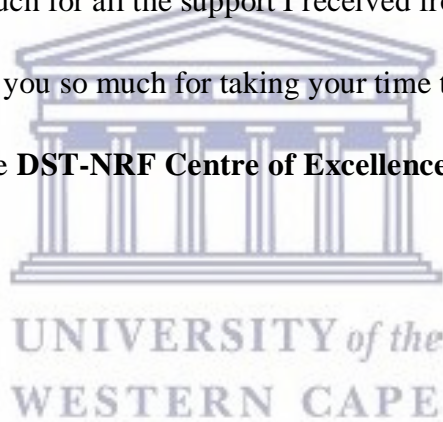
To my family, especially my aunt, **Nombuso Pasiya** and my sisters, **Ntombehlubi Nondo**, **Sinazo Nondo** and **Nasiphi Pasiya**, thank you for your support and for being there when I needed you most. I love you all!

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To **God** be the glory!



Abstract

The concept of food insecurity is complex and difficult to measure. Food insecurity is measured at different levels – global, national, household and individual. In order to have appropriate assessments of food security status, it is important to use the correct measure. This study focused on explaining three major indicators of household food security in measuring the different dimensions of food security (availability, access, utilization and stability). The contribution of this study is to add to the literature and determine how appropriately different indicators measure food security.

The study explored the relationship between the three alternative indicators of food security by comparing them, using data collected on farm workers in the Northern Cape Province of South Africa. From the results of the study, it was concluded that most of the surveyed farm workers in the Northern Cape Province are food insecure. This conclusion was arrived at because of two indicators. The Household Food Insecurity Access Scale (HFIAS) reported 42.8% of farm workers as severely food insecure; 42.8% as moderately food insecure; and 13.9% as mildly food insecure. The Coping Strategies Index (CSI) reported 56.2% of farm workers as food insecure. The Dietary Diversity Score (HDDS) reported a higher dietary diversity in farm workers (71.8%).

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Key words: Food insecurity, food security, indicators, households, household food insecurity access scale, dietary diversity, coping strategies.

List of Abbreviations and Acronyms

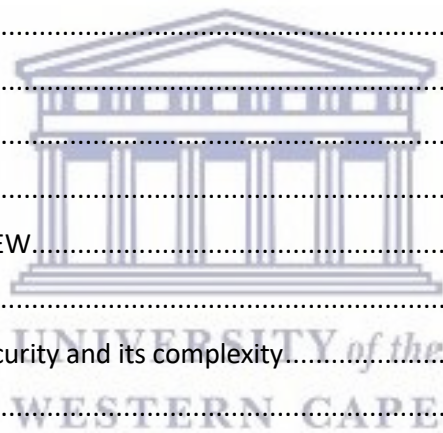
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| CSI | Coping Strategies Index |
| HDDS | Household Dietary Diversity Score |
| FAO | Food and Agriculture Organization (of the United Nations) |
| FIMI | Food Insecurity Multidimensional Index |
| GFSI | Global Food Security Index |
| GHI | Global Hunger Index |
| HFIAS | Household Food Insecurity Access Scale |
| POU | Prevalence of Undernourishment |
| WFP | World Food Programme |
| WFS | World Food Summit |



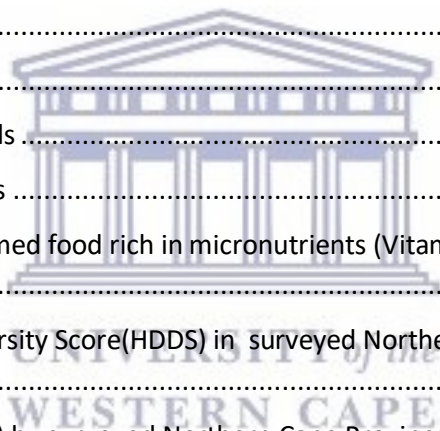
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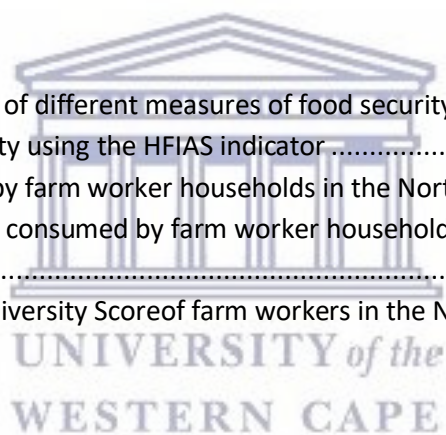
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CHAPTER ONE: INTRODUCTION

This chapter provides the background information for this study. The chapter also presents the problem statement, research questions, objectives of the study, and motivation for the study.

1.1 Background

Food security is one of the greatest human advancement issues that should be investigated, comprehended and addressed. Food insecurity remains one of the major development challenges for Africa in the 21st century (Battersby, 2012:142). FAO reported in 2017 that there was a rise on the prevalence of hunger in Africa. Recent data showed a continuation of this trend, with Western and Central Africa being the worst. Africa's worsening trend is caused by difficult global economic and environmental conditions that keep getting worse. Countries affected by conflict have shown worsening food insecurity, which in many times had been made worse by drought or floods. An example to this could be, in Eastern and Southern Africa, a large number of countries suffered from drought (FAO and ECA, 2018). Battersby (2012:142) mentioned that food insecurity and different interventions that aim to achieve food security emphasize rural food security and the concern of the rural poor. According to FAO and ECA (2018) stated that a fifth of Africans suffer from being undernourished, this represented a shocking 257 million individuals.

There have been nearly 200 definitions of food security; nonetheless, researchers have reduced the number to a few universally accepted definitions. One definition of food security that is widely accepted is that by the World Food Summit (1996): "... a situation that exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life" (FAO, 2008:1). In light of this definition, four dimensions of food security can be distinguished: availability of food; both physical and economic access to food; utilization of food; and stability over time (FAO and WFP, 2015).

The term 'food security' evolved in food policy debates following a shift in the 1980s. This shift was from food supply to the demand for food and the development of new emphases on vulnerability, access, and risk as well as food entitlement (Maxwell and Slater, 2003:103). International shifts in thinking about food security were matched by the development of multiple

definitions of food security (Maxwell, 1996:104). Food insecurity, on the other hand, is a circumstance that can be found when individuals lack reliable access to enough nutritious and safe food for regular growth and development as well as a healthy and dynamic life. Food insecurity might be caused by food inaccessibility, inadequate buying power, or insufficient utilization of food at the individual level. Food insecurity, poor health conditions and sanitation and incorrect care are the main causes of poor nutritional status. Food insecurity might be chronic, seasonal or temporary (FAO and WFP, 2015).

1.2 Food security situation in South Africa

Defining the level of food insecurity in South Africa is a difficult task. South Africa is an upper middle-income country that has a modern industrial and financial sector. At national level, it is viewed as a country that is food secure, because agricultural production is high and there is enough food available for the entire population (Dube, 2013:29). The country is overwhelmed with food insecurity, poverty, and unemployment. This can be the result of high inequalities in the country as well as the poor distribution of food and resources (Dube, 2013:30).

Large numbers of people in South Africa experience being food insecure (Altman et al., 2009:349). According to the 2016 General Household Survey (GHS) made available by Statistics South Africa (Stats SA), the percentage of South Africans with insufficient or severely insufficient access to food has declined from 23.9% in 2010 to 22.3% in 2016 (Stats SA, 2016). The percentage of households that experienced hunger decreased from 23.8% to 11.8% and there was also a decrease in the percentage of individuals who experienced hunger from 29.3% to 13.4% over the same period (Stats SA, 2016). These statistics show that even though people still suffer from food insecurity, some improvements are being made.

Change of emphasis from objective to subjective measurements has been made and is reflected in the liberal development of definitions. These subjective measurements include the acceptability of food by cultures and having fears of suffering from hunger (Hendriks, 2011:2). The shift away from focusing on national food production to the focus on sustainable livelihoods has also led to the development of food security measurement methodologies that are more focused on households (Hendriks, 2011:3). This presents many empirical challenges because the influences and determinants of food security at the household level are too many and diverse compared to the

national level. The concept of food insecurity is multidimensional; measuring it is therefore complicated.

Historically, because food security was projected at the national and regional levels and was considered identical as the self-sufficiency of national food production, it was measured mainly at the macro level by assessing food production and supply nationally. Nonetheless, major inconsistencies at the micro level are often masked by aggregated measures. To assist policy-planning and effective distribution of resources, it would be advisable to measure food security at the individual or household level. Additionally, not only the availability of food, but also access to food has to be considered, as well as the subjective view of food security (Becquey et al., 2010:1). Numerous indicators have been used for measuring different facets, determinants, or outcomes of food insecurity. These include measures that are derived from assets or nutritional status; food availability-based indicators such as food expenditure, or food consumption; Household Dietary Diversity Score (HDDS) at household level; experience-based indicators of food security using coping strategies and behaviours; and the Household Food Insecurity Access Scale (HFIAS) on the model Radimer/Cornell scale. Amid these indicators, there are two promising tools that could provide information about food security at the household level, with the objective of driving action (Becquey et al., 2010:2). These are, the HFIAS, which measures numerous dimensions of household food insecurity, and the HDDS, which complements this measure by assessing household dietary sufficiency, a central component of food security definitions (Becquey et al., 2010:2). For these two indicators, methods of data collection are neither resource nor time consuming and their operation does not require extensive technical skills (Becquey et al., 2010:2). In a study by Bunana Bikomo- Understanding Household Food Insecurity and Coping Strategies of Street Traders in Durban, these indicators were used and the outcome of HFIAS showed that, 9.2% were food secure, 17.2% were mildly food insecure, 29.2% were moderately food insecure and 42.5% of households were severely food insecure. These results indicated that 90.8% of households were food insecure and these results are similar to the findings of Frayne et al (2009) and Battersby (2011) on urban food security situation in South Africa, which the findings were; 87% and 80% of the surveyed households were food insecure respectively in Pietermaritzburg and Cape Town, of which from these households only 15% was classified as food secure. In the same studies Frayne et al (2010) used HDDS to measure dietary diversity on households in eleven cities across eight SADC countries in 2008- 2009 showed that on average,

five different food groups were consumed by households. Other studies by Frayne et al (2009) and Battersby (2011) in South African cities revealed that households were consuming inadequate diet.

1.3 Statement of the problem

As mentioned above, food security is multi-dimensional and this makes it challenging to create solid and reliable indicators and measurement devices to precisely capture it. This challenge exists as most indicators focus on measuring one dimension only. Because food security is multi-dimensional, researchers and food security agencies propose the application of multiple effective indicators, capable of complementing each other in the measurement of food security (Ike, 2015:2).

Letts (2013:23) recommends that, as genuine indicators to assess food security at household level, the consideration of the total income of households and prices of food, under assumptions of household behaviour, spending on other goods and services and also the shared distribution of income in the household. Other measures concentrate on the use of more objective measures, for example, food intake measurement and anthropometric measurement. Mallick and Rafi (2010:597) contend that these measures can be different and that they all depend on the season, hence their inability to capture the genuine condition of food security in any given setting. However, the focus of this research is on three indicators of food security, namely the Household Dietary Diversity Score (HDDS), the Coping Strategies Index (CSI) and the Household Food Insecurity Access Scale (HFIAS).

The CSI is a good tool when measuring the behaviour of people and what they do when they do not have access to food. The main questions in this measure are, what do people do when there is not enough food and they do not have enough money to buy food? People apply various means of coping when they do not have access to enough food. The HDDS measures the number of unique food groups consumed by households over a given period. It also is a measurement of the ability of a household or an individual to access food. It further measures the household's or individual's economic ability as its assumption is that households or individuals consume diverse foods if they have money to get such food. A higher number of unique food groups consumed is associated with higher levels of food security. The HFIAS measures whether households have experienced problems with accessing food during the last 30 days. It seeks to determine what changes

households made in their diet or food consumption patterns because of limited resources to obtain food. This indicator focuses on households, not on the individual and compares change over time.

1.4 Research questions

The research question of this study is as follows:

What is the level of food insecurity amongst farm workers in the Northern Cape Province, using the three household food security indicators (HFIAS, HDDS, and CSI) and how well do the three indicators complement each other?

1.5 Objectives of the study

The aim of the study is to make a comparative analysis of the following food insecurity indicators: the Household Dietary Diversity Score (HDDS), the Coping Strategies Index (CSI) and the Household Food Insecurity Access Scale (HFIAS). These indicators are commonly used by food security researchers to measure household food security. Below are the main research objectives of this study:

- a. to assess the level of food insecurity of farm worker households using each indicator;
- b. to analyze the efficacy of each of the three indicators (HFIAS, HDDS, and CSI) based on what they are measuring and how they are measuring it;
- c. to compare the relative accuracy across the three indicators in estimating food insecurity and conclude how well they complement each other.

1.6 Rationale of the study

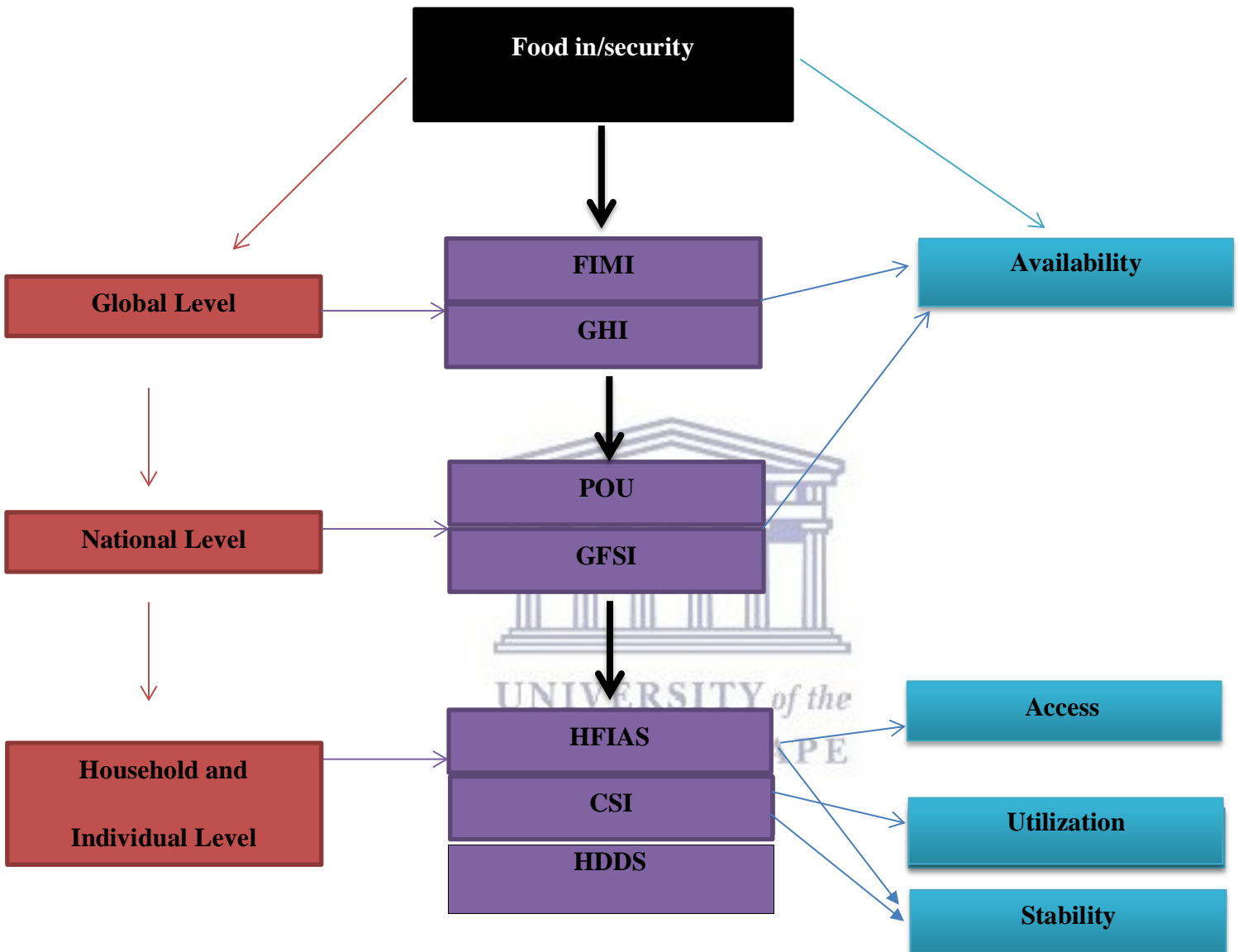
The use of the correct measure is very important because it allows researchers to obtain good results of the status of food security. It is important to understand how each measure captures food security in order to have a clear understanding of the results from each indicator. This study focuses on exploring three major indicators of household food security in measuring the different dimensions of food security, namely, availability, access, utilization, and stability. These three indicators were chosen because they are the most common measures of household food (in)security. They measure the different dimensions of food security and could lead to the correct classification of food secure and food insecure households. The contribution of this study is to add on the present knowledge and focus on determining which measure captures household food security appropriately.

The study explored the relationship between the three indicators of food security by comparing them using the data collected on farm worker households in the Northern Cape Province. The reason for choosing this group of study was opportunistic. The data had already been collected (see Devereux, 2017). The result of this study will help in assessing the accuracy of each indicator, the relationship between them and how they complement each other. In addition, the study will explore each indicator to figure out what it really measures. It is important to not miss information when addressing food security. The starting point to this is to have an appropriate measure for it. Having an appropriate measure would help in not misclassifying people as food secure when they are food insecure. This paper aims to compare the alternative indicators of food security at the household and individual levels, recognizing that the measurement of food security can also be done at several other levels, including global, national, regional, and community levels. The focus of this study is on food access at the individual and household levels, rather than on other levels and dimensions of food security, because there are already several initiatives focusing on food security at the national and global levels. Such initiatives involve discussions aimed at strengthening the work of the Food and Agriculture Organization (FAO) and the Global Food Security Index, on the measure of undernourishment in the world. Each indicator is mapped, based on the level of measurement and the components of food security access it captures. It also highlights the strengths and weaknesses of the evidence. The findings of this study provide particular guidance on the indicators that are best suited for the measurement of the different components of food security access and make recommendations for future research.

1.7 Conceptual framework

A conceptual framework binds facts together and it provides guidance in the collection of relevant information or data (Katani, 1999). The conceptual framework applied in this study (see Figure 1 below) – devised by the author of this study – classifies the measurements of food security at different levels.

Figure 1: A conceptual framework of different measures of food security



Key

FIMI- Food Insecurity Multidimensional Index

GHI- Global Hunger Index

POU-Prevalence of Undernourishment

GFSI-Global Food Security Index

HFIAS- Household Food Insecurity Access Scale

CSI- Coping Strategies Index

HDDS- Household Dietary Diversity Score

As the definition of food security includes all four dimensions, it is important to use more than one indicator to measure food security. From the explanation of each indicator above, there is no doubt that one measure is not enough to capture the entire dimensions found in the definition. The figure above shows that the definition of food security has four dimensions and that food insecurity can be measured at different levels – global, national, household and individual. All these levels have different indicators to measure food insecurity. It shows that even though each indicator seems to measure more than one dimension of food security, each has one measure that it focuses on. Most global and national indicators measure food availability and the household and individual indicators (focus of the study) measure the remaining dimensions. The focus of HFIAS is to measure access, HDDS focuses on measuring utilization and CSI focuses on measuring stability. The three indicators analysed in this study focus on household food insecurity. What is debatable now is the viability of a single measure that combines all three (HFIAS, HDDS, and CSI).

There may be several and different causal factors or determinants in the different levels in which food (in)security can occur. These causal factors can also be used as indicators, which are used in determining the status of food security of different levels. Labadorios et al. (2009) define national level food security as a state whereby a country is able to support its minimum per capita nutrition needs via importing or national production. The two main indicators used to measure this are the Food Balance Sheet and the Prevalence of Undernourishment (POU). These factors may be further influenced by the state of the country's economy, climate and land degradation (Dube, 2013:21).

According to FAO (2003) as cited in Labadorios et al. (2009) there are different determinants of household food security that are not applied at national level. These may include the household's employment and income status, the composition of the household, the household occupant's health status and its own production of food. In addition to this, there are also other factors, which include

the family's distance to basic services, the status of their education and type of settlement. It is evident that different factors affect food security at different levels. Several factors within these different levels may be interlinked, with forward or backward linkages that affect the circumstance or outcome of the household or nation. There are differences in issues that affect food security in a particular village or household and those at district, provincial or national levels (Dube, 2013:22). In summary, there are different kinds of measurements of food security that measure the status of food security of regions, nations, individuals, and households. These measurements are different from each other based on their conceptualization of food security, the purpose they are used for and their source of data.



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CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

The focus of this chapter is on reviewing the literature regarding food security, the different levels at which food security is measured and the tools used when measuring it. Food security is complex and researchers use different measures when assessing it. This chapter unpacks the most important concepts of food security. It also assesses the current literature on household food security measures and the reasons for choosing relevant measures when measuring food security.

2.2 The definition of food in/security and its complexity

2.2.1 Food security

There have been many developments towards the definition of food security. Some definitions have been used broadly, compared to others. Incorporating ‘safe and nutritious’ in the definition highlights the composition of food safety and nutrition, while adding ‘food preferences’ changes the food security concept from adequate access to food, to a more simplistic focus on accessing preferred food types. The implication is that those who have the same access to food but different food preferences, could reveal different food security levels (Pinstrip-Andersen, 2009:1).

The definition of food security has developed over time, which shows an appreciation of the complexity of the concept. During the 1970s, food security researchers focused on global and national supplies of food, as food availability was equated to food security. The work of Amartya Sen in the 1980s (Sen, 1980) challenged this notion when it became clear that the availability of food does not guarantee that everyone has access to it. Hence, the focus moved to food access at the individual and household levels. There has been a continuous growth on the focus of ‘a household’s access to food’ mostly because households are an important social unit where most individuals access their food.

During the 1990s, the spotlight shifted to micronutrient under-nutrition, thus moving attention from adequacy of calories to overall quality of diet. Currently, the developments around food insecurity are not only focusing on poverty and stunting but also obesity. Undernutrition, mainly stunting and lack of micronutrients, coexist with obesity and overweight which have been rising over the past few decades. A survey on a small sample of adults conducted in 2010 in South Africa,

revealed that the range of obesity was between 52% and 72% among 500 adults who were evaluated (Muzigaba et al., 2016:33).

The concept of food security was created during the 1970s, at a time when there were global food crises. Its initial focus was on ensuring available food supplies and the stability of prices of basic food at the national level. The changing organization of the global food economy, regarded as the cause of these crises, was reflected by the emphasis on supply-side issues. The prevalence of hunger, famine and food crises needed a new food security definition, which highlighted the critical needs of potentially vulnerable and affected people and their resultant behaviours (Berry et al., 2015:3).

A shift of the emphasis from availability to an approach that is broader which did not disregard demand was influenced by a better understanding of the historical situation. This called for a deeper understanding of the functions of agricultural markets under strenuous situations as well as those populations who were at risk, who found themselves in a situation of being unable to access food. This led to the FAO's development of its definition of food security to embrace obtaining access to supplies that are available by those who are vulnerable. A reviewed and revised definition emerged from reaching a balance between the demand and supply sides of the food security equation (Berry et al., 2015:3).

The next development evolved in 1986 with the release of a seminal report, "Poverty and Hunger" by the World Bank (Reutlinger, 1986). This report announced the time scale of food security by differentiating between chronic food security, associated with poverty problems, and acute, transient food insecurity, caused by humans and natural disasters. The Human Development Report of the UN Development Programme of 1994 identified six main threats and these were recorded from both the micro and macro levels. The six threats relate to food, economic, personal, political, health and environmental security. While food insecurity is experienced as an individual problem, policies are devised and implemented at the national level. It would make good sense to measure it at the household level, so that food preferences are not excluded (Berry et al., 2015:3).

The 2009 World Food Summit brought about a deepening of the understanding of food security when it added a fourth dimension to its definition, namely stability. This was identified as the indicator for the short-term ability of food systems to survive shocks – whether they were artificial

or natural. The other three dimensions are availability, access and utilization. This newly added fourth dimension was the one to introduce the concept of steadiness in food security. The phrase ‘four pillars of food security’ was also used for the first time by the Summit (Berry et al, 2015:5).

The four dimensions of food security

Food security is the result of food systems that operate proficiently and effectively. Efficient and effective food systems make a positive contribution to all food security dimensions (Kingu, 2015:50). As highlighted by the definition, food security is a multi-faceted problem. This concept includes the four main dimensions of availability, access, utilization, and stability (WFP, 2009).

Food availability

Availability is defined by the World Food Programme (2009) as “the presence of food in a specific country through all different domestic production forms, imports, food stocks and food aid” (WFP, 2009 cited in Napoli et al., 2011:67). The term is normally applied to food availability at regional and national levels instead of the household level and this can cause some misperception because the micro-level also uses the word ‘availability’ (Napoli et al., 2011:8). The supply side of food security is addressed by food availability and is determined by the food production and stock levels, as well as imports and exports, losses in storage, etc. (Eggersdorfer et al. 2013:9).

Measures that focus on food availability exclude information on food quality and nutrients intake. Haddad et al. (1997) tested the relationship between the availability of food and food security nutritional dimensions, using child nutrition and dietary diversity. They reached the conclusion that it was not a strong indicator of the content of food quality and nutrients consumed. Evidently, the definition of food security in terms of food availability and access gives a different idea about the level of food insecurity than a definition that is focused on nutrient intake (Jacobs, 2009:5).

Food security can also be determined based on process and outcome indicators, which Maxwell and Smith (1992) define as follows: process indicators involve variables that reflect the supply of food by providing information on the possibility of a disaster or shock that will unfavourably affect a household’s food security. Outcome indicators at the household level are separated into two groups – direct and indirect indicators. Direct indicators of food security are those close to the consumption of food, rather than someone’s medical status or marketing channel information. Indirect indicators are used when direct indicators are either unavailable, or too costly in terms of

money and time (Kingu, 2015:51). According to Kingu (2015:52), the main food security direct indicators are:

- money spent on food and the amount of kilocalories in the foods consumed;
- how households perceive food security and the degree of self-provisioning, which is determined by whether people are able to access their culturally accepted food;
- the number of months their harvest of food lasted;
- food frequency, which refers to the number of meals the individuals eat per day and the frequency of consuming particular food items believed to be superior or inferior.

Food access

As concluded at the World Food Summit (WFS) of 1996, food access was defined as the ability to have physical, economic and social access to food. To explain the physical dimension, one could use a condition where food is produced in only one part of a country, but there is no transport available to transport food. This means that the delivery of food to other parts that suffer from inadequate food is not possible or will not happen. From an economic perspective, food security is determined by an individual's ability to afford to buy adequate food. The last component, which is the socio-cultural dimension, arises in cases where food may be physically available and the consumer can afford to buy the food, but is prevented from buying it because of his/her membership of a specific social group or gender (Napoli et al., 2011:9).

Food access is rooted in prices and markets. Economists have used primarily quantitative data on food expenditure from surveys, whether nationally representative or purpose-built, for measuring food access and consumption. Webb et al. (2006) criticized this approach for its reliance on the imputation of monetary values. On the other hand, direct qualitative assessment investigates how people express their own food insecurity and the perception of and responses to food insecurity by their household members (Jacobs, 2009:6). Access is normally dependent on the availability of income to the household, income distribution within the household, and food prices. Other food security determinants include people's ability to access their institutional, social and market-related rights (Kingu, 2015:53).

Utilization

Utilization of food refers to the capability of a person's body to consume and metabolize food (Gross et al., 2000:3). Food utilization is defined by USAID (1992:1) as the proper use of food; proper processing of food and the use of storage techniques, sufficient knowledge of nutrition methods exists and is applied. Food availability and food access on their own are insufficient. Food providers should always ensure that food is safe and nutritious before it can be consumed by people. Food has to supply the body with adequate energy to allow an individual to do routine physical activities (Napoli et al., 2011:9).

There are two key aspects of food utilization – the socio-economic and biological aspects. If there is both availability and accessibility of adequate and nutritious food, the decision of the household will focus on the food being consumed or demanded, as well as the household's choices on the allocation of food. In households where there is unequal distribution, some individuals may suffer from lack of food, even if the aggregate access that is measured is adequate (Sharma, 2013 as cited in Kingu, 2015:53). On the other hand, access to food and food utilization could be restricted by economic growth, scarcity of job opportunities, insufficient training, lack of credit and inadequate knowledge (Kingu, 2015:53). A healthy environment and adequate sanitation is also required in determining a good utilisation of nutrients so they are properly absorbed by the body. And also understanding and awareness of proper health care, preparation of food and storage processes is crucial. In a context like this, safe drinking water plays a crucial role, particularly for the preparation of food and creating a healthy physical environment (Islam, 2017).

Food Stability

The WFS (2009) emphasizes the need for stability in a household, with regards to availability, access, and utilization, to ensure effective and adequate food security. It also says that stability in food availability, access and utilization has to be present at all times in order for food security to exist. If a household's food intake is adequate today and their access to food on a periodic basis is inadequate, then that household is considered food insecure.

According to the FAO (2008) a permanent or temporary loss of access to food or resources used to obtain food, determines food stability. Unstable access to food is caused mostly by climate variability (Klennert, 2009). Loss of income/employment, conflict and civil insecurity also

contribute immensely on food stability. Stability can only be given when the supply on household level does not change during the year and in the long-term. Additionally, minimizing external risks for example climate change and natural disasters is very important (Klennert, 2009). A household, a population, or individual can only be labelled food secure if it has access to adequate food all the time. They should not be at risk of not having access to food as a result of changes in climate, economic crisis or seasonal food variations. The concept of food stability refers to both access to food and available food. Improving the management of disasters can guarantee that individuals have access to enough and nutritious food at all times and in a form that is useable (MAFS, 2006). Frayne et al. (2013) added price fluctuations and political factors as other factors that affect food stability.

2.2.2 Household food security

Household food security is dependent largely on household income status. It is more likely for a household with low income to experience shortages of food than it is for a well-off household. The spending of almost all poor households is dominated by food expenditure and this is the cause of their vulnerability to the impacts of food price inflation. This relationship between the household's status of food security and its purchasing power changes over time. The quantity and quality of food bought and consumed changes when income changes, even if everything else is kept constant. Changes in food prices and other items also have an effect on the ability to purchase food (Jacobs, 2009:4).

2.2.3 Food insecurity

Food insecurity is defined as a situation whereby individuals or households do not have access to food and are unable to afford food for a healthy and dynamic lifestyle (Napoli, 2010). Food insecurity can be classified into two categories, namely acute (also known as transitory) or chronic (Napoli, 2010). According to Salih (1995) transitory food insecurity is a temporary deterioration or shortage in food needs of a country, region or household. The deterioration can be a result of instabilities in food production, changes in food prices and incomes. Cyclical or seasonal food insecurity, which falls under transitory food insecurity. Chronic food insecurity is a persistent and long-term inability to meet the minimum food consumption requirements (Devereux, 2006:11). Regardless of the diversity and complexity in these food in/security definitions, most of them develop some themes that are common, which are important when measuring and analysing food

insecurity. These themes involve availability, accessibility as well as affordability, commonly referred to as the forces of demand and supply (Menamo, 2014:13).

Food insecurity is associated with, yet different from, concepts such as malnutrition and poverty and its experience is at a range of spatial scales from households to regions and also at a time scale range (Wineman, 2013:15). A limited focus on crop yield improvement neglects the inter-related socio-political factors, for example, poor governance, conflict and a high burden of disease. This view also disregards economic factors such as unemployment, market failure and poverty that produce increasingly unstable and vulnerable communities in the region. Hence, the measurement of any change in food security and identifying the cause of that change is a complex task (Wineman, 2013:16).

Research that only focuses on and calculates the average availability of food from national food production and imports cannot reveal how this food is distributed among individuals, households, and communities (Misselhorn, 2005). Instead, the causes and correlates of food insecurity are likely to be found at the household level and individual livelihoods (Wineman, 2013:16). The narrow definition of food insecurity implies that an insufficient diet during the current state, as well as this likelihood in the future, could render a person food insecure. According to Barrett (2010), a useful conception of food security has to consider changes over time, as well as the way people view and respond to these changes, for example, the role of consumption smoothing in minimising risk and uncertainty.

2.3 Measuring food security

Many measures currently focus on the household level of food security and this is done through numerous ways. There has been a need to agree on suitable measures that will shift from availability to access, ever since Sen's work (Sen, 1980) refocused the agenda of food security from the supply of food, to the access of food by households. Endeavours to measure the dimension of food access have shifted away from indirect indicators – which focus on measuring proxies for food security, like household expenditures and income – to instruments that measure the experiences of food security by the household, known as the direct or experience-based measures. According to Ike (2015:26), “more objective indicators are however not rejected entirely because of this; there has been a shift towards the collection of objective dietary, health indicators,

economic, as well as subjective measures, socio-cultural acceptability and risk exposure that are survey-based.”

Given that food security is multi-dimensional by nature, policy-makers and practitioners have long recognized that a variety of measurement means is needed (FAO and WFP 2015:14). The ‘holy grail’ of measurement of food security would be a valid and reliable single measure, comparable over some space and time, and which captures different food security elements. Even though there has been some development of numerous different indicators in the previous years, there is not even one that meets these benchmarks (Coates and Maxwell, 2012, cited in Maxwell et al., 2013:3).

The shift in phases in economic thought relate to changing approaches when measuring food insecurity. These can be grouped into three classes or generations. It is interesting that these three generations of food security are still being used today as each may be more suitable for different assessment, research contexts or programme (Lamb, 2011:18). There has been a common agreement that efforts must be made to measure food security as an experience that is multi-dimensional.

2.3.1 Why measurement matters

There are at least three reasons why measurement matters. First, a measure can capture one phenomenon while ignoring other phenomena that are also important to the concept of food security, thus slightly influencing prioritization among interventions of food security. Second, observational data necessarily report things that occurred in the past, but the interests of policy-makers lie mostly in the possible effects of prospective interventions in the future. Third, measures at the national level only address gaps in food availability at a national-scale, and leave out access and utilization.

As food insecurity measures are known to inform actions, they also need to be connected with vulnerable households’ characteristics that are targetable and also take into account the causal factors that put households at a risk of being food insecure. The frontier of the research is therefore revolving around the development of a cross-nationally measurement at the individual and household levels (Barrett, 2010:4).

Measurement derives from diagnosis and response. As the global attention is returning to food security, there is a rise in new opportunities to improve its measurement. For the improvement of

the disaggregated identification of food insecure sub-populations and their targetable behaviours and characteristics, research moves towards survey-based anthropometric and perception measures (Barrett, 2010:5). The following two developments will bring the greatest development to food security measures. First, ‘a global network of sentinel sites’, which makes use of standardized core survey procedure for regular, repeated individual and household-level monitoring, would help researchers in tracking the co-evolution of multiple indicators of food security with targetable characteristics of individuals, households, and communities across continents. Second, if researchers knew better, different indicators’ predictive accuracy in estimating states of food security, they could concentrate the collection of data in a more cost-effective way on measures of which targetable actions can be most reliably programmed (Barrett, 2010:5).

There are three important functions of measuring. First, a good measure should allow for standardization. It should, for example, enable greater certainty of just how much food one is receiving or purchasing, since subtle discriminations and more appropriate descriptions are facilitated by a better measurement. More importantly, the function of measurement is to enable the application of mathematical techniques to verify, predict or explain a phenomenon. A good food security measure has to be credible, relevant, less costly, time sensitive and should be comparable across different places and cultures. In addition, a measure must be tested for its validity. This becomes the problem, since this needs a measure for comparison and there is no existence of such golden measure (Nathalie, 2012:20).

2.4 The development of compound indicators

Over decades, many indicators to measure food security were proposed: from narrow measurements that focused on particular variables, for example, percentage of children who are undernourished, to complex indices that are intended to synthesize the multiple dimensions characterizing food security, for example, Global Hunger Index (GHI), Global Food Security Index (GFSI) and others. The GHI is a tool aimed at measuring and tracking hunger globally, regionally, and by country (Von Grebmer et al., 2010:7). The GFSI is a dynamic qualitative and quantitative benchmarking model, built from 28 unique indicators that give an objective framework for assessing food security across many different countries (Santeramo, 2015:1). These are at the global or national level, but the focus of this study is on individual and household food insecurity. In order to organize indicators, numerous classifications have been implemented. For

example, first, food security indicators may produce information at different levels e.g. global, national, household and even individual. Second, indicators may be focused on one or more food security dimensions (Santeramo, 2015:7).

Because it is impossible to capture all food security dimensions by a single indicator, using more than one indicator is strongly suggested. Following this worry, some researchers decided to work on improving measures of food security by using simultaneously more than one indicator or by producing composite indicators. Composite measures of food security try to synthesize indicators that capture different food security dimensions in a single indicator or measure. Composite measures include the Global Hunger Index and the Food Insecurity Multidimensional Index. The components of these composite indicators include mainly national-level indicators e.g. income, under-nourishment, poverty, food production, and macronutrient or micronutrient data (Ike, 2015:32).

Food security is an important, universal dimension of personal and household well-being, it does not matter whether it is viewed globally, nationally, or in local communities, it remains important. One cannot succeed in capturing all aspects of food insecurity and hunger by using only one indicator. Rather, the level of food security of a household must be determined by getting information on different particular circumstances, experiences, as well as behaviours that function as indicators of the changing degrees of the conditions' severity (Bickel et al., 2000). In addition, one needs to identify the type of food insecurity to be measured and the indicator that is best for measuring that.

After all the existing indicators and measure of food security, the solution and way forward are to use different indicators depending on what one is trying to measure. Maxwell et al., (2013) made conclusions that the focus of the effort when developing a measure that is comprehensive should be on identifying how the indicators complement each other and on how they adapt to being locally relevant (Ike, 2015:35). Theoretically, there are difficulties when constructing an indicator that will capture each dimension simultaneously in a single indicator. Yet a more comprehensive food security measurement is only allowed by a compound index (Jacobs, 2009: 6).

2.5 Challenges in measuring food security

When food security was defined, it was emphasized that it is a multi-dimensional concept. Hence it is very difficult to measure it. It has become a goal to find clear baseline indicators for a target of food security. This baseline information should be set to give answers to these questions: which household cannot access enough food and what determines their status of food insecurity? (Nathalie, 2012:8). Because of the shift in perspective of food security, from national to food security measures that are more focused on households, there have been numerous challenges.

The multi-dimensionality of food security also contributes to the technical complications when developing food security indicators, since developing an indicator for every component of such a multi-dimensional concept is a very difficult task. According to Maxwell and Smith (1992:9) this multi-dimensional approach also makes both information collection as well as the development of policy more complicated. However, it shows the diverse and complex lives of those who are food insecure, much more clearly. In search of food security measures, a growing emphasis on fundamental measurement is noticeable as opposed to dependence on proxy measures. The change from macro supply to issues at household level occurred in part because of the increasing findings that established only weak relations between nutritional status and food availability, either at national or household and individual levels (Webb et al., 2006:2).

2.6 Alternative indicators of food security

Identifying appropriate food security measures is vital for separating those who are food secure from those who are food insecure and also identifies the nature as well as the cause of food insecurity (Hoddinott and Yohannes, 2002:10). There are many different methods that are used to measure the status of food security.

An indicator is used as a tool to reflect a feature of an assumed characteristic, for example, some components or dimension of food security. The construction of indicators is usually by the classification of values of a particular measure that was calculated from numerous measures, based on a degree or specific meaning. When an indicator is derived, it means that there is an understanding of what value of an index, measure, or scale is deemed sufficient or insufficient, for example, normal versus high body temperature (Leroy et al., 2015:3).

For indicators to be useful they need to be **valid**, that is they must be constructed in a way that is appropriate in giving a useful analytical measurement for a specific context and purpose. Indicators

become valid when they are constructed very well, reliable, and appropriate. When indicators are said to be **well-constructed**, it means that they understand the underlying phenomena that are being measured, and for which the performance of an indicator is compatible with that understanding. Indicators that are **reliable** do not produce different results when the measure is repeated, for example when weight is measured three or four times within 10 minutes. **Accuracy** is defined as the degree to which an indicator provides the phenomenon's unbiased assessment. To assess the accuracy of an indicator one has to compare it with another measure of the phenomenon that is well-known for being appropriate. It is challenging for indicators of food security to ensure validity because of the complex constructs and the lack of a universally accepted gold standard measure that reflects all food security components and dimensions. Hence, the exercises of validation have to identify first the component or dimension of food security that is being assessed and identify a relevant standard (Leroy et al., 2015:4)

The measurements used in this study are, HFIAS, HDDS and CSI and many countries have used them; these include many international agencies of the United States. These measures seem to be easy and quick to use, the analysis is straightforward and the information they provide is instant. Universal spheres of food insecurity experiences of households is presented by the developed questions and can be used to classify households based on the severity, i.e. from food secure household to severely food insecure household (Maxwell and Caldwell, 2008).

2.6.1 Household Food Insecurity Access Scale (HFIAS)

HFIAS is a nine-item scale for food insecurity, established by the USAID's FANTA project (FANTA, 2019). They used this scale to measure food security at a household level. The measurement instrument comes after a development that starts with the concern about the household's food supply followed by a decline in the quality and quantity of food, and lastly, going to sleep hungry and going an entire day and night with no food (Knueppel et al., 2010:361). In addition, HFIAS also captures reduced intake and its effects on the household as well as feeling ashamed. The reason why this measure is developed is that, when households experience food insecurity, it causes reactions that are predictable and that can be captured, calculated and also presented on a scale of severity (Ike, 2015:35). The purpose of developing the HFIAS was to reflect three apparently universal domains of the experience of inadequate food access at the household level, namely anxiety about the supply of food in a household, insufficient quality of

food, which involves variety and preferences, and inadequate food quantity, i.e. the amount consumed and the physical consequences of having inadequate food. A higher score of HFIAS indicates the poorer food access and greater food insecurity in a household (Muzah, 2015:22).

HFIAS measures the level of food insecurity (access) in the household in the month previous to the survey. “An HFIAS score is calculated for each household based on answers to nine ‘frequency-of-occurrence’ questions” (Coates et al., 2007:26), with 0 being the minimum score and 9 being the maximum score. Two methods are used to present the outcomes from this measure, namely a food insecurity scale and categories. The food insecurity categories in the HFIAS are as follows: Group 1: High food security – household did not have problems or worry about accessing food. Group 2: Marginal food insecurity – the anxiety and problems of households in accessing enough food was rare or occasional, but there was no significant reduction of their food intake (quantity, quality, and variety). Group 3: Low food security – there was a significant disruption of the quality, variety, and interest of food consumed by these households, but there was no disturbance in quantity and eating patterns of their meals. Group 4: Very low food security – at times during the survey period, one or more household members’ eating patterns were disturbed, and their food quantity also reduced because of the lack of resources or lack of money to buy food.

Intended uses: the use of the information collected from the HFIAS can be used for assessing food insecurity prevalence of the household, or of a population; also to keep record of changes in food insecurity over time. This is beneficial in monitoring programmes and evaluation of activities related to food access, also in the population-level targeting.

Reliability validity: the HFIAS is part of numerous household surveys. For example, there is an adapted version used in the Bangladesh Integrated Household Survey and this is publically available, this makes it useful for comparability through countries and years.

Strength of HFIAS: HFIAS can detect, in a unique way, food insecurity aspects that involve a decrease in access to an adequate quality or quantity of food and also the psychosocial expressions of uncertainty and anxiety around food access, which can also play a negative part on an individual’s health and well-being. In addition, it is understandable and can be applicable through different contexts, which includes both urban and rural settings. It is also short and it is easy to add it as a module to other surveys conducted in households.

Weaknesses of HFIAS: the language used in the questionnaire of HFIAS is said to be culturally specific, which provides a challenge when it has to be used in comparing across sociocultural contexts. This indicator fails to quantify the consumption of food or directly assess the quality of diet. When one wants to do so, it necessitates other methods, for example, the 24-hour dietary recall that is used to quantify the consumption of food or a diet diversity index that is used to paint a clear picture of the ‘adequacy’ aspect of diet quality (INDDEX Project, 2018: 2).

2.6.2 Household Dietary Diversity Score (HDDS)

Dietary diversity is recognized as the main element of the quality of diet because by consuming a variety of food groups it ensures enough intakes of important nutrients and helps in promoting good health. There have been developments of simple scores to measure household dietary diversity in contexts where the use of detailed dietary assessment methods, for example, 24-hour dietary recall is prevented by limitations of resources (Leroy et al., 2015:16).

Intended uses: originally, the development of HDDS was intended to monitor changes in household access to sufficient food quality and quantity and to evaluate what impacts the programmes have.

Validity and equivalence: the accuracy of the FANTA (2019) HDDS indicator that is used in this study as one of the alternative measures, was originally tested by the connection it has with household per capita energy consumption – which is used as the instrument that measures access to adequate food and per capita energy consumption from non-staples and staples, respectively (Leroy et al., 2015:18).

The Food and Nutrition Technical Assistance (FANTA) project of the United States Agency for International Development (USAID) developed the HDDS (Ecker and Van Asselt, 2019:13). The questionnaire in the HDDS method stimulates information on consumption of 12 food groups over the reference period of the past 24 hours. When an interview is conducted, the person who should be asked to recall all meals, snacks, and drinks consumed by that particular household (every member) should be the person primarily responsible for preparing meals for that household (Kennedy et al., 2010:2).

According to Mvula and Chiweza (2016:6) the HDDS provides information on the consumption of many food groups by households over the past 24 hours. Based on the classification of food

groups for Africa by the FAO (2015), the HDDS ranges from a score of 0 (least diverse) to 12 (most diverse, an indicator that foods from all food groups are being consumed in the household). When the average number of consumed different food groups increases, it gives a calculable measure of the household's improved access to food. In general, when there is an increase in the household's dietary diversity, it reflects that the household's diet and food security has improved (Hoddinott and Yohannes, 2002).

The HDDS is intended to capture food security's nutritional aspect, to be time sensitive in terms of changes that occur over time and to be less subjective, and not to take much time for data collection and analysis. The HDDS is a respectable alternative measure of food security, for the following reasons: (a) having a more expanded diet is a very important outcome itself; (b) upgraded outcomes, for example, anthropometric status and birth weight are related to more diversified diets; and (c) it identifies hidden hunger that exists, which comes from micro-nutrient deficits (Ike, 2015:34).

What is more attractive in dietary diversity tools, is that it is easy to compute them with data obtained through collection methods that are relatively inexpensive such as “rapid, user-friendly and easily administered low-cost assessment tools (Cafiero et al., 2014:8).” The problem with the simplicity of calculation is that it has a possible cost in error – for instance, discrete jumps in the diversity score may be encouraged by classifying food items wrongly into food groups. To improve the reliability of this classification, food groups must be adapted to foods available in the location being studied. There has been a fair conclusion that, even though they cannot be perceived as comprehensive food security measures, HDDSs one way or another, are reflecting energy consumption at the household level. When they are analyzed together with other information that is food security-related, they offer a holistic picture of the status of food security and the impact it has on access to a diverse diet (Cafiero et al., 2014:9).

2.6.3 Coping Strategies Index (CSI)

The Coping Strategies Index (CSI) tool is intended to determine the coping strategies' number and frequency that may be employed by the household when there is a shortage of food (Maxwell et al, 2003). The CSI is a comparative tool, rather than an absolute measure of food insecurity. Unlike HFIAS and the HDDS, the CSI is specific to its context, it does not have a designated cut-off point in its scale as to at what level can one say a household is 'food secure' and above which one could

say a household is 'food insecure'. But it can be used in an analysis that is cross-sectional to determine the households that are better off and worse off, and what the associates of these two kinds of households are (Maxwell and Caldwell, 2008). The comparison of CSI scores and averages gives a clear picture of a household's overall food security (Devereux, 2001).

The use of a Coping Strategies Index (CSI) in this study was to assess the coping strategies that households use when they are experiencing food shortages, through keeping record of the different strategies that were used by households and to compare its results to other household food insecurity indicators. Poor households use more coping strategies than those who are not poor. According to Maxwell and Caldwell (2008) households that use severe coping strategies in dealing with food shortages become more vulnerable. The coping strategies are divided into four categories (Maxwell et al., 2003):

- a. dietary change: this is when households change their diet by consuming less preferred food or food that is less expensive;
- b. the use of short-term strategies in order to increase their supplies of food, namely borrowing food and purchasing food on credit;
- c. reducing the number of household members that need to be fed by either sending some of them to eat at relatives, or at neighbours and friends;
- d. reducing meal portions in the household, favouring certain members of the household and going a whole day without a meal (Maxwell et al., 2003).

CARE International and the WFP developed the CSI to measure the access to food component of food security in Uganda, Ghana and Kenya. Currently it is also used in other countries in Africa and some other countries in Asia and the Middle East (Maxwell and Caldwell, 2008; Minwuye, 2015).

The CSI is a group of questions asked in a household with a goal of finding out how they manage to cope with the shortage of food. Maxwell (1996:159) identified the most common household short-term coping strategies: eating food that households prefer less, limiting the size of the portion, borrowing money to buy food or borrowing food and skipping meals. The CSI is known to measure behaviour. It is simpler, quicker and also cheaper to gather information on the coping strategies (Maxwell et al., 2003:3).

Intended uses: the plan of the CSI was to be used to determine food insecurity's causes and consequences – “by identifying coping strategies that reflect early onset, rather than very severe forms of food insecurity” (Leroy et al., 2015:15) and to identify food insecure households.

Validity and equivalence: the CSI's construction is reliant on discussions carried out on focus groups; there has been no establishment of its reliability.

The accuracy of the CSI was verified in a study carried out where the findings showed its correlation with per capita availability of energy. The reduced CIS reliability and accuracy do not have a construct, measurement, item, or scaler equivalence. The importance of assessing coping strategies is that it understands behavioural responses when a household has lack of access to or cannot access adequate food, but not necessarily for the assessment of the access dimension of food insecurity *per se*. Of importance is also whether or not there are certain coping strategies adopted by a household, as well as the perceived need or the desire to adopt them (Leroy et al., 2015:16).

Coping strategies are defined as mechanisms used to cope with inadequacy of food in a short-term and they can be ‘consumption smoothing’ or ‘income smoothing’ strategies. Consumption smoothing strategies are efforts made to limit consumption of a household's members. Income smoothing strategies are efforts made in reducing food insecurity through the diversification of income. In general, coping strategies are activities used by people as a means to get through tough times that are due to events that negatively impact their livelihood and way of living. Coping strategies are different based on region, community, ethnic group, social class, household, age, gender and season (Chambers, 1989; Thomas et al., 1989). These types of strategies that households employ also differ based on the severity and duration of the potentially disruptive conditions.

Strength of the CSI: the CSI is applied in both qualitative and quantitative settings and this helps in offering a fast cross check validity. Coping strategies are simpler, quicker, and cheaper to gather information than the actual household levels of food consumption. The method does not require highly trained enumerators and also no complicated analytical procedures are needed. It can be understood easily by both food policy-makers and non-specialists. The CSI helps to capture some vulnerability element, which is the most important element of food security definition.

Weaknesses of the CSI: as with any technique that gathers information and that is dependent on respondent recall, it is possible in the CSI that the recall information is inappropriate, or that the respondent will recall more coping than actually took place when they think they will benefit from it. Because of this, it is not recommended to use this tool repeatedly using the same sample of households. The CSI measures food insecurity status at the household level and it overlooks the status of food insecurity at the individual level. Measurements at household level are not appropriate for interventions that target individuals. Household measures are not suitable for interventions that are individually targeted. When it comes to the CSI, there is no chosen cut-off point below whereby a household would be considered ‘food secure’ and above which it would be considered ‘food insecure’. But the CSI can be used in cross-sectional analysis that is monitored over time to determine households which are better off and which are worse off. The CSI can help to differentiate chronic and transitory food insecure households. The main critic of the CSI is that in its original form it has been relatively unhelpful in comparative analysis (Maxwell and Caldwell, 2008).

2.7 Farm workers in South Africa

According to the study titled “Sleeping giant is stirring: Farm workers in South Africa” (Andrews, 2014:1), the population of the farm workers in the Western Cape makes up the largest number of farm workers in South Africa. These workers are mostly in the industry of fruit and wine. In 2012, out of an estimated 603, 000 farm workers working in South Africa; the Western Cape had an estimated 121 000 farm workers employed in the industries of fruit and wine (Andrews, 2014:3). The minimum wage prescribed by the law for the sector by then was R69 a day in 2012; nonetheless, numerous workers were getting paid an amount less than R69 every day (SAHO, 2012:3). This minimum wage increased by 52%, after the strikes that happened in 2012 and 2013, from R69 per day to R105 per day (Masemola, 2013:1). After the wage increase, many workers lost their jobs, and some became casual instead of permanent workers (Masemola, 2013:1). This implied that people were now at higher risk of being food insecure because of the loss in income. Since 2013, the loss of permanent employment has continued in this sector; and some researchers have attributed this decrease largely to the increase in the minimum wage (Ranchhod and Bassier, 2017:23).

Farm workers rely upon farm owners for income to purchase the basic needs of their households. Most permanent workers live on the farms where they work, much of the time in poor living conditions – the quality of housing is not good, access to water, sanitation and electricity is a problem, they are far from health and education services and this makes it hard for their children to attend school. Not only do they live in poor conditions but also there are high levels of food insecurity amongst many of these workers as they mostly fail to access adequate nutritious food (SAHO, 2012:5). Seasonal workers have additional difficulties due to not having stable work (Visser and Ferrer, 2015:2). Women on farms are most likely to be casual workers. Because seasonal or casual employment is temporary, they are paid less and are less secure compared with permanent employment. As such, they are regarded as being among the most vulnerable workers (Devereux and Solomon, 2010:3).

Food insecurity is extensive and the experience of hunger is common to people living and working on commercial agricultural farms in South Africa today. People who produce food and their children often go to bed with an empty stomach. Children of farm workers in South Africa are most marked with growth stunting due to malnutrition (Mackay, 2018). Women in particular are vulnerable within this system because they depend on a relationship with a man for them to have access to housing on farms. Regardless of what the South African Constitution and Bill of Rights stipulate, that is, people should not be discriminated against based on their gender, a highly institutionalized system of job reservation exists in commercial agriculture in South Africa. Permanent jobs are effectively reserved for men – this is based on a patriarchal belief that men are heads of households, while most women are limited to seasonal, low-paying and often more risky and dangerous jobs. These discriminations encourage women to sacrifice meals in times of food scarcity, since all livelihoods depend on a male breadwinner in the family (Mackay, 2018).

Farm workers in the North-West Province were identified in a study by THUSA (Transition and Health during Urbanization of South Africans) as an extremely vulnerable group concerning their poor nutritional status, mental and physical health. In particular, children who live on commercial farms were identified to be a very vulnerable group and were at high risk of being stunted and underweight compared to any other children. A ‘farm worker’ was defined by the THUSA study as “dependent wage labourers and their families who work and also live on white-owned farms” (Kruger et al., 2003:16). When a survey for that study was conducted, respondents stated that they

were not satisfied with the low income level and high costs of living. In the discussion, they also revealed that they long for the past practices of *mahala*, that means that something is received free of charge. In the past, there was no need for farm works to pay for certain services, for example housing and water, and they used to get maize meal from the farm owner as part of the monthly salary. Another dissatisfaction was revealed by women, where they complained about limited employment opportunities for them on farms. Additionally, they frequently highlighted the problem of distance to towns and shops and lack of transport, which leaves them with no other option but to buy food in the smaller shops that are located close to farms and from the more expensive cafés. This limits availability of and access to food and has negative impacts on household food security (Kruger, 2006:833).

2.8 Conclusion

The literature review discussed the extensive range of literature on household food security indicators, as the focus of this research. This chapter also considered the various contributions to the formulation of a comprehensive definition of food security. This study uses the definition, as proposed by the 2009 World Food Summit that includes all four dimensions of food security, i.e. food availability, food access, utilization and stability. There are many different measures of food security presented in the literature. What is most important when measuring food security is to decide from which level it will be measured. For example, one cannot use the same measures when measuring food security at the national level and at the household or individual levels.

CHAPTER THREE: RESEARCH METHODOLOGY AND DESIGN

3.1 Introduction

The aim of this chapter is to explain the techniques used by this study and to elaborate on the five components of its structure. The first section presents the study's research design. The second section discusses the sampling techniques applied; the third section elaborates on the methods of data collection; the fourth section deals with the questionnaire design and the last section discusses the methods of data analysis.

3.2 Research design

This study seeks to demonstrate how the three alternative indicators of food security complement each other and which one is more appropriate in capturing food security. The case study is based on farm workers in the Northern Cape Province. The reason for choosing farm workers is that research has shown that this category of workers in South Africa, who ironically produce food for their country, suffer food insecurity, on a very large scale (see Devereux and Solomon, 2010; Shabodien, 2018; Mackay, 2018).

This study makes use of an existing data set, which was collected in 2017 in a study conducted by the Centre of Excellence in Food Security (CoE-FS) at the University of the Western Cape (see Devereux, 2017). The researcher of this study captured, cleaned and analysed the data, for purposes of this study.

The 2017 study used a quantitative approach to collect data on household food insecurity in the Northern Cape Province. This approach was applied to each of the three indicators (HFIAS, HDDS, and CSI) in engaging with the households. Quantitative research is used when explaining phenomena “by collecting numerical data and analysing it using mathematically based methods, statistics in particular” (Muijs, 2010:1). Quantitative research is specific when it comes to surveying and experimentation, as it is known to build on theories that already exist (Williams, 2007:66).

3.3 Sampling techniques

The sample was drawn from the population of farm workers in the Northern Cape Province, as part of the 2017 CoE-FS study (Devereux, 2017) - The interview questions were given to women

on farms. The study aimed at a sample size of 200 households and eventually commenced the baseline study with 195 households. Budgetary constraints prevented a larger sample or a survey design that is fully randomized. The sample was disaggregated by geographic area. The sampled areas included Augrabies, Kakamas, Keimoes and Upington. The study employed a total of 8 research assistants who were given designated areas to work in and a number of questionnaires to complete. Research assistants visited farms and farm worker communities randomly and interviewed not more than two households working or living on any one farm, to determine the discrepancies experienced by farm workers. If the farm authorities denied access to their farm, the interviewer resorted to other locations or proceeded to the next interviewee until the targeted number of interviewees was met. Telephone interviews were also conducted; all households were interviewed each month by telephone for twelve months. The aim was to get a panel sample of 200 during every round. Interviewers found that the number of households interviewed from the first to the third round varied, due to attrition. The baseline data had 195 households, the HFIAS had 189 households, the HDDS had 166 households and the CSI had 169 households.

When the data for the HFIAS, HDDS and CSI was cleaned, the writer of this thesis decided to use households who responded to all three questionnaires and in total there were 166 instead of the 200 targeted households. Because of inconsistencies in some variables, the decision was taken to disregard the ambiguous cases when analyzing the data, to make it easier for comparison of the three indicators. If the 166 households responded to all three questionnaires, it would give a clear indication of the relationship between the three indicators rather than having inconsistent responses from some households.

3.4 Data collection methods

This study made use of the primary data collected in 2017 by the Centre of Excellence in Food Security. The CoE-FS used a mixed methods research strategy, which had two components. Firstly, the household survey quantitative baseline questions, which included income and food security status of farm workers. Secondly, the food security monitoring, which included the household food security indicators (HFIAS, HDDS and CSI), access to social protection and market prices (local costs of a basket of basic food items). The data was collected either in locations that were convenient, for example where women working on farms were organized for other purposes, or using telephones. The three indicators were used in a three-monthly cycle, which

started in September 2017 and was repeated 4 times. The first instrument, the HFIAS, was administered in October 2017, the HDDS in November 2017 and the CSI in December 2017.

3.5 Questionnaire design

As indicated above, this study used data from the 2017 CoE-FS study. The instruments were rotated, except for the baseline. These four questionnaires included the baseline survey and food security monitoring, which used three questionnaires for each of the indicators – HFIAS, HDDS and CSI. The baseline survey included the following modules:

- a. Identifying information, which was done by both the interviewer and the respondent; personal information, which includes the marital status and employment situation of the respondent.
- b. Household information, which includes household roster – age, education, etc. of each member in the household.
- c. Sources of food and income, which include food gardens and animal ownership.
- d. Spending, which includes estimated monthly expenditure on food and non-food goods and services
- e. Social protection, which include household access to social grants, informal support and school meals; and hunger, which pertains to experiences of hunger during the previous year, coping strategies and feelings of shame.

This study uses the first three rounds of the monthly monitoring survey, to cover all three indicators, using the data collected in October 2017 (HFIAS), November 2017 (HDDS), and December 2017 (CSI). The HFIAS questionnaire included questions about worry/uncertainty in accessing food in the past month. The HDDS questionnaire included questions about the diet of households and the number of food groups they consumed in the past 24 hours. The CSI questionnaire included questions about coping strategies used by households when they are experiencing food shortage.

3.6 Methods of data analysis

This researcher entered and cleaned the quantitative data collected, using Microsoft Excel and Stata/SE 13.1. The latter was used to perform all statistical analysis. Data analysis included descriptive statistics – to generate graphs and frequencies, Spearman correlation, and cross-tabulations. To assess the food insecurity status of farm worker households, each indicator was

used. These indicators have different ways of measuring food insecurity. As mentioned above, these indicators are different in terms of what they measure, as each indicator has its own variables that were analysed to get outcomes. To answer objective one, all three indicators were used to measure food security in the surveyed farm workers. The status of food security reported by each indicator was compared and analysed. To answer objective two, Spearman's correlation was used to compare the relationship across the three indicators. Objective three was answered by comparing results obtained in objectives one and two. Below is an in-depth explanation of how scores for each indicator are calculated to arrive at conclusions about the status of food insecurity in farm worker households. Data analysis included descriptive statistical techniques. The HDDS, HFIAS and CSI methods of calculations were used to analyse the data. The study used the Spearman correlation to do a comparative analysis of the three indicators. The Chi-square test was also used in testing differences across these indicators.

Spearman's rho is a measurement of strength of association between two variables. The values of the strength of co-occurrence of two variables is expressed in a single value of -1 and +1. A positive relationship between the two variables is shown by a positive correlation coefficient, while a negative relationship is shown by a negative correlation coefficient (Hauke and Kossowski, 2011). A Chi-square test is used in testing hypotheses about how observations are distributed in different categories. The null hypothesis is that the observed frequencies are no different from the expected frequencies. It is also used in testing whether two categorical variables are associated (Satorra and Bentler, 2001).

3.6.1 Household Food Insecurity Access Scale (HFIAS) Score

The HFIAS is a continuous indicator that measures the degree of the access to food in the household in the past 30 days. According to Coates et al. (2007), to calculate HFIAS "one has to sum the codes for each frequency-of-occurrence question. Before the frequency-of-occurrence could be summed, the data analyst should code frequency-of-occurrence as 0 for every case where the answer to the matching occurrence question was no ... For example, if Q1=0 then Q1a= 0, if Q2=0 then Q2a=0, etc." (Coates et al., 2007:18).

A household can only get to 27, which is the maximum score when it has responded 'often' to the questions asked in the HFIAS questionnaire and this response is often coded as 3. When a household answers 'no' to all the questions, the answers are recoded a 0 and this is known as the

minimum score. Even though, between these scores there have never been universal cut-off points with regards to food insecurity levels, a higher score means more food insecurity is experienced by the household – which can also be translated as having poorer access to food. A lower score means less food insecurity is experienced by the household (Coates et al., 2007:18).

| | |
|---------------------------|---|
| HFIAS Score (0-27) | Sum Frequency-of-occurrence Question Response Code (Q1a+Q2a+Q3a+Q4a+Q5a+Q6a+Q7a+Q8a+Q9a) |
|---------------------------|---|

Source: Coates et al., 2007:19.

| | |
|----------------------------|---|
| Average HFIAS Score | $\frac{\text{Sum on HFIAS Scores in the sample}}{\text{Number of HFIAS Scores (i.e., households) in the sample}}$ |
|----------------------------|---|

Source: Coates et al., 2007:19.

A food secure household does not experience the conditions of food insecurity, i.e. access, or the only thing it experiences is worry, but it hardly ever does. A household that worries about not having adequate food often or sometimes, and/or does not consume food they desire, is known to be mildly food insecure. However, this does not include them cutting back on food quantity and they do not experience the three conditions that are most severe. These include, having to go to bed hungry, running out of food and not eating an entire day even at night. A household that sacrifices the quality of food more often, by consuming undesirable foods or a dull diet sometimes or often, and/or has begun on cutting back on quantity by decreasing the number or sizes of meals they eat a day, sometimes or even rarely. This category of household is not experiencing the three conditions that are most severe and is therefore known to be moderately food insecure. A household that has graduated from the situation of cutting back on the sizes/number of meals and also experiences all three most severe conditions, even if it means experiencing them once in the previous month, is labelled food insecure (Menamo, 2014:36).

Household Food Insecurity Access Scale Score (HFIAS SCORE)

The range of possible scores for the HFIAS is from 0 to 27. A study by Chakona and Shackleton (2018) divided households into four groups as follows:

- Food secure = 0-1
- Mildly food insecure = 2-7
- Moderately food insecure = 8-11
- Severely food insecure = greater than 11

To derive the HFIAS, each household's score of (0-27) was calculated by summing the 9 questions in the last 30 days (these questions are also known as frequency-of-occurrence); (Q1a+Q2a+Q3a+Q4a+Q5a+Q6a+Q7a+Q8a+Q9a).

3.6.2 Dietary diversity

To calculate the dietary diversity scores, one must add all food groups that the household consumed in the past 24 hours. A food group variable has to be created for those groups of food that need to be grouped (FAO, 2010:25). For instance, the food group 'Starchy staples' is a mixture of 'White roots and tubers' and 'Cereals'. A new variable labelled 'Starchy staples' has to be created by joining the answers to 'White roots and tubers' and 'Cereals'. For instance, "Starchy staples=1 if q1 (Cereals) =1 or q2 (White roots and tubers) =1. Starchy staples=0 if q1 (Cereals) =0 and q2 (White roots and tubers) =0" (FAO, 2010:26). The last step is to create the variable labelled HDDS (Dietary Diversity Score). Then, all the values for the dietary diversity variable will be calculated by adding all food groups included in the Household Dietary Diversity Score– meaning all 12 foods for the household (FAO, 2010:26).

| | |
|-------------|-------------------------------|
| HDDS (0-12) | Sum (A+B+C+D+E+F+G+H+I+J+K+L) |
|-------------|-------------------------------|

Source: Swindale and Bilinsky (2006).

| | |
|--------------|---|
| Average HDDS | $\frac{\text{Sum (HDDS)}}{\text{Total Number of Households}}$ |
|--------------|---|

Source: Swindale and Bilinsky (2006).

For example:

In the last 24 hours, did you and members of your household eat any of the following food items, Cereals?

0= No

1= Yes

Scoring and analyzing the collected data is straightforward. The HDDS reflects a household's ability to access a diversity of foods. It has been revealed by studies (see for example, Nana et al., 2014 and Ike, 2015) that increasing dietary diversity is related to household food security and higher socio-economic status. The Household Dietary Diversity Score (HDDS) is used to reveal the number of different food groups consumed by household over a period of 24 hours. The number of different food groups each household consumed was calculated in order to show their quality of diet. The 12 food groups listed below were used to calculate the HDDS based on questions of yes/no, and a person responsible for preparing meals answered these question on behalf of the whole household. The list is as follows:

1. Cereals
2. Tuber and roots
3. Legumes, nuts and seeds
4. Milk and milk products
5. Eggs
6. Fish
7. Meat
8. Sweets
9. Oils and fat
10. Vegetables
11. Fruits
12. Spices, condiments and beverages.



3.6.3 Coping Strategies Index (CSI)

The CSI tool counts the coping strategies and these are unequal in terms of severity. The weighing of each strategy is different and it is dependent on the severity of that particular strategy to the person relying on them. The frequency answer should then be multiplied by a weight that reflects the severity of the behaviour of an individual. Lastly, the totals must be added. The easiest and simplest procedure for doing this is to make a group of individual coping behaviours based on the similar levels of severity and allocate a weight to each group, from lowest, which is least severe to highest, which is most severe. To be able to do an analysis of the CSI results, there must be two

pieces of information. The first is a means of scoring the relative frequency; the other is a means of scoring the weights from least severe to most severe (Maxwell and Caldwell, 2008:9).

Table 1: Frequency

| | Frequency | | | | |
|-----------------------|------------------|---------------|------------------|-----------------|-----------|
| Report | Never | Hardly at all | Once in a while | Pretty often | Every day |
| Number of days | 0/week | 1 time a week | 1-2 times a week | 3-6 days a week | 7 days |
| Mid-point | 0 | 0,5 | 1,5 | 4,5 | 7 |

A coping index was computed based on the frequency that the household employed different coping strategies. Households reported nine coping strategies when reporting their status of food security in the past month.

3.7 Conclusion

This study used quantitative research methods to answer its research questions. Three questionnaires were used as methods of data analysis and these questionnaires focused on different aspects of food security. The HFIAS questionnaire focused on the access of food by households, the HDDS questionnaire asked questions about the quality of the household's diet and the CSI questionnaire asked questions about the coping strategies used when households experience food shortages. The results of these three indicators are explained in the next chapter.

CHAPTER FOUR: DISCUSSION OF FINDINGS

4.1 Introduction

The purpose of this chapter is to present and discuss the results of data collected from farm worker households in the Northern Cape Province. The chapter is divided into five sections, namely, socio-demographic results, access to food by households, food diversity of households, coping strategies index, a comparison of indicators and crosstabs with Chi-square test.

4.2 Socio-demographic results

The section below merely shows a picture of households' demographics. The research will not dwell much on the demographics because its interest is on the three indicators.

Table 2: Levels of education of farm worker households in the Northern Cape Province

| Highest level of education (n=195) | Percent |
|------------------------------------|---------|
| Primary Schooling | 30.8 |
| Secondary Schooling | 64.6 |
| Tertiary Schooling | 0 |
| No Schooling | 2.1 |
| Missing | 2.5 |

Table 2 above shows four things: almost all farm workers surveyed have attended school (only 2% have not); about 1/3 of farm workers surveyed have completed primary school (31%); about 2/3 have completed secondary school (65%); and lastly, no farm workers surveyed have a tertiary qualification (0%).

Table 3: Household's relationship status

| Relationship Status (n= 195) | Frequency | Percent |
|------------------------------|-----------|---------|
| Co-habiting | 63 | 32.3 |
| Divorced | 1 | 0.5 |
| Married | 33 | 16.9 |
| Separated (not yet divorced) | 1 | 0.5 |
| Single | 93 | 47.7 |

| | | |
|----------------|---|-----|
| Widowed | 4 | 2.1 |
|----------------|---|-----|

The table above shows that a large number of women in the survey are single (47.7%), followed by 32.3% of people who are living with their partners although they are not married; 16.9% of households are married people and only a small percent (0.5%) are divorced and separated but not yet divorced people and lastly, 2.1% of people are widows.

Table 4: Status of farm workers' living arrangements

| Worker lives on farm or not (n=195) | Frequency | Percent |
|--|------------------|----------------|
| No | 137 | 70.3 |
| Yes | 58 | 29.7 |

The table above indicates that most farm workers surveyed (70.3%) in the Northern Cape Province do not live on farms while only 29.7% farm workers live on farms.

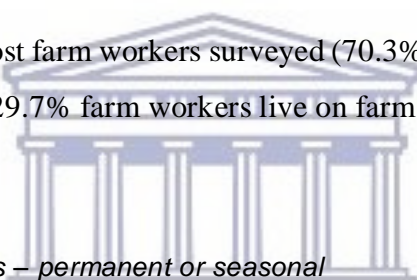


Table 5: Category of farm workers – permanent or seasonal

| Category of farm worker (n=195) | Frequency | Percent |
|--|------------------|----------------|
| Missing | 1 | 0.5 |
| Permanent | 20 | 10.3 |
| Seasonal | 174 | 89.2 |

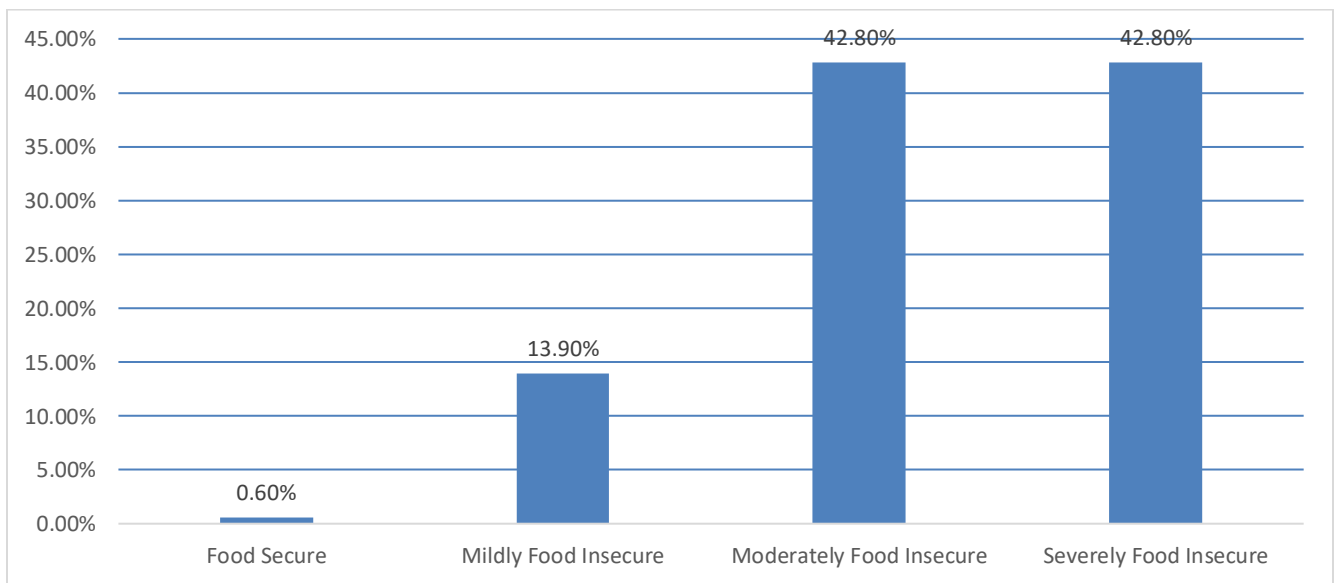
In the whole sample, 47.7% of the household are single parent households and 70.3% live off farms. Table 5 shows the category of the farm workers: 89.2% of these women are seasonal farm workers and 10.3% are permanent workers. In general, it can be said that most women on farms in the Northern Cape Province are seasonal workers. Food insecurity is more likely to occur in seasonal farm workers because of their income instability, unlike permanent workers.

4.3 Access to food by households

The results in Figure 2 show that 0.6% of households were food secure, 13.9% were mildly food insecure, 42.8% were moderately food insecure and 42.8% were severely food insecure. According

to the HFIAS, more than half of the surveyed households are food insecure, whether mildly or severely food insecure. The study's results showed that surveyed farm workers in the Northern Cape Province in terms of HFIAS are food insecure. A total of 99.4% of the households experienced challenges in accessing food at the household level. This total number is the sum of the percentage of all severely, moderately and mildly food insecure households. These results are somehow similar to the results from the studies by Bunana Bikomo (2014), Frayne et al (2009) and Battersby (2011), where it showed that a large number of households were food insecure (90.8%, 87% and 80%). Only few households were classified as food secure (15% and 9.2%).

Figure 2: The status of food security using the HFIAS indicator

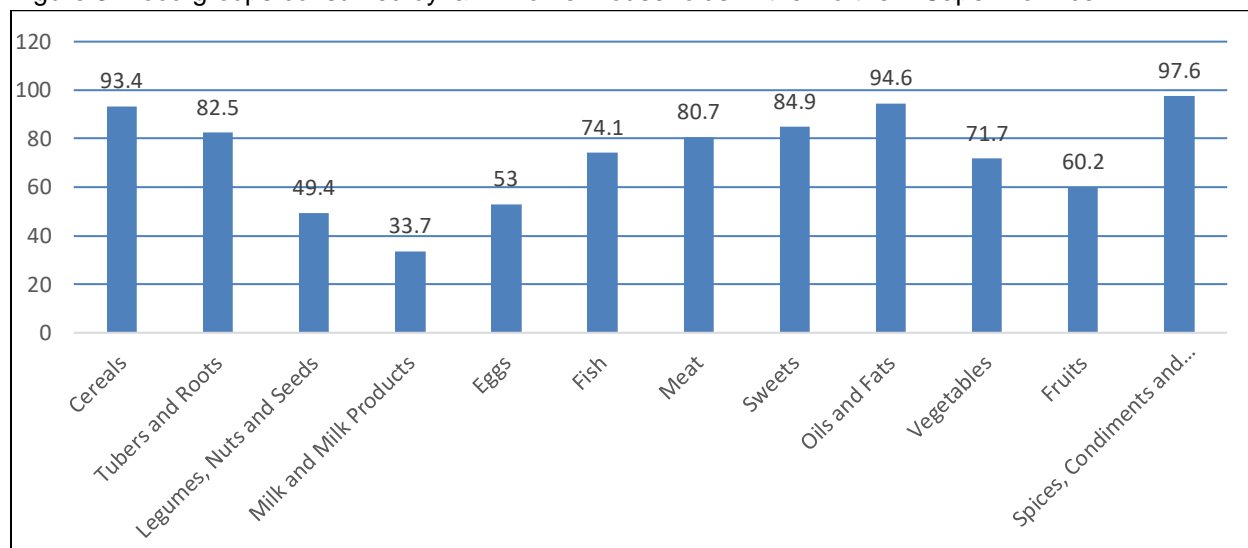


Source: Author.

4.4 Food diversity of households

The diversity of household diets was determined in this study by using the Household Household Dietary Diversity Score(HDDS).

Figure 3: Food groups consumed by farm worker households in the Northern Cape Province



The figure above gives a picture of food groups consumed by farm worker households surveyed in the Northern Cape. It shows spices, condiments and beverages were the most consumed in the past 24 hours by 97.59%. More than 50% of households consumed different food groups and these food groups were mostly, spices, condiments and beverages, oils and fats, cereals, sweets, tubers and roots, meat, fish, vegetables, fruits, and eggs.

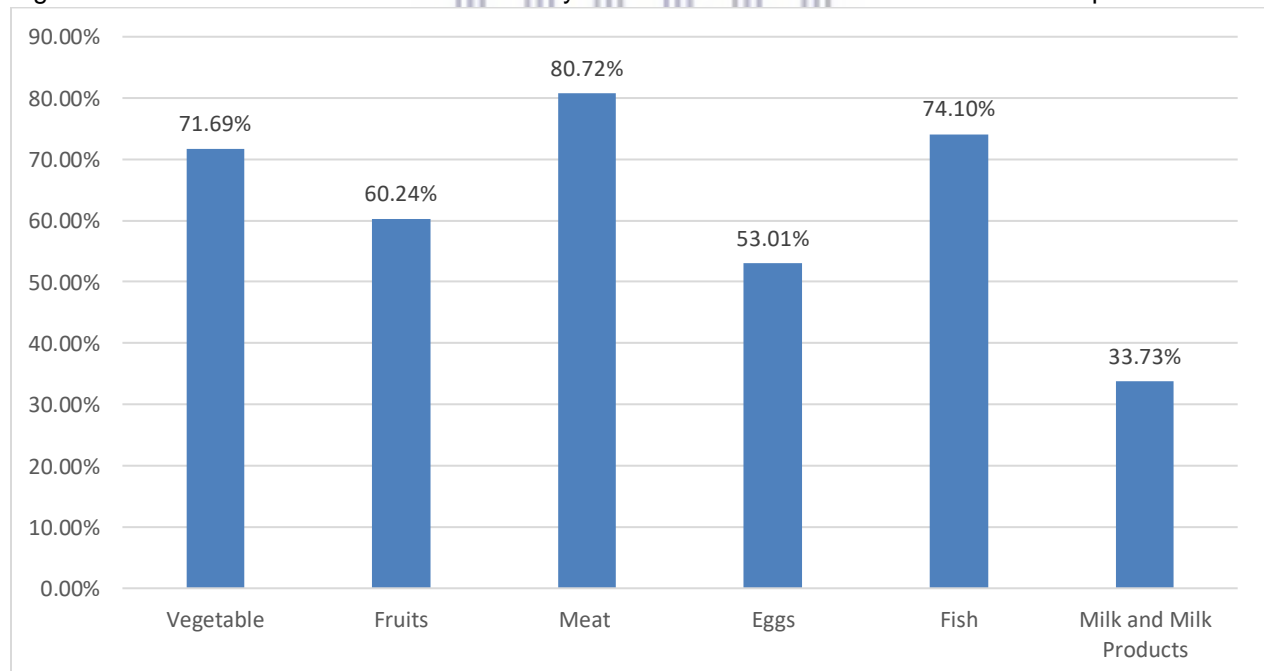
The figure above shows that about 93.37% of households consumed cereal products. Cereal products includes wheat (bread) and maize, which can be purchased at an affordable price and are easily accessible. The food groups that households least consumed (less than half of respondents) are milk and milk products, legumes, nuts and seeds, consumed respectively by 33.73% and 49.4%. This is important mainly in terms of the diversity of diet because these least consumed food groups (legumes, nuts, seed, milk and milk products) are very nutritious as they are rich in minerals such as calcium, vitamin A, iron and high quality proteins (amino acids) (Bean et al., 2011). This study revealed that on average, the Household Dietary Diversity Score of farm workers' households is equal to 8.7. This is above the cut-off of 6 – which symbolises an adequate diet, and this further means that on average, the surveyed farm worker households are consuming 8.7 variety of food groups. This way of establishing the cut-off of 6 for the Household Dietary Diversity Score was used in the study by Chakona and Shackleton (2018). It was also revealed that 20.48% of households have a diversity score that is equal to or less than 5, and that if starchy foods

like cereals and tubers, oils and fats, even spices and beverages were to be removed from their diet, there would be a drop (below 5) in the average score. This further means that what greatly influences the dietary diversity score, are the cereals, oils fats, beverages, tubers and roots consumed. Other studies which used HDDS indicator to measure the household's dietary diversity, for example a study by Frayne et al (2010 and 2011), Battersby 2011) and Bikomo (2014) found that on average, the households consumed inadequate diet. It was difficult to find a study with unusual results as this one. This is why it could be concluded that, maybe the way the respondents were asked these questions was not clear.

4.4.1 Households that consumed food rich in micronutrients (Vitamin A and iron) in the Northern Cape Province

To add on the above information about Dietary Diversity Score, it is important and can be beneficial to understand and know how often households consume good sources of micronutrient-food groups. These, in particular, consuming food groups rich in Vitamin A and iron, because without these food groups diets are insufficient and may result in morbidity which is related to not having enough micronutrients.

Figure 4: Food rich micronutrients consumed by farm worker households in the Northern Cape Province



The findings of our study as illustrated in Figure 4 above reveal that: the consumption of food rich in micronutrients is as follows: green leafy vegetables (71.7%), meat (80.7%), fish (74.1%), fruits

(60.2%) and eggs (53%) were the most highly consumed by more than half of respondents. Milk and milk products were the least consumed (33.7%) by less than half of respondents. The percentage of households that consumed foods rich in vitamin A was calculated by recording the number of households that responded ‘yes’ to questions 4, 5, 6, 7, 10, 11.

4.4.2 Household Dietary Diversity Score(HDDS) in surveyed Northern Cape Province farm worker households

The range of possible scores for the HDDS is from 0 to 12. To calculate the Household Dietary Diversity Score of the households, they were grouped into three categories (Chakona and Shackleton, 2018:5):

- a. Low-dietary diversity: which consisted of households that consumed less than or equal to five food groups.
- b. Medium diversity: households that consumed six to seven food groups.
- c. High diversity: households that consumed greater than or equal to eight food groups.

These households will further be separated based on the food groups they had consumed in the next section.

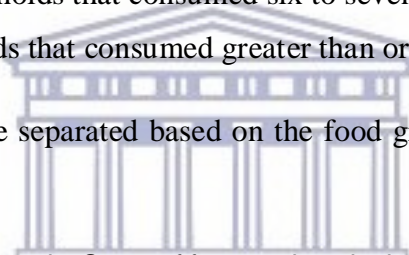
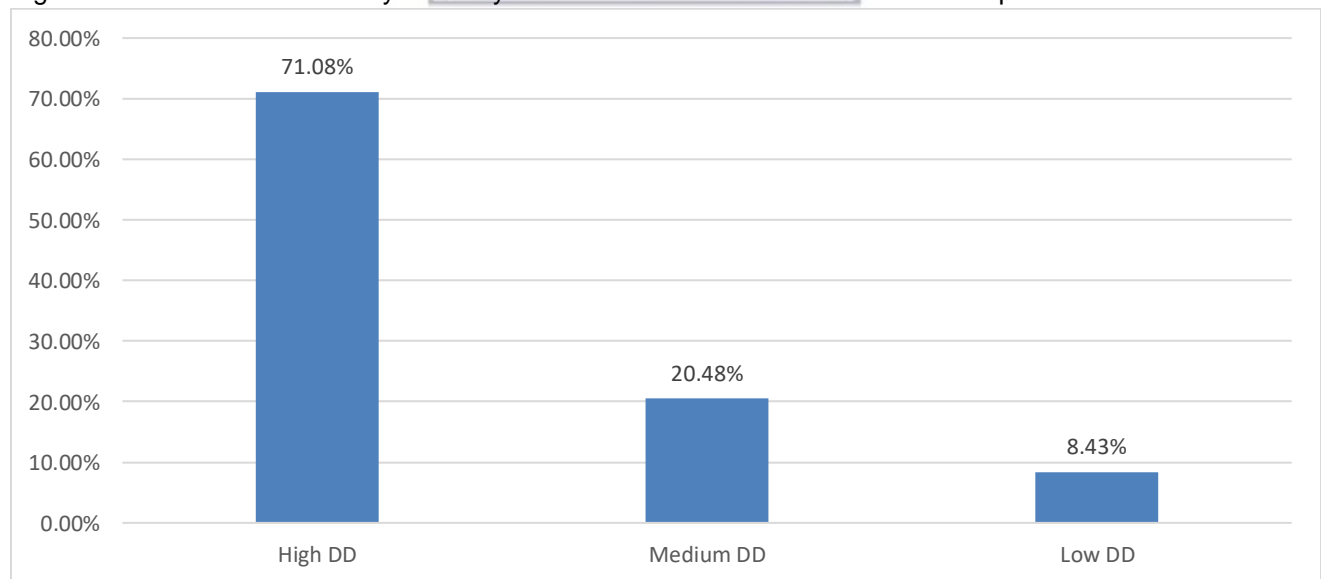


Figure 5: The Household Dietary Diversity Score of farm workers in the Northern Cape Province



The figure above indicates that the Household Dietary Diversity Score of farm worker households was generally high with a percentage of 71%, whereas only 20.5% of the respondents had a medium Household Dietary Diversity Score and a low Household Dietary Diversity Score of 8.4%.

With regards to the diversity of food groups that households consumed, the study revealed that on average the HDDS of farm worker households was 8.76, which is above the cut-off figure of 5- for food secure. This means that on average the households are consuming an adequate diverse diet. The research revealed that the high dietary diversity that the households scored was mainly influenced by cereals (starchy foods), oils and fats, spices, condiments and beverages. The research also revealed food groups that were least consumed by households, i.e. milk and milk products consumed by less than half of households (33.73%), legumes and nuts being consumed by 49.4% of households. These foods are very nutritious and are rich in Vitamin A and iron. One would expect the Household Dietary Diversity Score of these households to be low since a large number has reported to be food insecure in the HFIAS above. This could be due to different recall times, i.e. a month and a 24-hour recall time and also the days of the month that these two indicators were conducted. The higher Household Dietary Diversity Score of farm worker households in this study could also be because these households are engaged in farming, thus having access to food groups like, vegetables, fruits and other foods. Another reason could be because of errors that could have occurred in the data collection, maybe the respondents did not understand the questions well or the questions were unclear. Lastly, it could be because of the month that the HDDS interviews were conducted, i.e. November – being a good month for people.

4.5 Coping Strategies Index (CSI) by surveyed Northern Cape Province farm worker households

The surveyed households reported coping strategies they used when they are experiencing food shortages. Below is the illustration of the percentages of all the coping strategies that households used in the past month, including the four categories of coping strategies mentioned above that were used by farm worker households in the Northern Cape Province. The calculation of the coping strategy index was explained in Chapter 3.

Table 6: Coping strategies used by surveyed households in the Northern Cape Province

| Types of coping strategies | Frequency of Use | | | | |
|----------------------------|------------------|------------------------|-----------------------|------------------------|------------|
| | Everyday % | 3-6 times/week % | 1-2 time/week % | 1 times a week % | Never % |
| | | | | | |

| | | | | | |
|--|----------------|----------------|----------------|----------------|-----------------|
| Rely on less preferred and less expensive food | 7.69% (13) | 18.93% (32) | 46.75% (79) | 26.04% (44) | 0.59% (1) |
| Borrow food, or borrow money to buy food | 0% | 11.24% (19) | 17.16% (29) | 49.70% (84) | 21.89% (37) |
| Purchase food on credit | 1.78% (3) | 10.00% (17) | 26.63% (45) | 48.52% (82) | 13.02% (22) |
| Rely on help from relative or friend outside household | 1.78% (3) | 6.51% (11) | 23.67% (40) | 33.73% (57) | 34.32% (58) |
| Limit portions at meal-times | 12.43% (21) | 10.65% (18) | 33.14% (56) | 33.73% (57) | 10.06% (17) |
| Ration the little money you have to household members to buy street food | 0% | 1.18% (2) | 12.43% (21) | 25.44% (43) | 60.95% (103) |
| Limit your own intake to ensure child gets enough | 14.79% (25) | 13.02% (22) | 31.36% (53) | 29.59% (50) | 11.24% (19) |
| Reduce number of meals eaten in a day | 5.33% (9) | 5.92% (10) | 20.12% (34) | 33.14% (56) | 35.50% (60) |
| Skip whole days without meals | 0.59% (1) | 1.78% (3) | 8.88% (15) | 32.54% (55) | 56.21% (95) |

The table above illustrates the coping strategies used by the surveyed households. It is evident that all nine coping strategies were used by the surveyed households, with “limit your own intake to ensure child gets enough” being the most used every day (14.8%). The coping strategy that was used mostly, 3-6 times a week was “rely on less preferred and less expensive food” (18.9%). “Rely on less preferred and less expensive” was the most used, even 1-2 times a week when compared to other coping strategies (46.8%). The least used coping strategy with 0 times a week was “ration the little money you have to household members to buy street food” (60.8%).

The study examined differences between low coping score households and households with high coping scores. Households with a score less than 15.5 were labelled “food secure” thus, using low coping strategies, and households with a score equal to or greater than 15.5 were labelled “food insecure” thus, using many copy strategies. The researcher chose 15.5 as the cut-off-value because 15.5 is the mode of the coping strategies score index. This way of establishing the cut-off scale for the CSI was also used in the study by Broz (2014).

Table 7: The coping strategies score of farm workers in the Northern Cape Province

| Coping Strategies Index | Frequency (N=169) | Percent |
|--------------------------------|--------------------------|----------------|
| Food secure | 74 | 43.79 |
| Food insecure | 95 | 56.21 |

Table 7 shows that more than half of households were food insecure. This generally means that these households used more coping strategies on a monthly basis to cope with food shortages. The coping strategies they used will be discussed further in the section below.

4.6 A comparison of the indicators

The main purpose of this study was to do a comparative analysis of the three alternative food security indicators. This comparative analysis was based on what each indicator measures, the recall time and how it measures household food security. The expectation was that with high HFIAS scores, the HDDS score would be low and the CSI score would be high or with a high HDDS, the HFIAS would be low and the CSI would also be low. The study was also looking for that one indicator that measures food security more appropriately than the other two.

The study chose to use Spearman’s rho correlation and Pearson’s Chi-square because Spearman’s correlation test association between variables that do not have a normal distribution and the data of the three indicators was not normally distributed. Because the indicators are grouped in categories, it was important to use the Chi-square test to test the differences between categories of all the indicators.

4.6.1 Statistics of the three indicators (mean comparison)

The mean, standard deviation, the minimum and the maximum of the three indicators are given in Table 8 below. In the sample, the average HFIAS score is 11.52, which falls in the middle of 0-27 possible range (the higher the HFIAS score, the more food insecure the households). The mean HDDS is 8.76, which relates to the consumption of 8.76 different foods by a household in the past 24 hours (the higher HDDS). The average coping strategies used by households in the past month was 23.81, which is higher than the cut-off established in the beginning of the research of, 15.5. This reveals that households in the sample used many coping strategies to cope with food shortages in the past month.

Table 8: Statistics of the three indicators (HFIAS, HDDS and CSI)

| Indicator | Mean | Standard deviation | Minimum | Maximum |
|-----------|-------|--------------------|---------|---------|
| HFIAS | 11.52 | 5.097 | 0 | 26 |
| HDDS | 8.76 | 2.33 | 2 | 12 |
| CSI | 23.81 | 19.54 | 0.5 | 110.5 |

4.6.2 Spearman's Correlation

Spearman's rank correlation is calculated if neither variable was normally distributed or if one of the variables was disconnected – in this case all variables were not normally distributed. This study used Spearman's rank correlation to test the association between three indicators of food security, i.e. HFIAS, HDDS and CSI; this was done by means of a pair-wise test. Statistically, significance was set at 0.05.

Table 9: Spearman's rho correlation between the three indicators

| HFIAS and HDDS | HFIAS and CSI | HDDS and CSI |
|--|--|---|
| Number of observations= 166 Spearman's rho= 0.0053 Prob> t = 0.9461 | Number of observations= 166 Spearman's rho= 0.1750 Prob> t = 0.0242 | Number of observations= 166 Spearman's rho= -0.1491 Prob> t = 0.0551 |

Spearman's correlation of HFIAS, CSI and inverted HDDS

This researcher decided to do an additional analysis by inverting the HDDS and comparing that against the HFIAS and the CSI, and re-doing the Spearman's correlation coefficient and the Chi-square test. The reason for doing this additional analysis was that, a high HFIAS and high CSI signifies food insecurity but a high HDDS signifies food security. Therefore, there was a change

in the HDDS scores so that a high HDDS also reflects food insecurity just like the HFIAS and the CSI. This will make the analysis more consistent.

Table 10: Spearman's correlation between inverted HDDS against the other two indicators

| HFIAS and inverted HDDS | HFIAS and CSI | Inverted HDDS and CSI |
|--|--|--|
| Number of observations= 166 Spearman's rho= 0.0316 Prob> t = 0.6861 | Number of observations= 166 Spearman's rho= 0.1750 Prob> t = 0.0242 | Number of observations= 166 Spearman's rho= 0.1507 Prob> t = 0.0527 |

HFIAS and HDDS

A negative correlation between HFIAS and HDDS results is expected because a household with higher HFIAS (food insecure) is expected to have a lower HDDS, while a household with low HFIAS (food secure) is expected to have higher HDDS. A Spearman's correlation was performed to measure the relationship between HFIAS and HDDS and a sample of 166 participants was used. There was a negative relationship between HFIAS and HDDS, which was statistically not significant, rho= -0.0111, p= 0.8874. It can further be explained that a Spearman's correlation coefficient is not statistically significant because p= 0.8874, which is greater than p<0.05 (a common threshold for statistical significance). It is not surprising that the HFIAS and HDDS are negatively correlated. It is evident since a higher HFIAS score means that a household is more food insecure, while a higher HDDS is an indication of better dietary diversity, which then indicates a better food security status.

HFIAS and inverted HDDS

To measure the relationship between HFIAS and inverted HDDS, a Spearman's correlation was performed and the sample used was of 166 participants. The Spearman's rho was 0.0316 and this indicates a weak positive relationship between the two variables. This monotonic relationship is statistically insignificant because p= 0.6861, which is more than p<0.05. Because a test of significance was applied: if p> 0.05 a null hypothesis must be rejected and a conclusion must be made that there is no statistically significant correction between the two indicators. In this case, this researcher rejects the null hypothesis.

HFIAS and CSI

A positive correlation between HFIAS and CSI results is expected because a household with higher HFIAS (food insecure) is expected to use more coping strategies, while a household with low HFIAS (food secure) is expected to use fewer coping strategies. A Spearman's correlation was performed to measure the relationship between the HFIAS and the CSI and a sample of 166 participants was used. There was a positive relationship between the HFIAS and the CSI, which was statistically significant, $\rho = 0.1750$, $p = 0.0242$. It can further be explained that the Spearman's correlation coefficient is statistically significant because $p = 0.0242$, which is less than $p < 0.05$. Therefore this study accepts the null hypothesis.

HDSD and CSI

A negative correlation between HDSD and CSI results is expected because a household with higher HDSD is expected to use fewer coping strategies, while a household with low HDSD is expected to use more coping strategies. A Spearman's correlation was performed to measure the relationship between the HDSD and the CSI and a sample of 166 participants was used. There was a negative relationship between the HDSD and the CSI, which was statistically not significant, $\rho = -0.1016$, $p = 0.1928$. It can further be explained that a Spearman's correlation coefficient is statistically not significant because $p = 0.1928$, which is greater than $p < 0.05$. A null hypothesis is rejected at this point.

Inverted HDSD and CSI

Lastly, a Spearman's correlation was performed to measure the relationship between the HDSD and the CSI with a sample of 166 participants. There was a weak positive relationship between the HFIAS and the CSI with Spearman's $\rho = 0.1507$. This weak relationship is statistically significant because $p = 0.0527$, which is equal to $p = 0.05$.

This researcher decided to do an additional analysis by inverting the HDSD and comparing that against HFIAS and CSI, and re-doing the Spearman's correlation coefficient and the Chi-square test. The reason for doing this additional analysis was that, a high HFIAS and high CSI signifies food insecurity but a high HDSD signifies food security. Therefore, there was a change in the

HHDS scores so that a high HHDS also reflects food insecurity just like HFIAS and CSI. This made the analysis more consistent.

4.7 Crosstab with Chi-square test

A Chi-square test was performed between the HFIAS and the HHDS. The reason for using only the two indicators instead of three was that, the CSI in this study does not have categories and Chi-square is performed only for categorical variables. From the table above, it is evident that the correlation coefficient (r) is 4.6928, which is interpreted as a large coefficient. The p -value is more than 0.05 indicating that it is statistically insignificant, so this study accepts the H_0 against the H_1 . For surveyed farm worker households in the Northern Cape Province there is no relationship between the HFIAS and the HHDS.

Table 11: Chi-square test between HFIAS, HHDS and CSI

| HFIAS category | HHDS category | | | TOTAL |
|----------------|----------------------|---------------------------|--------------------|-------|
| | 0 Food insecurity | 1 Mild food insecurity | 2 Food security | |
| 0 Food secure | 0 | 0 | 1 | 1 |
| 1 Mild | 4 | 4 | 15 | 23 |
| 2 Moderate | 3 | 16 | 52 | 71 |
| 3 Severe | 7 | 14 | 50 | 71 |
| TOTAL | 14 | 34 | 188 | 166 |

Pearson chi2 (6) = 4.6928 Pr= 0.584

Pearson's Chi-square test with inverted HHDS and CSI categories

This researcher looked at the Pearson's Chi-square test of association. The reason for this, was to test if two variables were associated, more than just by chance but tested based on statistical significance. The null hypothesis (H_0) – there is no association between HFIAS and HHDS, was tested against the alternative hypothesis (H_1) – there is association between HFIAS and HHDS.

Convention for social sciences: If $p < \text{or equal } .05$, then H_0 rejected. A Chi-square test was performed between HFIAS and HHDDS. A p-value of 0.329 was observed and this value is greater than $p = 0.05$, so this study accepts H_0 against H_1 . The study then concludes that there is no association between HFIAS and HHDDS of the surveyed farm worker households in the Northern Cape Province.

A Chi-square test between the HFIAS and the CSI was also performed. A p-value of 0.070 was observed. This study accepted H_0 against H_1 because the p-value was greater than $p = 0.05$. The conclusion was that there is no association between HFIAS and CSI, even though the p-value was closer to 0.05.

Lastly, a Chi-square test between the HHDDS and the CSI was also performed. A p-value of 0.081 was observed. This study accepted H_0 against H_1 because the p-value was greater than $p = 0.05$. The conclusion was that there is no association between HHDDS and CSI, even though the p-value was closer to 0.05.

4.8 Conclusion

The first part of the study was to assess the level of food insecurity amongst farm workers in the Northern Cape Province using the three household food security indicators (HFIAS, HHDDS, and CSI). According to the HFIAS, 42.8% of farm workers are severely food insecure; the HHDDS reported 8.4% of farm workers as having a low dietary diversity and the CSI reported 56.2% of farm workers as food insecure.

When the comparison of the three indicators was done, it can be said that there was hardly a relationship between the three. If there was, it was a weak relationship. The results proved that the HHDDS does not measure food security well, even though it was inverted for additional analysis. The relationship between the HFIAS and the HHDDS was weak, an additional analysis was done with inverted HHDDS but still it was weak. One major explanation to this could be different recall times that these indicators use, with the HHDDS being only 24 hours. Another thing could be the period that the questionnaire was conducted, which may have tempered with the results. With the HHDDS it could have also been a reporting error – they did not understand the questionnaire.

CHAPTER FIVE: CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

The aim of this chapter is to conclude and make recommendations for further research. It will unpack what each indicator shows about the state of food security in the surveyed farm workers in the Northern Cape Province. It also serves as a summary of all three indicators used in the study.

5.2 Comparison of food security indicators

When the three indicators were compared by means of Spearman's correlation, the study revealed that there was no relationship between the HFIAS and the HDDS, because even though a large number of households reported food insecure, a large number reported having a diverse diet. When the HFIAS and the CSI were also compared by means of Spearman's correlation, a positive relationship between the two indicators was found, even though it was not a strong relationship. These different results could be because the indicators are not of the same recall time, i.e. the HFIAS and the CSI are reported on a month recall time and the HDDS is 24 hours. By using short-term and long-term indicators to probe food security, leads to one getting information on both chronic and transitory food insecurity.

5.3 Conclusions

This study concludes by answering the research question and objectives. To answer objective one, it can be concluded that 42.8% of the surveyed farm workers in the Northern Cape Province are food insecure, because two indicators (HFIAS- 42.8% severely food insecure and CSI- 56.2% food insecure) revealed that a large number of surveyed farm workers is food insecure. In terms of objective two – the efficacy of each indicator, the HFIAS and the CSI proved their efficacy but this researcher was not convinced with the HDDS efficacy. In terms of objective three – accuracy of indicators, it can be said that the HFIAS and the CSI are better compared to the HDDS. The HFIAS and the CSI are correlated but that cannot be said with the HDDS and inverted HDDS. One explanation of why the HDDS seems to be ineffective could be because its time frame is only 24 hours compared to 30 days of the HFIAS and the CSI. Maybe it would be good to consider stretching its time frame. The month in which the HDDS questionnaire was administered could be a good month for example, December – where there is plenty of food. Also if the HDDS questionnaire was administered just days after pay day then that could have had an impact on the

results. From the results of the three indicators, one can conclude that it is not easy to put severity on food security.

The HFIAS is the only scale that really differentiates the severity and it does that by taking into account the frequency of the answers. The results of this study also showed the importance of the recall period of an indicator in distinguishing the food secure from the food insecure. The methods used for each indicator to create categories of food security have a strong influence on how each indicator evaluates the prevalence of food security and the relationship they have to each other. Items that capture preference are included in the HFIAS and the CSI, and in addition, the HFIAS also captures an element that measures the psychological characteristic of worry/uncertainty. The implication of this is that to capture an illustrative picture of food security, different measures should be put into consideration for their complementarity to each other, instead of looking for the one 'best indicator'.

The three indicators proved to measure different dimensions of food security namely, access, utilization and stability. Different results that this study got from all three indicators showed that to measure food security one must not look at one indicator. Each indicator measured these different dimensions and since these make up the definition of food security, they should be included at all times, when measuring the status of food security.

5.4 Recommendations

In this study the focus was on the three alternative indicators of food security. These indicators measure different aspects of food security and are different in the time frame they use. Based on the results, it could also be interesting to change the time frame of these measures to be the same. Since the research in this study showed that different time frames could have an effect on how we report food insecurity, it would be really interesting to look at it by comparing same time frame. It would make more sense if the reporting period was a month for all the three indicators. Another thing is to look more on the HDDS, to make sense of why it seems not to be such a good measure of food security.

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Appendices

Food security monitoring

Appendix 1: Household Food Insecurity Access Score (HFIAS) questionnaire

| # | Question | Response * [0, 1, 2, or 3] |
|-----------------------------|--|-------------------------------|
| 1 | In the past 4 weeks, did you worry that your household would not have enough food?ke | |
| 2 | In the past 4 weeks, were you or any household member not able to eat the kinds of foods you preferred, because of a lack of resources? | |
| 3 | In the past 4 weeks, did you or any household member have to eat a limited variety of foods, due to a lack of resources? | |
| 4 | In the past 4 weeks, did you or any household member have to eat some foods that you really did not want to eat, because of a lack of resources to obtain other types of food? | |
| 5 | In the past 4 weeks, did you or any household member have to eat a smaller meal than you felt you needed, because there was not enough food? | |
| 6 | In the past 4 weeks, did you or any household member have to eat fewer meals in a day, because there was not enough food? | |
| 7 | In the past 4 weeks, was there ever no food to eat of any kind in your household, because of lack of resources to get food? | |
| 8 | In the past 4 weeks, did you or any household member go to sleep at night hungry, because there was not enough food? | |
| 9 | In the past 4 weeks, did you or any household member go a whole day and night without eating anything, because there was not enough food? | |
| Additional questions | | |
| 10 | In the past 4 weeks, how many days of paid work did you do? [WRITE NUMBER] | |
| 11 | How much money were you paid each day? [WRITE NUMBER] | |
| 12 | In the past 4 weeks, how many other people in your household worked for money? [WRITE NUMBER] | |
| 13 | How much money were they paid each day? [WRITE NUMBER] | |
| 14 | In the past 4 weeks, how many social grants did your family receive? [WRITE NUMBER] | |

Source: Devereux (2017)

*** Response options:**

0 = No

1 = Rarely (once or twice in the past 4 weeks)

2 = Sometimes (three to ten times in the past 4 weeks)

3 = Often (more than ten times in the past 4 weeks)



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Appendix 2: Household Dietary Diversity Score (HHDDS)

In the last 24 hours, did you and members of your household eat any of the following food items?

| # | Food group | Y/N |
|----|---|-----|
| 1 | Cereals: Maize, wheat, sorghum, rice, bread, biscuits | |
| 2 | Tubers and roots: Sweet potato, potato, yam, cassava, Irish potatoes | |
| 3 | Legumes, nuts and seeds: Beans, soy beans, lentils, chick peas, peanuts | |
| 4 | Milk and milk products: Milk, cheese, yoghurt, or other milk products | |
| 5 | Eggs | |
| 6 | Fish | |
| 7 | Meat: Beef, goat, mutton, chicken, pig, rabbit | |
| 8 | Sweets: Sugar or honey | |
| 9 | Oils and fats: Foods made with oil, fat or butter | |
| 10 | Vegetables: Cabbage, amaranth, aubergine, carrot, pumpkin, tomato, onion | |
| 11 | Fruit: Orange, pineapple, lemon, avocado, mango, papaya, tree tomato, passion fruit | |
| 12 | Spices, condiments and beverages: Any other foods such as condiments, coffee, tea, non-alcoholic drinks | |

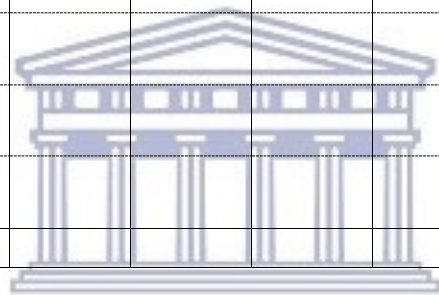
Source: Devereux (2017)

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Appendix 3: Coping Strategies Index (CSI) questionnaire

| In the past month, how often have you had to... | Every day (7) | 3-6 x a week (4.5) | 1-2 x a week (1.5) | <1 x a week (0.5) | Never (0) | Weight | Total |
|---|---------------|--------------------|--------------------|-------------------|-----------|--------|-------|
| 1. Rely on less preferred and less expensive food? | | | | | | 1 | |
| 2. Borrow food, or borrow money to buy food? | | | | | | 3 | |
| 3. Purchase food on credit? | | | | | | 2 | |
| 4. Rely on help from a relative or friend outside household? | | | | | | 2 | |
| 5. Limit portions at meal-times? | | | | | | 2 | |
| 6. Ration the little money you have to household members to buy street foods? | | | | | | 2 | |
| 7. Limit your own intake to ensure child gets enough? | | | | | | 2 | |
| 8. Reduce number of meals eaten in a day? | | | | | | 3 | |
| 9. Skip whole days without eating? | | | | | | 4 | |
| Total Index Score | | | | | | | |

Source: Devereux (2017)



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