

FOOD SECURITY

Limpopo Province

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ABSTRACT

South Africa is one of the few African countries considered to be an upper-middle-income country. Its economy is by far the largest in Sub-Saharan Africa and over the last decade the country has achieved a high level of political and economic stability (World Bank, 2011). Although South Africa is food secure at country level, large numbers of households within the country remain food insecure. The Department of Agriculture in South Africa has recognized several key food security challenges in the Integrated Food Security Strategy for South Africa (IFSS). However, as Altman (2009) points out, South Africa still lacks specific and accepted measures for food security and currently has no regularised way of monitoring the food security status of its population. This project therefore proposes an investigation and methodology to enable the accurate measurement of food security and vulnerability at the household level. The research builds on inputs from the University of Pretoria, the University of Stellenbosch, the University of Antwerp, University of Ghent, the NAMC (National Agricultural Marketing Council) and Limpopo Department of Agriculture. Qualitative and quantitative data have been gathered in the province of Limpopo across 5 different districts. This data allows a thorough description of household characteristics and livelihoods and an assessment of the food security and poverty levels in the area. Our findings show that 52% of the sampled households are severely food insecure while 32% is living of less than 1\$US a day. A combination of several multivariate analyses has been used to identify the main household characteristics that determine the household's food security status. These determinants can be grouped into i) human capital, entailing mainly education, household size and gender of the household head, ii) household income, iii) type of employment the household has formal employment vs unskilled employment and iv) dependency on grants and gifts. These findings indicate that policy priorities related to food security in the area of Limpopo should be focused on the promotion of rural education and creating an enabling environment for the rural labour market.

SUMMARY OF STATISTICS

- 52% of sample severely food insecure
- Waterberg most food insecure district, Sekhukhune most food secure district
- 32% of sample living on less than 1 dollar per day
- Mopani highest poverty rates (50%), Vhembe lowest poverty rates (19%)
- 46% of households experience a hungry period during the year
- Most difficult periods in terms of income and hunger: December-February and June-July
- One third of household heads did not enjoy any schooling
- Most important food groups in diet: maize, food containing sugar and poultry
- 92% of households are connected to the electricity grid
- Tap water is most important source of water (private & public)
- Average household income: 1600 Rand (SD: 845)
- Average income is highest in Vhembe, lowest in Mopani
- Most important income sources: grants, formal salary & farming income
- 57% of sample reports grants as largest contribution to livelihood
- 57% of households involved in crop production
- 50% of households involved in livestock production
- 25% of households irrigate the cropping land
- Most popular crops: maize (31%), mango (25%), pawpaw (16%) & spinach (15%)
- Most popular livestock: poultry (50%), cattle (27%) & goats (27%)
- Fruit production is mainly for subsistence purposes (87% own consumption)
- For staple and vegetable production: 50% own consumption and 50% sold
- Livestock production quite intensive (on average more than 10 units of animals)
- Increase of food prices is most important stress in the area
- Coping strategies are based on social capital and reduction of consumption
- Main determinants of food security
 - Education level
 - Household income
 - Type of income sources
 - Dependency of grants & gifts

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INTRODUCTION

1 JUSTIFICATION AND OVERVIEW

The government of South Africa has committed to halve poverty between 2004 and 2014. In order to achieve this objective it is crucial to achieve household food security. Therefore the government of South Africa has adopted an Integrated Food Security Strategy (IFSS) in 2002 which explicitly aims to eradicate hunger and nutrition deficits among poor households. Yet, the South African poverty context is particular, given the high inequality in income and asset ownership. Hence the effect of policy measures towards reducing poverty and food insecurity, and establishing the link between poverty, incomes and food security is still unclear in areas that were disadvantaged during the Apartheid policy, making policy targeting difficult. While South Africa is food secure at national level, available data suggests that this is not the case for many households.

Various surveys that aimed to grasp the food security status at household levels obtained different results: the 1995 Income and Expenditure Survey indicated that around 43% of households were subjected to food insecurity. The National Food Consumption Survey of 2005 shows that 52% of households were experiencing hunger. The General Household Survey of 2007 estimated that 41% of households were food insecure. Several authors (Hart, 2009; Altman et al., 2009; Jakobs, 2009; Baiphethi, 2009) point out that this variation in the obtained results is because each survey probes a different dimension of food security (food expenditure, hunger and household food production) thereby using different indicators/ measures. The use of different methodologies and the relatively long time period between surveys makes it however difficult to compare across the different surveys let alone monitoring the food security status of households over a long period of time.

Food security is multidimensional in nature and that makes accurate measurement and policy targeting quite challenging. The multiple factors that influence the access to food are not well understood. This project therefore proposes an investigation and methodology to enable the accurate measurement of food security and vulnerability at the household level. The research builds on inputs from the University of Pretoria, the University of Stellenbosch, the University of Antwerp, University of Ghent, the NAMC and Limpopo Department of Agriculture.

The project report is organized as follows. Section 2 of the introduction outlines the aim, purpose and objectives of the project. Then the concepts as well as the terminology that were used will be presented. Section 4 describes the methodology. Section 5 and 6 give an overview of the dissemination and the project management team. Section 7 presents the results. Finally, further steps and recommendations are discussed in conclusions.

2 AIMS, PURPOSE AND OBJECTIVES

This study aims to provide an in-depth comprehension of the social and economic aspects of food security at district and household levels.

This research determines the needs and possibilities at household level per district in Limpopo, one of the poorest provinces in terms of per capita income and which is at the same time characterized by high inequalities in the distribution of income between various population subgroups and unemployment.

This research addresses the following objectives:

- (i) Identify the factors influencing food security (vulnerability) at household and at municipality level;
- (ii) Compute a Food Security Index (FSI) based on four major components: food *availability*, food *accessibility*, food *utilization* and food *system stability*;
- (iii) Create capacity through training of professionals with the data collection and analysis in order to continue the measurement of this important indicator.

The above objectives are expected to lead to the following benefits:

- (i) Development of an accessible assessment tool to measure food security vulnerability;
- (ii) Allow for the accurate measurement of food security and vulnerability in South Africa at household levels;
- (iii) Come up with policy advice and new strategies related to food security.

3 CONCEPTS AND TERMINOLOGY

A. FOOD SECURITY AND ITS COMPONENTS

For the purposes of this project, the definition of food security is based on the FAO's definition: "*a situation that exists when all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life*". This definition comprises four key dimensions of food supplies: availability, stability, accessibility, and utilization. A food system is vulnerable when one or more of the four components of food security are uncertain and insecure (FAO, 2008).

Food availability is determined by the physical quantities of food that are produced, stored, processed, distributed and exchanged. FAO calculates national food balance sheets that include all these elements. Food availability is the net amount remaining after production, stocks and imports have been summed and exports deducted for each item included in the food balance sheet. The food availability for human consumption is calculated by deducting from total food availability the portion lost during transport, stocks and processing, the portion used for animal feeding and the portion used by non-food industries. Nutrient adequacy per day is assessed through comparison of estimated average nutrient availability per person per day (total energy, g proteins, g fats, etc.) with the estimated nutrient requirements per average person per day. Food availability relates to the availability of sufficient food, i.e., to the overall ability of the agricultural system to meet food demand. Its sub-dimensions include the agro-climatic fundamentals of edible crop and pasture production and the entire range of socio-economic and cultural

factors that determine where and how farmers perform in response to markets (Schmidhuber and Tubiello, 2007).

Food accessibility is a measure of the ability to secure entitlements, which are defined as the set of resources (including legal, political, economic and social resources) that an individual requires to obtain access to food (Sen, 1989, cited in FAO, 2003). This dimension covers access by individuals to adequate resources to acquire appropriate foods for a nutritious diet. Until the 1970s, food security was linked mainly to national food production and global trade (Devereux and Maxwell, 2001), but since then the concept has expanded to include households' and individuals' access to food.

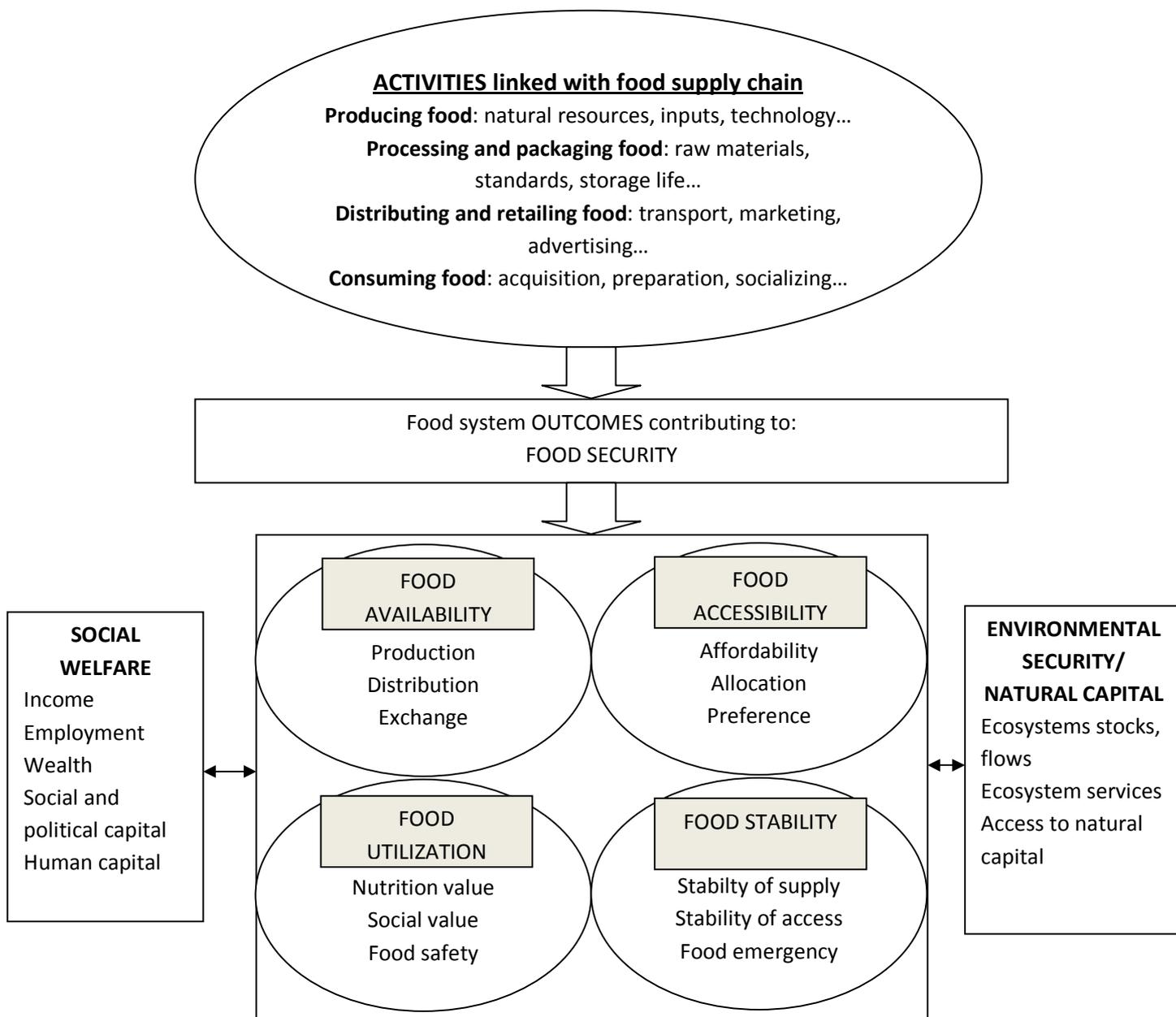
Food system stability is determined by the temporary or permanent loss of access to the resources needed to consume adequate food. Climate variability is an important cause of unstable access. However, if projected increases in weather variability materialize, they are likely to lead to increases in the frequency and magnitude of food emergencies for which neither the global food system nor affected local food systems are adequately prepared (FAO, 2008).

Food utilization refers to the use of food and how a person is able to absorb essential nutrients from the food consumed. It encompasses food safety and the nutritional value of the diet, including its composition and methods of preparation; the social values of foods, which dictate what kinds of food should be served and eaten at different times of the year and on different occasions; and the quality and safety of the food supply, which can cause loss of nutrients in the food and the spread of food-borne diseases if not of a sufficient standard. Other factors are also involved in food utilisation, such as health status determining appetite or to fast excretion of micronutrients and knowledge in order to compose and prepare well balanced diets, etc.

B. RELATIONSHIP BETWEEN FOOD SYSTEMS AND FOOD SECURITY

At the 33rd Session of the Committee on World Food Security, FAO issued a statement to reaffirm its vision of a food-secure world: *“FAO’s vision of a world without hunger is one in which most people are able, by themselves, to obtain the food they need for an active and healthy life, and where social safety nets ensure that those who lack resources still get enough to eat.”* (FAO, 2007).

Food systems encompass (i) activities related to the production, processing, distribution, preparation and consumption of food; and (ii) the outcomes of these activities contributing to food security. The outcomes also contribute to environmental and other securities. Interactions between and within biogeophysical and human environments influence both the activities and the outcomes (Figure 1).



Food system activities and food security outcomes
 Source: Adaptation of Authors from GECAFS Online

Definitions of food security identify the outcomes of food security and are useful for formulating policies and deciding on actions, but the processes that lead to desired outcomes also matter. Most current definitions of food security therefore include references to processes as well as outcomes. Recent work describing the functioning of food systems has helped to show both desired food security goals and what needs to happen to bring these about (FAO, 2009) (Figure 2).

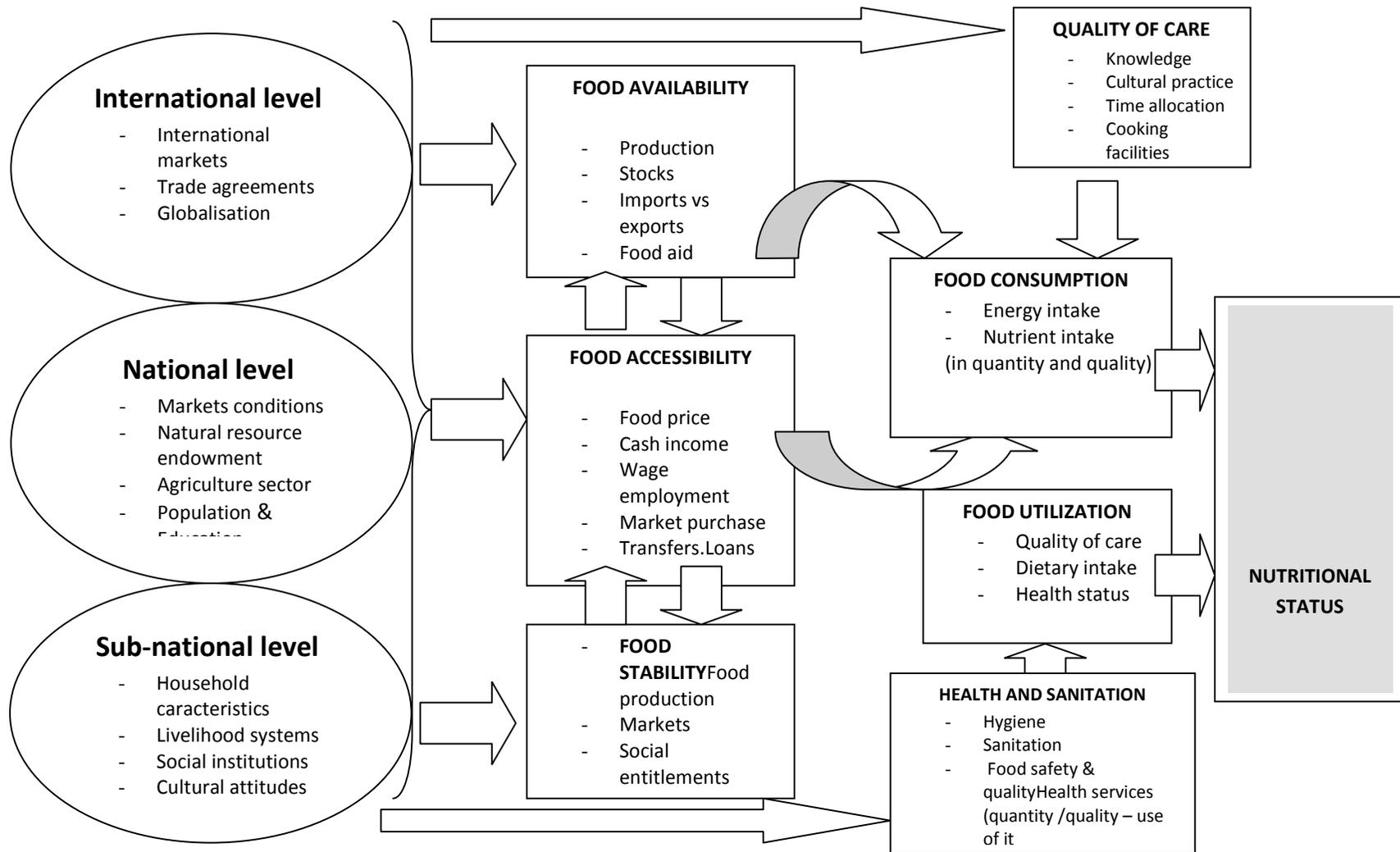


Figure 1. Framework of food security

RESEARCH METHODOLOGY

For the assessment of the food security status at household level in Limpopo, we have opted for a cross sectional data collection. Similar as for other interviewing techniques, it has its limitations related to the capacity of respondents to remember very precise information and perhaps their tendency to represent their situation worse than it actually is, perhaps in the hope of receiving extra aid. Yet, we have taken several precautions in designing the sampling frame and data collection procedure to assure the representativeness of the data that was collected. The following steps were taken, including a) the use of sampling methods ensuring the sample to be representative for the study area; b) intensive training of enumerators allowing obtaining high quality results; and c) regular quality controls during the data collection phase which also led to the collection of consistent information.

Furthermore, a large representative survey enables to capture different pointers and determinants of food insecurity and risk to food insecurity which is necessary towards formulating policy advice. These need to be further analysed, but the first results confirm the problematic food security situation in the study area.

1 LOCATION OF THE STUDY

The research has focused on the five districts of Limpopo province. From each district, two at random chosen municipalities have been incorporated in this research (see figure 3 and table 1).

Within each municipality several different villages were selected. This selection mainly occurred through random selection; however costs as well as the feasibility associated with the location of the selected village were taken into account when selecting villages.

Within each village 60 households were surveyed. In order to have a representative sample, the enumerators first met at one central point of the village. From there, two steps were undertaken. First, a random direction was chosen for each enumerator to go to. Second, the households were selected between the central point and the end of the village.

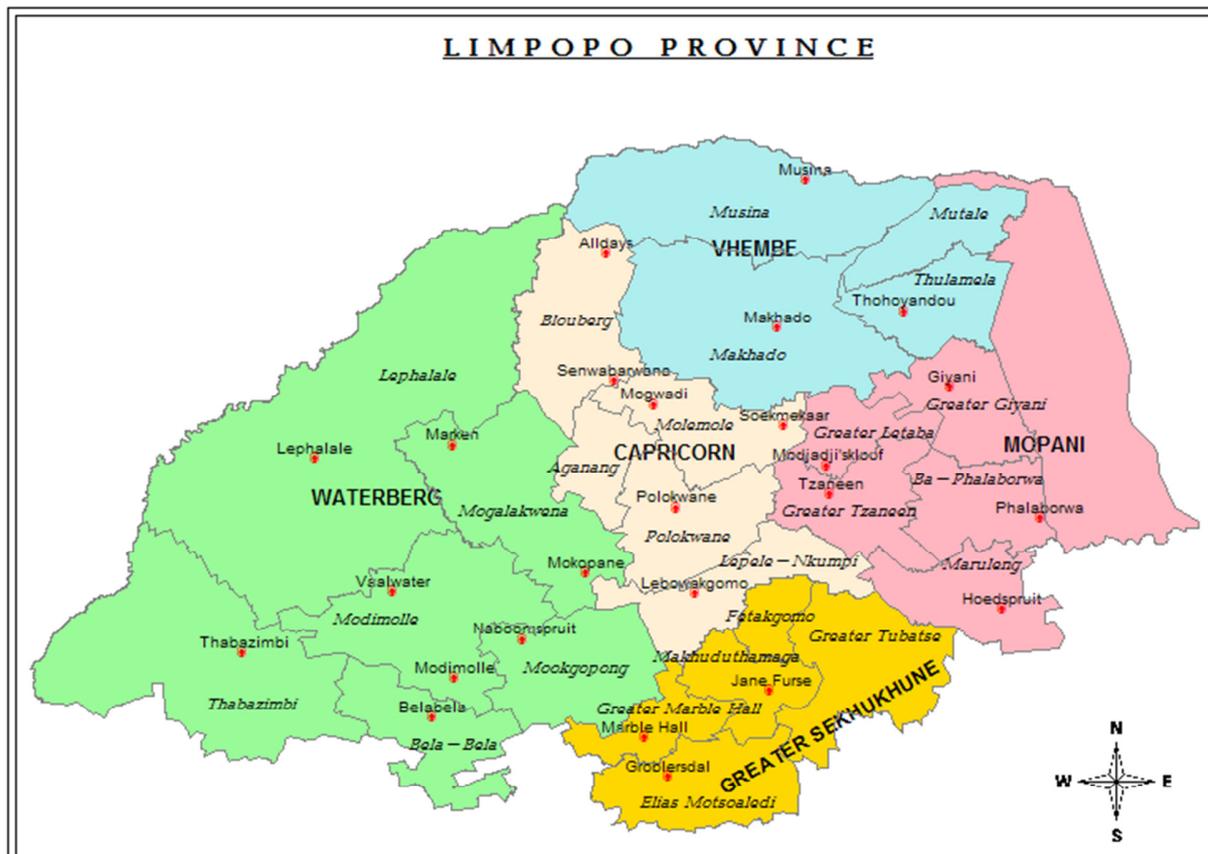


Figure 2. Localization of district and municipalities concerned by this research in Limpopo

Table 1. District and municipalities concerned by this research

DISTRICTS					
	Capricorn District	Mopani District	Sekhukhune District	Vhembe District	Waterberg District
MUNICIPALITIES	Aganang	Baphalaborwa	Groblersdal	Makhado	Bela-Bela
	Blouberg (60)	Giyani (60)	Fetakgomo (60)	Mutale (60)	Mogalakwena (60)
	Lepelle	Letaba	Makhuduthamaga	Musina	Modimolle
	Molemole (60)	Maruleng (60)	Tubatse (60)	Thulamela (60)	Mookgopong (60)
	Nkumpi	Tzaneen	Marble Hall		Thabazimbi
	Polokwane				Lephalele

Total sample size: 600

2 DATA SOURCE AND COLLECTION

SECONDARY DATA. Secondary data was collected with regard to the 5 districts and 10 municipalities. Socio-economic data covering the ten municipalities and additional information was obtained from the South African Statistical Services (StatSA) (SSA Census 2002, 2005, 2008). Variables on the agricultural sector came from the Agricultural census, 2004.

DATA COLLECTION. Data on the household level as well as on the levels of the municipalities and districts were obtained from the sample survey and this between 28th of July and 12th of August. For a detailed overview of this phase in the project, see part 4.4 operational plan.

The following qualitative and quantitative data was collected at the level of the households in the ten municipalities:

1. Household Characteristics
Household income
Income sources/structure
Ratio of dependants to wage-earners in average households
Value of agricultural credit
Male, female or child headed household
Average household size
Age composition
2. Food security and nutrition outcomes
Food Consumption Status
Average per person dietary energy supply (DES)
Cereals, roots and tubers as % of DES
Percentage of population undernourished
Nutritional Status
Food insecurity access scale on the basis of 10 questions/Fanta
Intra house distribution of food
Number of newborns with low birth weight
3. Outcome indicators for vulnerability factors
Environmental Conditions
Variability of food production
Energy use in agriculture
Availability of water
Distribution of land intra household
Economic Conditions
Cropped area as % of total area
Land under cultivation
Distribution of the land per commodity
Possibility to extent the land under cultivation
Composition of the livestock
Agriculture and livestock income

Access to income outside the farm
Yields per ha for major agric and productivity of the livestock production
Net cash income per ha per commodity
Growth in staple food yields by commodity
Economic factors affecting sustainability
Access to and control over resources necessary for survival
Informal sector employment as % of total employment
Wages, by economic activity (Rand per year)
Socio-Cultural Conditions
Adult literacy/illiteracy rate
Female illiteracy rate
Girl enrolment in primary school
Literacy of 15-24 year-olds
access to primary health care
pupils starting grade 1 who reach grade 5
4. Risks, Hazards, Shocks (see Focus group interview, appendix 3.)
Intensity of freshwater use from renewal internal sources
Intensity of rain (erratic rainfall)
Changes in drought
Changes in temperature
Changes in cyclones
Changes in flooding
Intensity of freshwater use from renewal internal sources
Land use change
5. The major components of Food Security
Food Availability
Production per unit area
Changes in use of fertilizers
Changes in labour due to out migration
Distribution (Food aid)
Food Accessibility
Access to agricultural land
Access to markets
Distance to major roads
Ration of the cost of a minimum daily food basket to the average daily income
Farm income
Income earnings opportunity/ remittances
Nonfarm income
Stability of food supplies
Income spent on food
Income spent on animal products
Income spent on crop products
Change in income
Changes in prices
Purchasing power
Coping and survival strategies

Market information
Months of cereal self-provisioning capacity
Variability of food prices
Food utilization: Health and Sanitation
access to adequate sanitation
access to primary health care services
access to safe water
Social value
Nutritional value
Food safety
Care and Feeding Practices
Number of meals eaten in a day
births attended by skilled health personnel
children under 15 in the labour force
Weaning age

3 ANALYTICAL FRAMEWORK

From the obtained data, a hunger index was computed as well as the Household Diet Diversity Score (HDDS) and the FANTA Household Insecurity Access Scale:

HUNGER INDEX. Reflects the number of months in which the household reported experiencing food security problems. This index ranges between 0 and 12.

HOUSEHOLD DIET DIVERSITY SCORE. Hoddinott and Yohannes (2002) define dietary diversity as the sum of the number of different foods or food groups consumed by an individual or household over a specific time period. This indicator is a proxy for quality of diet and is highly correlated with adequate caloric and protein intake, quality of protein consumption, and household income (Ruel 2002). The use of dietary diversity as a proxy for consumption stems from the fact that households consume a wider variety of foods when their incomes rise. Dietary diversity is also highly correlated with household per capita consumption and household per capita caloric availability (FANTA 2002). It is a good proxy for vulnerability because of populations' tendency to decrease the number of items they eat as they become more food insecure (FANTA 2003).

FANTA HOUSEHOLD FOOD INSECURITY ACCESS SCALE. With regard to the opportunities of collection of data, the team used a simple tool developed by FANTA. As described by Hendriks and Maunder (2006), the FANTA Household Food Insecurity Access Scale's (Coates et al, 2003) tool asks nine questions which represent universal domains of the experience of insecure access to food. This tool assigns households and populations along a continuum of severity and can be added to a standard baseline and final evaluation survey.

4 OPERATIONAL PROGRAM

The project exists out of three phases: 1) pre-data collection phase; 2) data collection phase; 3) post-data collection phase. See tables for a detailed overview of each phase.

1) Pre-data collection phase		
Completion date?	Activity?	Management team
01/03	1. Finalization of project proposal	Prof. Dr. Ir. Luc D’Haese, Prof Dr
01/04	2. Final approval is given by the steering committee	Johan van Rooyen, Prof Dr Nick Vink, Prof Dr Johann Kirsten,
01/05	3. Questionnaire and methodology is finalized	Prof. Dr. Ir. Marijke D’Haese,,
15/05	4. Control of the questionnaire and the SPSS program	Assistant Lotte Staelens, Ir. Anne-Marie Remaut-Dewinter, Ir
11/04- 24/04	5. Training of the data entry module	Ellen Van Damme, Dr Hettie Schönfeld Students
25/07- 27/07	6. Training enumerators and students on data collection and data entry	Management team + 20 enumerators + 8 students

The data collection took place in July – August 2011. The enumerators are collaborators from the Department of Agriculture from Limpopo, students from the University of Ghent, students of the University of Stellenbosch, students from the Pretoria University and members of the management team. All enumerators were trained before the data collection. Surveys were carried out in the five districts of Limpopo (2 municipalities/ district). In a first week, all enumerators and students focused on data collection in the district of Capricorn. By doing so, it was possible for the management team to closely monitor the data collection/ data entry phase and to make adjustments or to give feedback where necessary. In a second and third week, data collection took place in the four other districts (Mopani, Sekhukhune, Vhembe and Waterberg). In each district, 4 enumerators and 2 students were responsible for the data collection and data entry which took place simultaneously. Each enumerator was able to carry out on average 3 surveys/ per day. So at the end of the third week, 120 surveys were collected per district.

In association with the Red Meat Board, a focus group discussion with stakeholders from the respective municipalities took place in order to get more in depth information/ confirmation of the food security status and the food behaviour of the population. Next to this, an open questionnaire on the evolution of the agricultural situation in the last 5 years was used for a discussion with municipal authorities.

2) Data collection phase		
First week (28/07- 29/07)		
CAPRICORN DISTRICT		
Municipalities?	Activities?	Responsible?
Blouberg	Data collection: 40 surveys	20 enumerators 8 students
	Data entry: 40 surveys	8 students
Molemole	Data collection: 60 surveys	20 enumerators 8 students
	Data entry: 60 surveys	8 students
Second week (1/08- 5/08)		
CAPRICORN DISTRICT		
Municipality?	Activity?	Responsible?
Blouberg	Data collection: 20 surveys	2 enumerators
	Data entry: 20 surveys	1 student
MOPANI DISTRICT		
municipality?	Activity?	Responsible?
Giyani	Data collection: 60 surveys	4 enumerators 1 student
	Data entry: 60 surveys	1 student
SEKHUKHUNE DISTRICT		
Municipality?	Activity?	Responsible?
Fetakgomo	Data collection: 60 surveys	4 enumerators 1 student
	Data entry: 60 surveys	1 student
VHEMBE DISTRICT		
Municipality?	Activity?	Responsible?
Thulamela	Data collection: 60 surveys	4 enumerators 1 student
	Data entry: 60 surveys	1 student
WATERBERG DISTRICT		
Municipality?	Activity?	Responsible?
Mookgopong	Data collection: 60 surveys	4 enumerators
	Data entry: 60 surveys	1 student
Third week (8/08- 12/08)		
MOPANI DISTRICT		
municipality?	Activity?	Responsible?
Maruleng	Data collection: 60 surveys	4 enumerators 1 student
	Data entry: 60 surveys	1 student
SEKHUKHUNE DISTRICT		
Municipality?	Activity?	Responsible?
Tubatse	Data collection: 60 surveys	4 enumerators

	Data entry: 60 surveys	1 student 1 student
VHEMBE DISTRICT		
Municipality? Mutale	Activity? Data collection: 60 surveys	Responsible? 4 enumerators 1 student
	Data entry: 60 surveys	1 student
WATERBERG DISTRICT		
Municipality? Mogolakwena	Activity? Data collection: 60 surveys	Responsible? 4 enumerators
	Data entry: 60 surveys	1 student

Between 15th of August and 31th of August, the collected data was analyzed and a first draft report was written.

Post-data collection phase		
Completion date?	Activity?	Management team
15/08- 19/08	1. Data analysis	Students
20/08- 31/08	2. Writing draft report	Management team
15/10- early 2012	3. Report on food security	
	4. Discussion at District and Municipality level	
	5. Dissemination workshops/ food security	
	6. Imbizo/ Publication of international reviews	

DISSEMINATION

The data base and reports are public domain and available to all for use without charge. Scientific papers will be presented at (national/international) conferences, based on literature review, publication of papers (peer reviewed) on conceptual and empirical findings, Workshops to inform all interested stakeholders at academic, national, NAMC and provincial level, discussion at the district and municipality levels.

PROJECT MANAGEMENT

This project is jointly organized by the University of Stellenbosch, University of Pretoria, Ghent University, Antwerp University and the NAMC, with collaboration from of the Limpopo Department of Agriculture.

RESULTS

1 HOUSEHOLD CHARACTERISTICS

A. AVERAGE HOUSEHOLD SIZE

On average, a household is composed of 6 to 7 household members (see table 2). There is no significant difference between the household sizes of the different districts and municipalities.

Table 2. Average households size

Province	N	District	N	Municipality	N
Limpopo	7	Capricorn	7	Blouberg	7
				Molemole	6
		Mopani	7	Giyani	6
				Maruleng	7
		Sekhukhune	6	Fetakgomo	6
				Tubatse	6
		Vhembe	7	Mutale	6
				Thulamela	7
		Waterberg	7	Mookgopong	6
				Mogalakwena	7

B. HOUSEHOLD HEAD CHARACTERISTICS

(i) AVERAGE AGE OF HOUSEHOLD HEAD

The average age of the household head for Limpopo province is 57 years. Figure 3 shows how the household heads in the sample are distributed over different age categories. Mopani is the only district with household heads in the age category below 18 years (child headed households). About 16% to 30% of the households are headed by older people (more than 71 years).

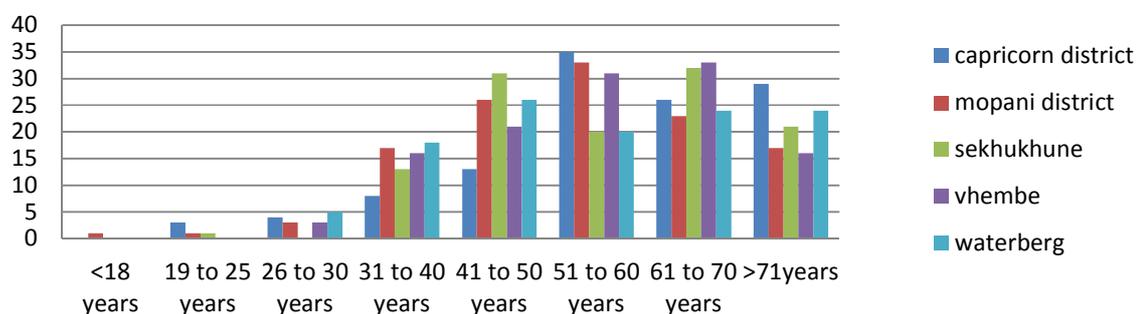


Figure 3. Age of household head by district

The age pyramid of the household population is given in annex 1

(ii) GENDER OF THE HOUSEHOLD HEAD

In Limpopo province 60% of the households are headed by males and 40% are headed by females. Figure 4 shows the distribution of the gender for the different age groups of the household head. From the figure it can be concluded that for every age category except <18 years the number of male headed households is larger.

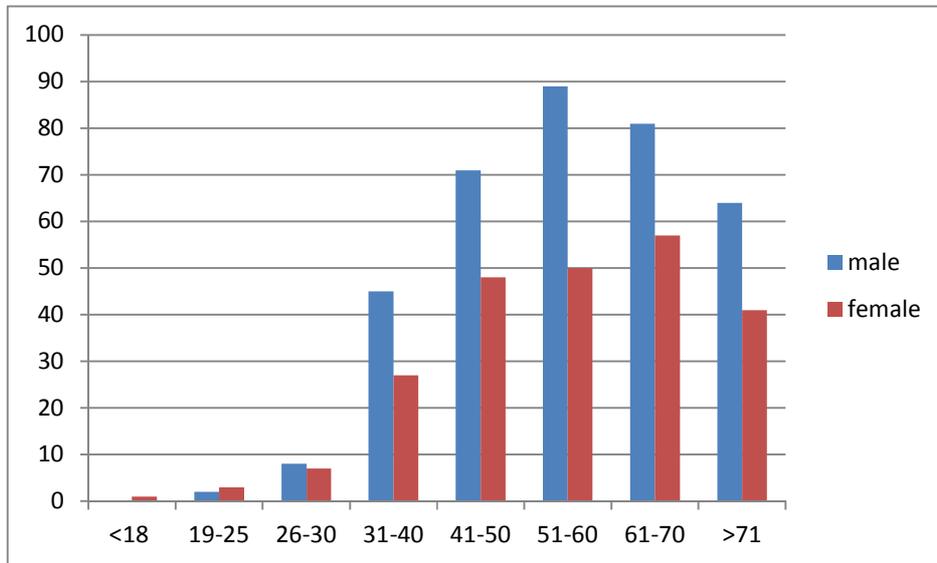


Figure 4. Gender household head by age group

(iii) EDUCATIONAL LEVEL OF THE HEAD OF THE HOUSEHOLD

The household heads have generally a low level of education. As indicated in figure 5, about 32% have no schooling. The majority of the household heads have either completed junior primary or senior primary or have had some secondary education. On average, 16% completed junior school (Gr 0 to Gr 4/ Std 2), 15% senior primary (Gr 5/Std 3 to Gr 7/ Std 5), 17% some secondary (Gr8/ Std 6 to Gr 11/Std 9/Form 4), 11% completed high school (Gr 12 / Std 10/Form 5/Matric), 3% has a certificate or have had some formal training and only 5 % are educated up to diploma or degree level.

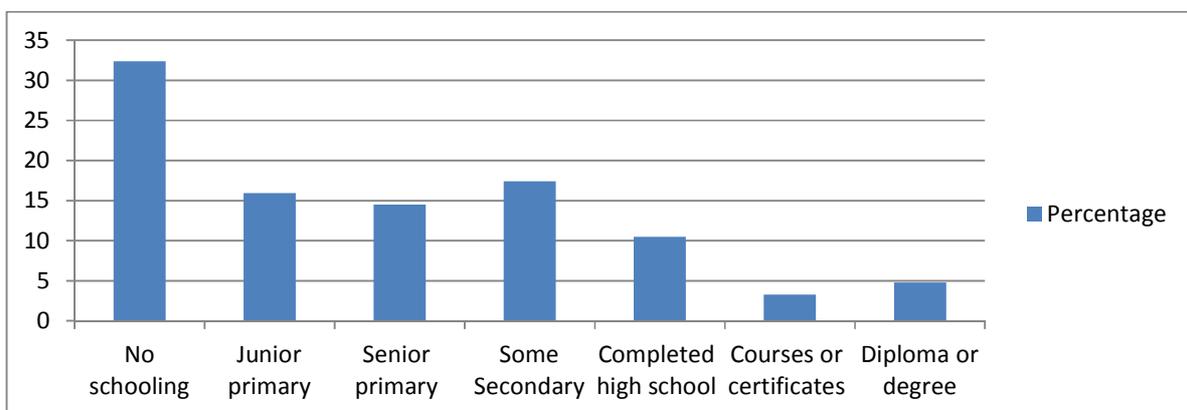


Figure 5. Education level of the household head

In all 5 districts most of the household heads have a low level of education as shown in figure 6. The Mopani district has the highest proportion of household heads (42.1%) with no schooling and Vhembe has the least proportion (13.3%). On average 10% of the household heads in Sekhukhune have acquired a diploma or degree while in the other 4 districts this is 5% or less.

The general trend shows that a large proportion of household heads did not enjoy any schooling except for Vhembe district. The majority of the household heads in all five districts have completed junior primary to high school.

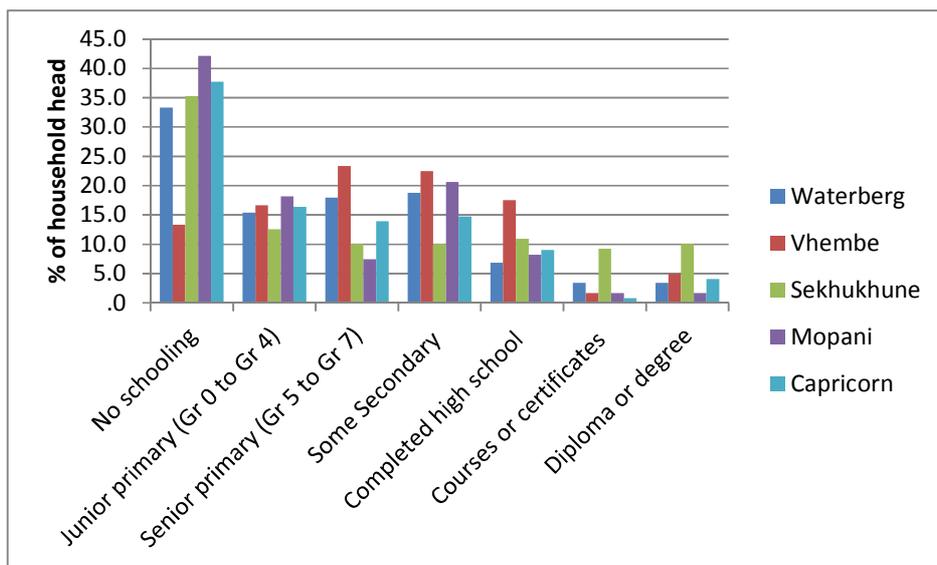


Figure 6. Educational level of the household by district

C. DEPENDENCY RATIO AND ACTIVITY RATES

Two different types of dependency ratios are computed. Firstly the number of active persons (people between 18 and 65 years old) is divided by the total household size. This results in an independency ratio that reflects the potential for households to gain income and be economically active. Secondly the activity rate of the household, how many household members are supporting the other household members. The proportion of the working population is given in annex 2

(i) NUMBER OF ACTIVE PERSONS (18-65)/TOTAL HOUSEHOLD SIZE

Figure 7 shows the ratio ranked from high to low at district level. In all 5 districts the dependency ratio is higher than 0.5, so in every household the number of active people is larger than the number of non active people (people less than 18 years and those above 65 years). The ratio is significantly different across the 5 districts. Mopani has the highest ratio while Waterberg has the lowest ratio. Since the dependency ratio is higher for Mopani and Vhembe, they will benefit more from new opportunities for labour or farming compared to the other 3 districts.

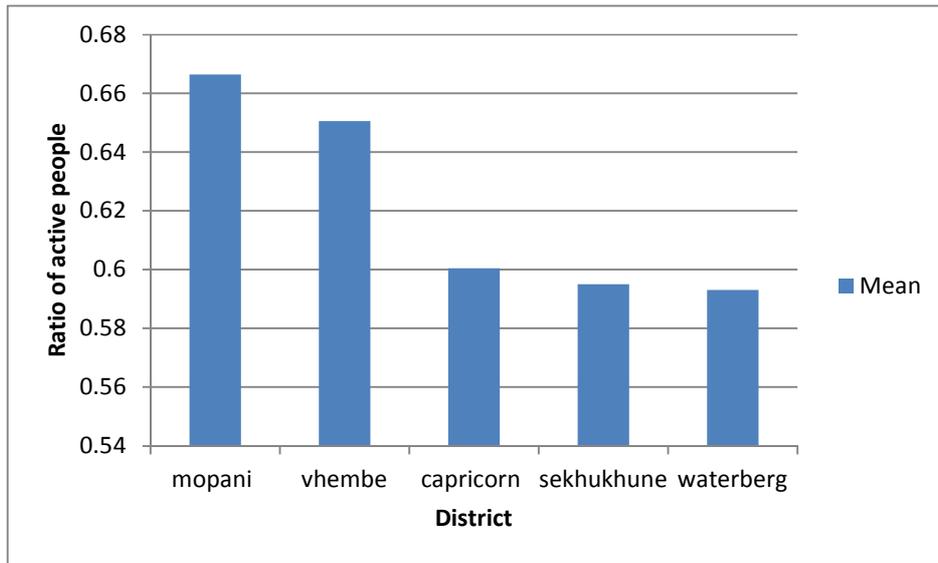


Figure 7. Dependency ratio defined in terms of active people

(ii) NUMBER OF PERSONS WITH INCOME/TOTAL HOUSEHOLD SIZE

Figure 8 shows the activity rate by district defined by income. A ratio lower than 0.5 indicates that there are less people in the household that have an income than those who don't have an income. There is no significant difference across districts in dependency ratio defined by income terms. In all 5 districts the activity rate is lower than 0.2, thus the number of household member with an income is lower than those without. In previous section, it was concluded that for all 5 districts the number of active household members, who are thus able to work, are higher than the not active. However, this is not reflected in the number of household member that do have a job compared to those without a job (Figure 8: dependency ratio < 0.2).

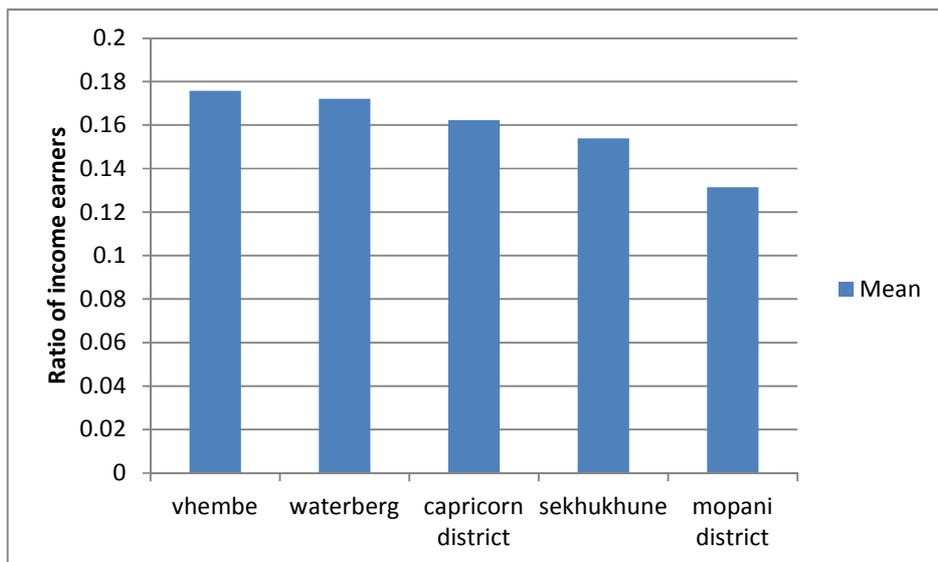


Figure 8. Activity ratio defined in terms of income

D. ETHNICAL GROUP

Almost all the surveyed households (99.8%) were black African households, 0.2% were Indian households.

Period living in the area

Table 3 indicates the percentage of people who have been living in each district for a specific period of time in years. Around 59% of the households have been living in their respective areas for more than 30 years. The Sekhukhune district has the lowest percentage of people who having been living in the area for more than 30 years. A significant proportion of households (25%) have been living in Sekhukhune between 11 to 20 years and this explains why the percentage of people who lived in the area for more than 30 years is lower compared to the other districts. The average number of years that people have been living in the area is 32 years for the whole province of Limpopo.

Table 3. Period of years living in the area per district

	Capricorn	Mopani	Sekhukhune	Vhembe	Waterberg	Total
1-5 years	4.1%	2.5%	3.4%	0.8%	13.7%	4.8%
6-10 years	4.9%	5.8%	7.6%	5.8%	7.7%	6.3%
11-20 years	11.5%	16.5%	24.4%	9.2%	10.3%	14.4%
21- 30 years	20.5	16.5%	26.1%	20.0%	8.5%	18.4%
> 30 years	59.0%	58.7%	38.7%	64.2%	59.8%	59.1%

E. ACCESS TO WATER

The majority of the people in the province use piped water for drinking and cooking from a tap in the yard (36%) or from a public kiosk (33%). A very small proportion of the households use water from other sources like carrier or tanker, rainwater tank, rivers, dams, wells, and springs. Figure 9 shows the distribution of the water sources by district. Across districts sources of water for drinking and cooking are almost similar except for Sekhukhune where 64.7% of the households use water from piped public tap and for Waterberg where 61.5% have piped tap in the home.

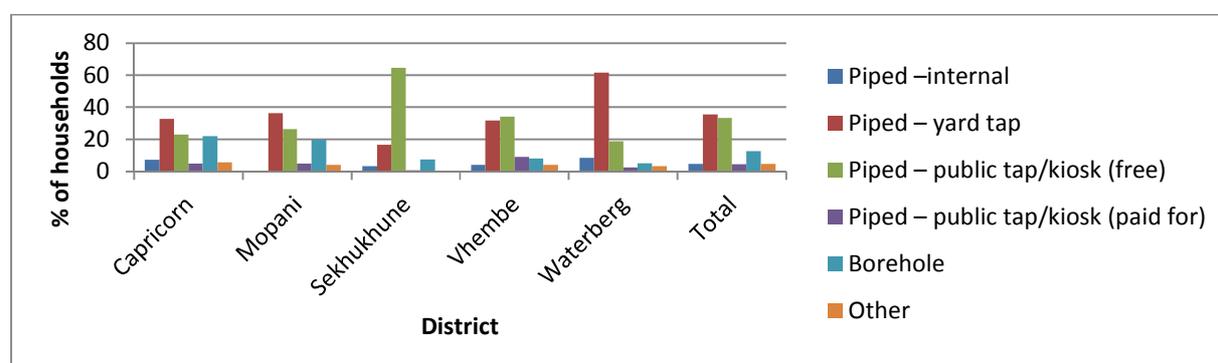


Figure 9. Sources of water used per district

F. SANITATION

In the province of Limpopo 95% of the people use some form of a toilet facility, with the three main types used being other pit latrine (48.9%), improved ventilated pit latrine (38.7%) and flush toilets (only 6.7%). In Limpopo most of the households have a toilet facility outside but on stand (91.7%). Only 7.2 % of the households have the toilet facility inside dwelling and a very small proportion has a toilet facility off stand (1.1%).

In table 4 the distribution of toilet types by district and municipality is given. In Mookpogong almost half of the interviewed households have a flush toilet (44.8%). For all municipalities, except for Mookpogong, the households either have an improved pit latrine or another pit latrine.

Table 4. Percentage of households that use a type of toilet system per district

District	Municipality	Flush	Improved pit latrine	Other pit latrine	None
Capricorn	Blouberg	1.5	33.8	52.9	7.4
	Molemole	1.9	31.5	66.7	0
Mopani	Giyani	0	8.2	78.7	13.1
	Maruleng	0	58.3	36.7	3.3
Sekhukhune	Fetakgomo	0	40	55	3.3
	Tubatse	0	28.8	61	10.2
Vhembe	Mutale	5	73.5	20	1.7
	Thulamela	11.7	31.7	56.7	0
Waterberg	Mookgopong	44.8	15.5	29.3	8.6
	Mogalakwena	3.4	62.7	28.8	3.4
Total		6.7	38.7	48.9	5.2

G. ENERGY

(i) ENERGY FOR COOKING AND BOILING WATER

When households were asked if they were connected to an electricity supply, 92% indicated yes. In the Limpopo province about 64% of the households use wood for cooking and boiling. About 28% of the households in the province use electricity from the grid for cooking and boiling. A very small percentage of the households (8%) use other sources of energy including dung, electricity from generator, charcoal and gas for cooking and boiling water.

Figure 10 shows that the main source of energy for cooking and boiling water was wood in all the 5 districts. Mopani has the highest percentage (89%) of households who use wood for cooking and has the smallest proportion (10%) that use electricity from grid.

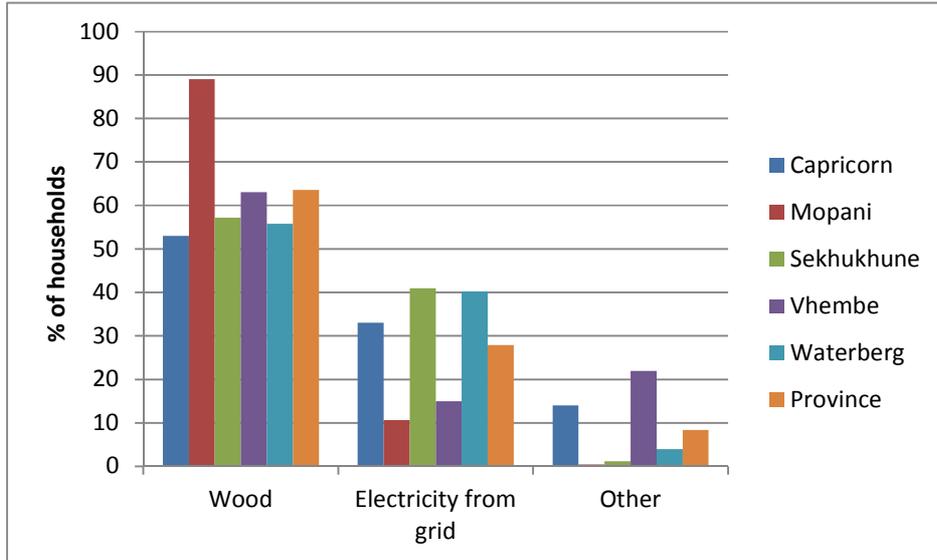


Figure 10. Source of energy for cooking, boiling water per district

(ii) SOURCES OF ENERGY FOR LIGHTING

On average 89 % of the households use electricity from the grid for lighting, while only a small proportion of the households use other sources of energy for lighting (candles 4%, wood 3%, paraffin 1% and electricity from generator 1%).

2 HOUSEHOLD FOOD AVAILABILITY, CONSUMPTION AND DIETARY DIVERSITY

A. FOOD SECURITY STATUS

The choice to capture the HFIAS score in the survey has been inspired by many other studies on this issue in the past. The HFIAS score has been tested and extensively used in food security studies, including: Coates, J., Swindale, A. & Bilinsky, P. (August 2007). Coates, J. et al. (2006). Frongillo, E. & Nanama, S. (2006) Melgar-Quinonez, H. et al. (2006) Swindale, A. & Bilinsky, P. (2006). Webb, P. et al. (2006).

Furthermore, it has been used in South Africa in following recent studies: Ballantine, N., Rousseau, G.G. & Venter, D.J.L. (2008) Faber, M., Schwabe, C. & Drimie, S. (2009). Kirkland, T., Kemp, R., Hunter, L. & Twine, W. (2011). Oketch, J., Paterson, M., Maunder, W. & Rollins, N. (2011). Taylor, T., Kidman, R. & Thurman, T. (2011).

According to HFIA methodology (USAID FANTA) 14.5% of the people in our sample are food secure, 5.8% of the people are mildly food insecure while 25.9% of the population are moderately food insecure and 52.2% of the people are severely food insecure as shown in the table 5.

Table 5. HFIA Category in Limpopo

Food Security Status	Frequency	Percent	Cumulative percent
Food Secure	87	14.5	14.7
Mildly Food insecure	35	5.8	20.6
Moderately Food Insecure	155	25.9	46.9
Severely Food insecure	314	52.4	100

Table 6 shows how in the district of Sekhukhune a larger share of the households are food secure compared to the other districts, while in Waterberg District a larger share of the households are food insecure. Table 6 also provides an overview of the food security status on municipality level. In Fetakgomo, a municipality in the district of Sekhukhune, 29.3% are food secure. In Mookgopong, a municipality in the district of Waterberg however, only 10.3% of the households appear to be food secure. At the same time, it is shown that in Mookgopong, 67.2% of the households are severely food insecure. Maruleng, a municipality in Mopani district also has a high number of severe food insecure households (65%).

Table 6. Share of households per Food Security Status category

Province	District	Municipality	Food secure	Mild food secure	Moderate food secure	Severe food insecure
Limpopo	Capricorn	Blouberg	9.1	1.5	27.3	62.1
		Molemole	13.5	5.8	21.2	59.6
	Mopani	Giyani	8.2	6.6	23.0	62.3
		Maruleng	6.7	3.3	25.0	65.0
	Sekhukhune	Fetakgomo	29.3	13.8	31.0	25.9
		Tubatse	18.6	11.9	37.3	32.2
	Vhembe	Mutale	13.3	5.0	40.0	41.7
		Thulamela	20.7	3.4	25.9	50.0
	Waterberg	Mookgopong	10.3	1.7	20.7	67.2
		Mogalakwena	18.6	6.8	10.2	64.4

B. POVERTY MEASURE

For measuring the poverty status of the population, the concept of daily income per capita is used. The income on household level was used to calculate per household member how much money they can spend on a daily basis. With this information we can divide the households into two categories: those living on less than one dollar a day and those living on more than one dollar a day. The same calculations can be done using two dollars a day as a cut-off point.

Mopani District has, with 49.6 % of the households, the highest percentage of people living on less than one dollar per day, while Vhembe District has with 19.2 % of the households, the lowest percent of 19.2. When compared with people living on less than two dollars a day, then Mopani still has the highest with a percent of 76.9 while Sekhukhune has the least with a percent of 43.7. Therefore in general, Sekhukhune District is better off in terms of poverty measures and Mopani District is worse off as shown in figure 11.

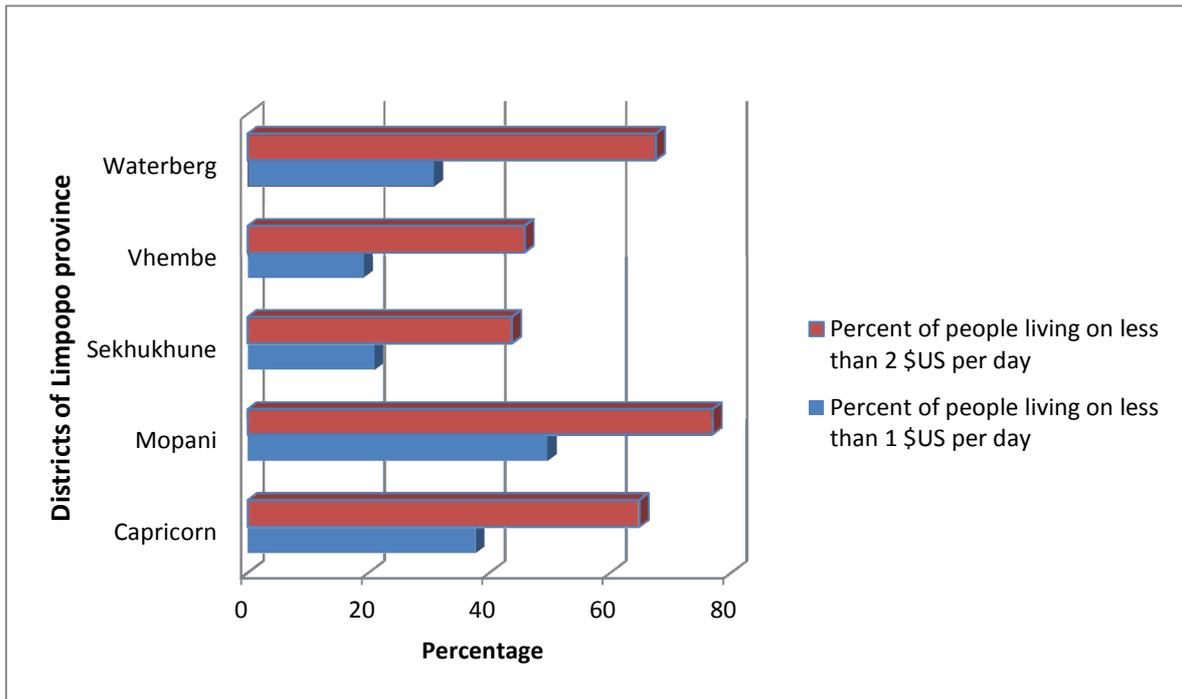


Figure 11. Poverty measures per district

C. HUNGRY PERIODS

(i) HUNGER INDEX

The hunger index represents the total number of months in which the household suffered from hunger. This index ranges from 0 to 12.

Most of the households (53%) in our survey did not experience any period of hunger throughout the entire year. However, for those households that experienced hunger, the period ranged between one to four months in a year, with the greatest number of households experiencing only one (13.2%) to two (10.2%) months of hunger.

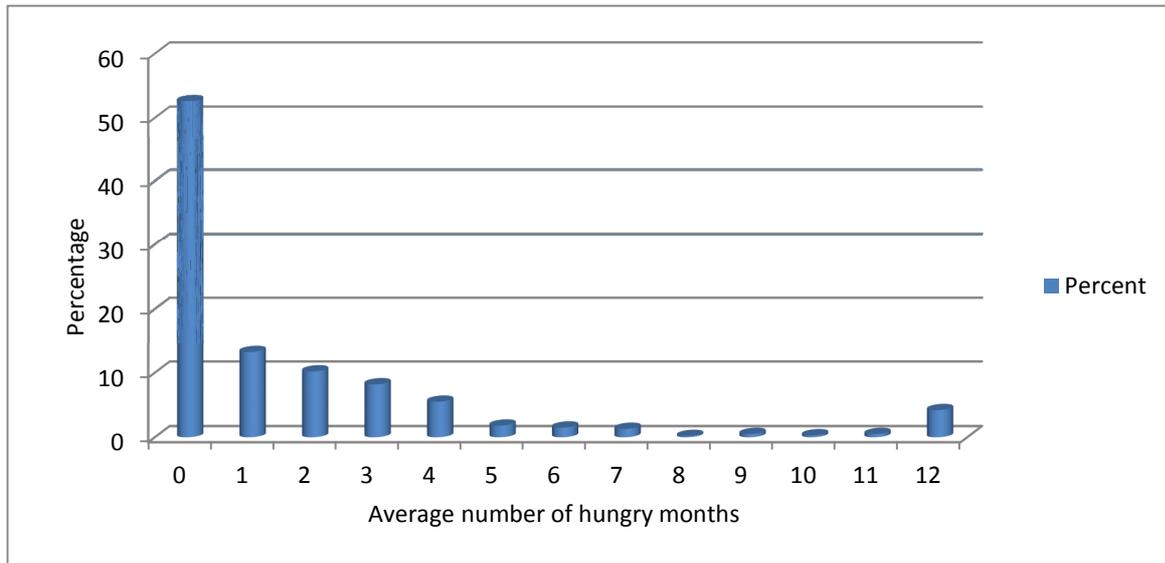


Figure 12. Total hungry months in Limpopo

The average number of hungry months in each municipality, district and the province as a whole is shown in table 7. On a district level, Waterberg presents the highest average number months (3 months) where people faced hunger. Conversely, Mopani district experienced the least number of hungry months in the entire past year (less than month).

Table 7. Mean hungry months distribution

Province	Mean hungry months	District	Mean hungry months	Municipality	Mean hungry months
Limpopo	1.7	Capricorn	1.8	Blouberg	1.9
				Molemole	1.6
		Mopani	0.8	Giyani	0.9
				Maruleng	0.7
		Sekhukhune	1.2	Fetakgomo	0.9
				Tubatse	1.5
		Vhembe	1.8	Mutale	2.1
				Thulamela	1.5
		Waterberg	3.1	Mookgopong	3.2
				Mogalakwena	2.9

(ii) HUNGER PERIOD

Similarly, data concerning the specific months in which households were hungry was obtained. Results indicate that the largest number of households (25.9%) experienced a period of lack of food or money during the month of January. This was subsequently followed by the months of June, February, July and December where 17.2%, 16.2%, 15.5% and 15.2% of households respectively experienced lack of food or money resulting in one or more members of the household having to go hungry.

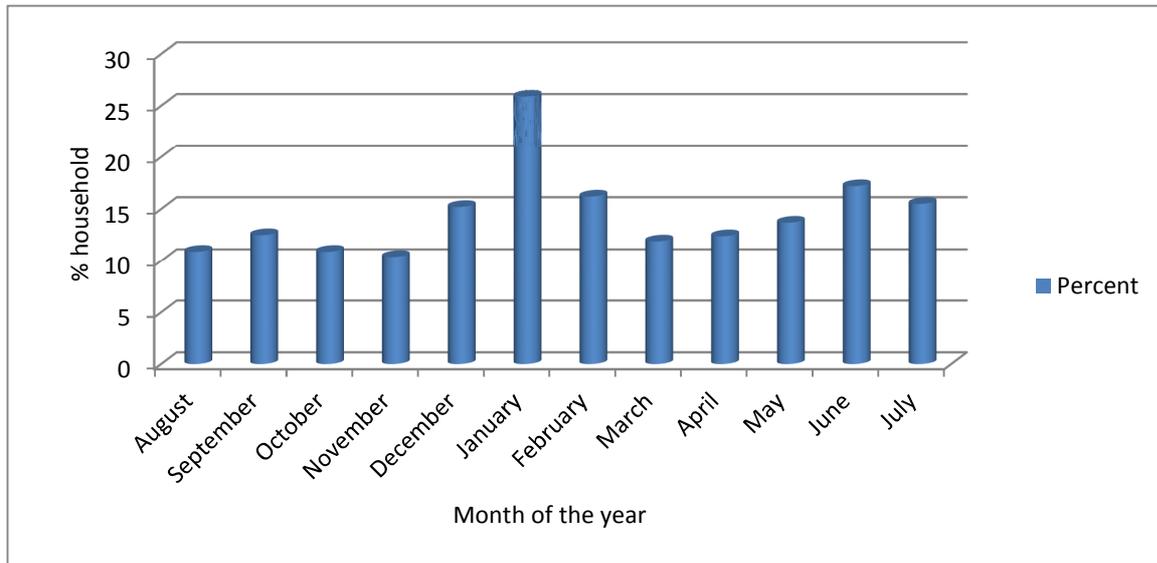


Figure 13. Percentage of households experiencing a period of lack of food

A Report on Survey in Sekhukhune to Pilot the Development of a Food Insecurity and Vulnerability Modelling System (FIVIMS, 2005) confirms that most of households experienced a period of lack of food or money during January and February. There are a number of factors which could explain this food shortage:

- Household budget deficit caused by high spending patterns over the festive season.
- Lack of income during the festive season due to vacation leave.
- Funds being allocated to other cost items (such as school fees and –clothing) in January (Stephen et al, 2005).

D. FOOD CONSUMPTION AND DIETARY DIVERSITY

Household Dietary Diversity Score (HDDS) is the measure of the total number of different food groups eaten by any household member at home in the 7 days, including food prepared at home but eaten outside, such as a sack lunch (FAO, May 2008 pg 5). The different food groups considered are: cereals & tubers, vitamin A rich vegetables & fruit, other vegetables & fruit, legumes, meat & fish, eggs, dairy, oil & fat, sugar & beverages. The HDDS ranges between 0 and 9.

From Table 8 it is clear that households have an average HDDS of 6.7 out of the 9 food groups eaten showing that the households have high diet diversity. There is very little difference for the different districts and municipalities.

Table 8. Household Dietary Diversity Score (HDDS) (0-9)

District	Municipality	Mean HDDS	Std. deviation	Std. Error	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
Capricorn	Blouberg	6.4	2.0	.2	5.9	6.9
	Molemole	7.0	1.6	.2	6.5	7.4
Mopani	Giyani	6.0	2.2	.3	5.4	6.6
	Maruleng	6.5	1.8	.2	6.0	7.0
Sekhukhune	Fetakgomo	6.9	1.7	.2	6.4	7.3
	Tubatse	7.0	1.6	.2	6.6	7.4
Vhembe	Mutale	6.3	1.6	.2	5.9	6.7
	Thulamela	6.6	1.6	.2	6.2	7.1
Waterberg	Mookgopong	7.3	1.4	.2	6.9	7.7
	Mogalakwena	7.2	1.8	.2	6.7	7.7
Total		6.7	1.8	.1	6.6	6.9

E. FOOD CONSUMPTION PATTERN

We choose not to include a 24hour recall of food consumed in the household because it would introduce a substantial measurement bias while taking much of the respondents' time and concentration. Asking the households to keep a 7 days food consumption diary was not because of logistics and the low level of use of scales.

An idea we would like to pursue is to define a proxy of main food consumed by the household as captured by summing the level of own production (if any) with an approximation of the amount of the major foodstuffs bought in a month (calculated by dividing the expenditure on each major food items by the unit price). We argue that households will know to some extent how much they have spent on different important food items (e.g. bags of maize, canned products...), yet, remembering exactly in small (daily or weekly) quantities how much was consumed by each household member is arguably much more difficult given the absence of scales, literacy issues and the intra-household food distribution. These measures will not be perfect representations of food consumption, but they should give an (although rough) indication to be interpreted with other food insecurity pointers.

In this survey the food consumption pattern was assessed based on the average number of frequencies a food type was eaten in the last seven days. Maize products had the highest frequency with a mean consumption of 6.7 in 7 days as shown in figure 14. This is because maize products are the staple food of the province hence accounting for the higher frequency, while pork and venison wild game are the least consumed. This may be explained by the higher cost attached to it.

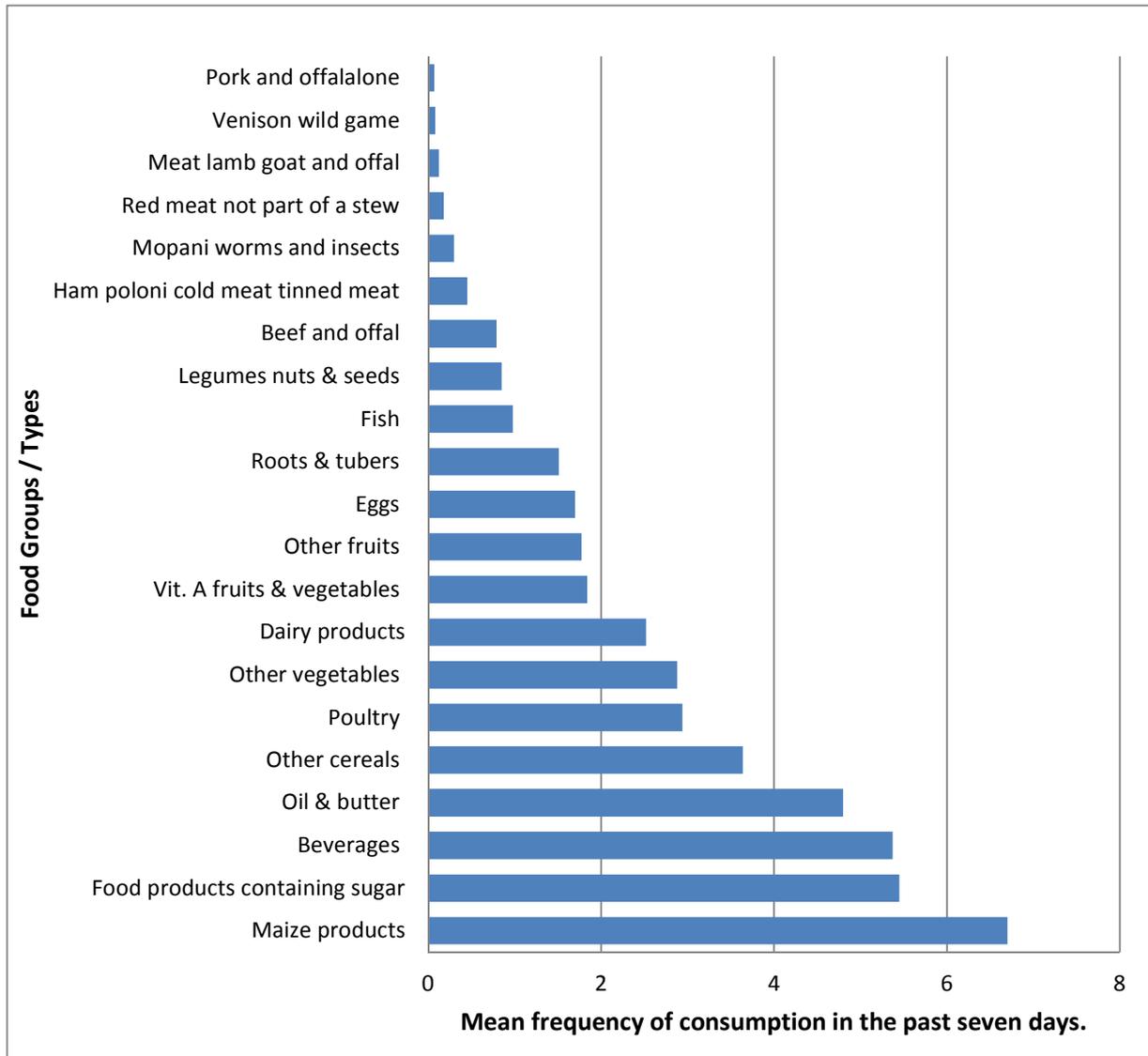


Figure 14. Household food consumption per type over last 7 days

F. HOUSEHOLD FOOD BUDGET ALLOCATION

Figure 15 presents the average monthly expenditure of households on different food groups. This gives an indication of the food budget allocation of households in Limpopo. Most money seems to be spend on maize products (R205.8 per month) followed by other cereal products like bread with a monthly expenditure of (R118.7 per month) and poultry with (R117.2 per month). Food groups with the lowest average expenditure per month include venison wild game (R2.3 per month) followed by pork (R3.92 per month) and eatable insects (R6.35).

Maize products and other cereals products like bread, rice have the highest monthly expenditure mainly because of the high importance in the daily diet. This is because maize products is the staple food group as 88.0% of the households consumed it. This finding is also confirmed by the FIVIMS Survey of 2005.

Mopani worms are among the least bought and consumed since its consumption mainly depends on the season. When the survey was being conducted it was not the season for Mopani worms.

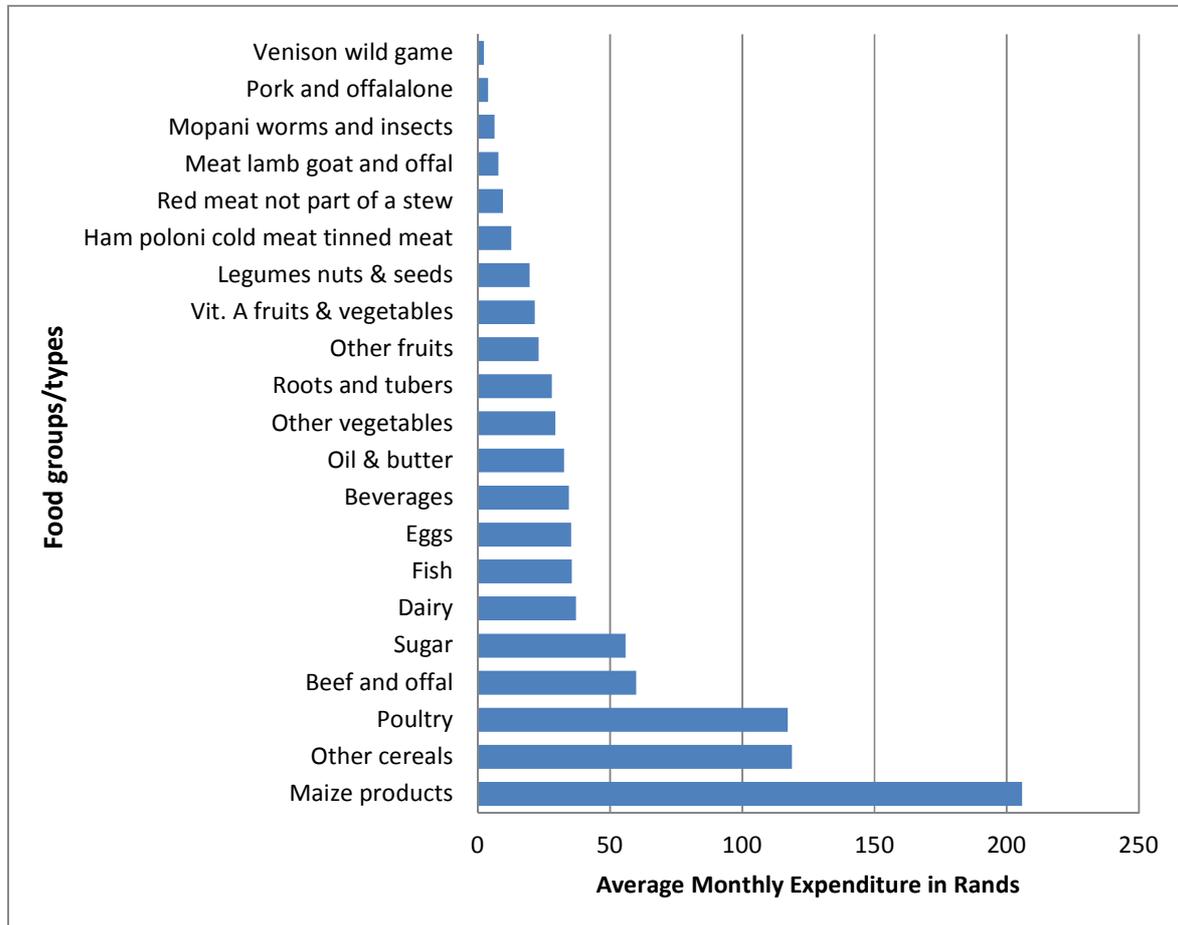


Figure 15. Average monthly expenditures for various food groups

G. MOST IMPORTANT SOURCES OF FOOD

The sources of food consumed are from purchase, own production, gathering, through gifts, exchange and food aid. From the survey data collected and analyzed we can see that the most important source of food is purchase.

Sources of food from own production includes Vitamin A fruits and vegetables as 19.4% of households indicate they obtain them from their own production. Also other vegetables like cabbage (12.0%), maize products (9.5%), and other fruits like apples (9.2%), legumes nuts and seeds (4.2%) are obtained from own production.

Other sources of food consumed like from gifts, gathering, hunting and exchange and food aid accounted for very minimal percentages.

Therefore, this observation supports the findings of the National Food Consumption survey (2002) in that most households procure maize, sugar, beverages, poultry, oil and butter, bread, meat products and roots and tubers by purchasing the items and that subsistence agriculture is not a major source of the most widely consumed food items including maize (FIVIMS Survey, 2005).

H. INTRA HOUSEHOLD FOOD DISTRIBUTION

Information was also gathered to investigate intra household food distribution during instances of food shortages to find out whether this affects food distribution in the household. This is reflected in figure 16.

From the data obtained at a provincial level, 48% of the respondents indicated that female adults (18 years and above) would be the ones eating less when confronted with a food shortage. Thus, female adults are more vulnerable to food insecurity than any other age/gender category of the household. Male adults are less susceptible to eating less than they would require. However, children (less than 5 years) and older children (5 – 18 years) generally seem to have adequate food to eat than any other age category in the household.

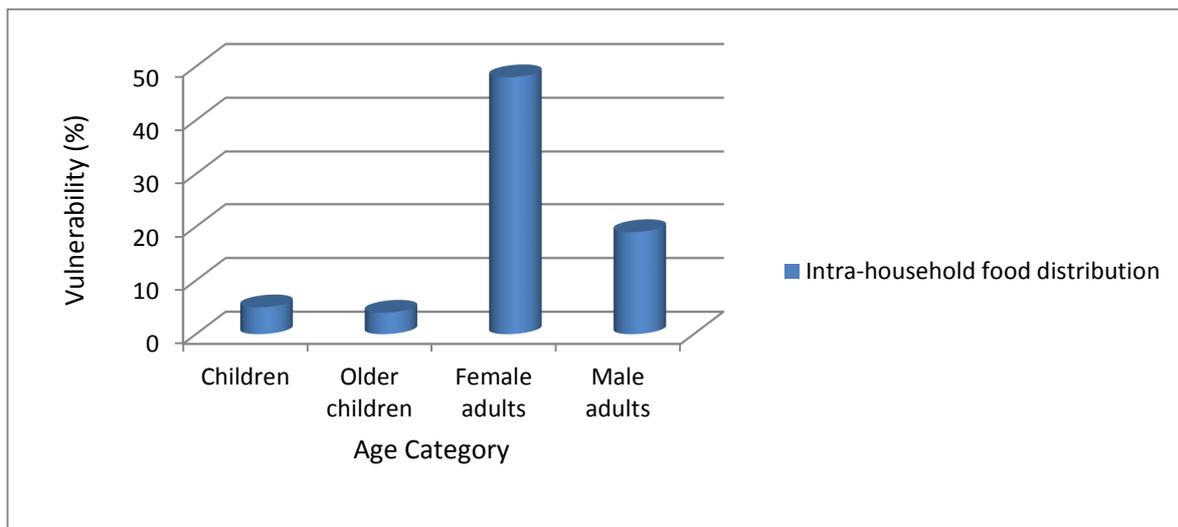


Figure 16. Intra-household food distribution in Limpopo

Furthermore, information regarding the number of meals eaten by both adults and children in a day was captured. Results show that the largest share of adults eat on average 2 to 3 times a day, with 54.6% of the household having two meals and 35.4% eating 3 meals a day.

3 HOUSEHOLD FOOD PRODUCTION

A. ACCESS TO FACTORS OF PRODUCTION

(i) LAND

Access to land and land tenure systems are an important aspect of agricultural production. In the analysis land has been divided into two main agricultural production systems, cropping and grazing. Table 9 presents the percentages (share) of household access to cropping and grazing land by ownership in 5 selected districts of Limpopo Province. The majority of the households practice farming operations, both cropping and animal production on communal land. About 27.2 % of respondents are farming on communal land and 11% are cropping on other types of land such as backyard gardens. Only 7.7% of the respondents indicated that they crop on their own private land while 1.8% crop on rented land. Only 13% of the respondents were engaged in animal production on communal land. None of the respondents were grazing their animals on either private or any other land.

It is difficult to obtain information on the type of land owned by the households. This is because the household may not always be well informed about the type of land (communal or private) it uses/ has access to. Yet, considering communal land as private land may in fact show that the households are rather secure about the land they have access to, even without holding a 'formal' title deed. The importance is then the issue that a household is having access to land to plough and not whether this land is officially theirs on paper. The suggestion that households do not recognize the land as communal land, would mean that they have no fear to be evicted and would use the land as if it was private land, or they perceive it as private land.

The results also confirm that (see table below): 1) communal land is the most common type of land tenure; and 2) no private land is used as grazing land. Livestock is kept on communal grazing land. But it is important to approach the results with some caution and add a more clear interpretation of these results. The variability in access to and the size of (arable) land may be more critical towards agricultural production (and hence livelihood and food insecurity) than the type of land holding. Interesting questions arising are whether there is a link between the level of agricultural production/investment/labour of a household and the type of land tenure that has been used for this production, while taking into account the fact that households are not always certain about the type of land they are using. What would really matter is to find the potential of agricultural production as a livelihood source among the food insecure households. Furthermore, given the high levels of food insecurity also among 'farmers' or household with access to arable land, it would indicate that perhaps not (only) the type of land tenure is important, but other factors that limit the efficient use of this land are more critical, for example water to name one.

Table 9. Respondents' cropping and grazing land in percentage in Limpopo

	Yes (%)	
Crops	Communal	27.2
	Private – own farm	7.7
	Private – rented	1.8
	Other	10.9
Grazing	Communal	13.7
	Private – own farm	0
	Private – rented	0
	Other	0

(ii) WATER

Figure 17 shows the various sources of irrigation water that are mainly used in the 5 districts of Limpopo Province. It clearly shows that respondents rely mostly on rain (9.3%) for their production, followed by river/ stream (9.2%), boreholes (5.7 %), municipal water (1.5%) and other sources of irrigation water such as water canals (1.3%). A dam is amongst the least sources of irrigation water with only 0.8%. This clearly shows that water is a scarce resource in these districts for agricultural production.

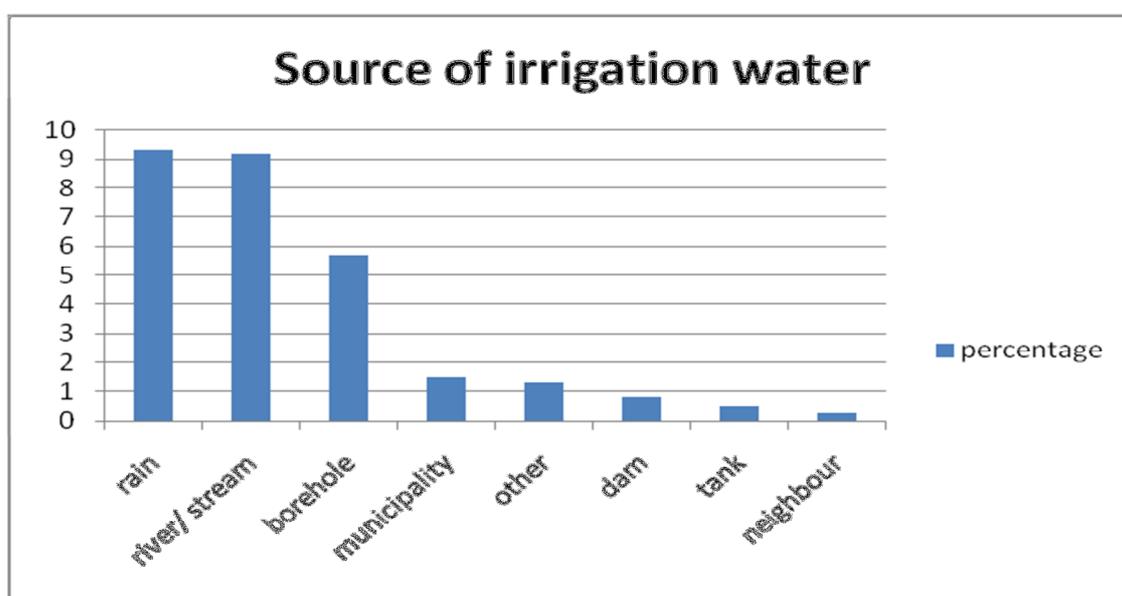


Figure 17. Sources of irrigation water in Limpopo

Figure 18 presents the types of irrigation systems that are mostly used in the 5 districts of Limpopo Province. It shows that the respondents in these districts rely mostly on other types of irrigation systems such as furrows (7.8%), followed by hose and drip irrigation (4.0%) of the respondents indicated using this type to irrigate. Buckets and pipes are the least important types of irrigation system (2.2% each).

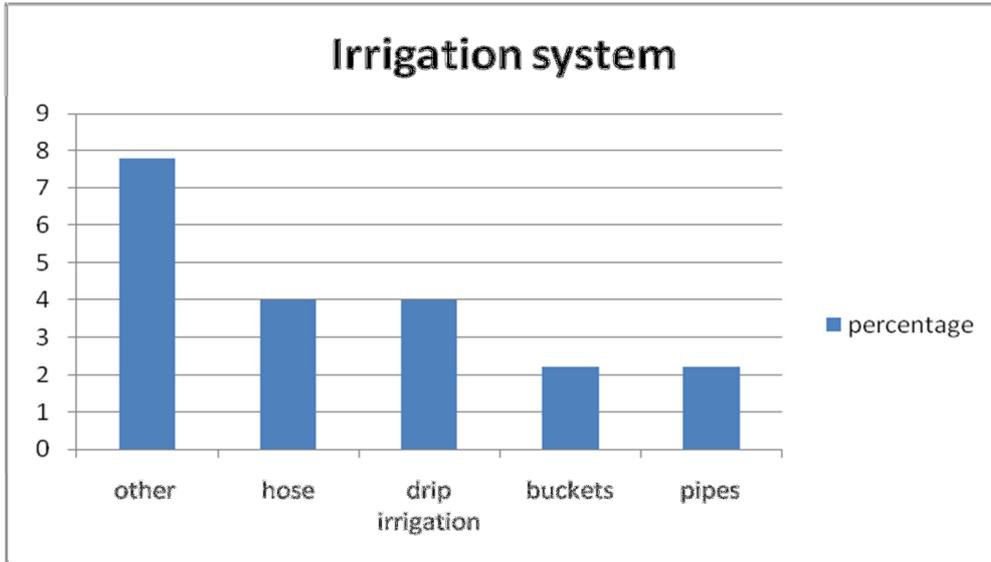


Figure 18. Irrigation systems in Limpopo

(iii) CREDIT SOURCES

Figure 19 shows the availability of respondents' credit resources. This figure shows that most respondents have access to financial assets whereby the three most important financial assets being burial insurance (55.8%), savings at bank/ post office (42.2%) and burial society (26.4%). Having access to financial assets will also enable the household to access credits for their agricultural production.

The difference between burial insurance and burial society is that a burial insurance is a formal policy that can be taken out as a contract between the insurer and a formal financial institutions such as banks and insurance companies and its terms are specifically designed to ensure that the earnings be used only to pay the burial expenses of only those insured. A burial society is regarded as an informal financial policy which is usually formed by people, mostly from the same community, to cover the costs of burying members in the event of their death (DGRV, 2003).

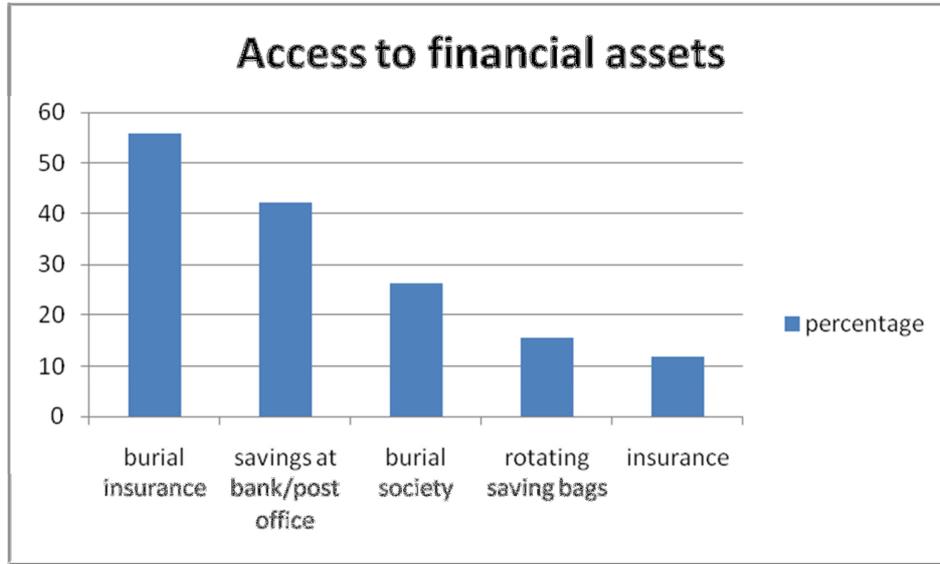


Figure 19. Access to financial assets

B. LAND REDISTRIBUTION

Table 10 shows the percentage of beneficiaries of Land Redistribution for Agricultural Development in the last 12 month (August 2010 – July 2011). The results show that only 0.2% of respondents are the beneficiaries of the LRAD programme.

Table 10. Beneficiaries of LRAD in percentage from August 2010 to July 2011

	Yes (%)
Beneficiaries of Land Redistribution for Agricultural Development in the last 12 months.	0.2

C. PROBLEMS IN LAND CULTIVATION

Figure 20 presents the respondents’ reasons for not using land. From this figure, it is shown that water is one of the most important reasons with 7.8% of the respondents indicating that a lack of access to water is the reason for not cultivating land, followed by money (6.8%) and seeds (3.5%).

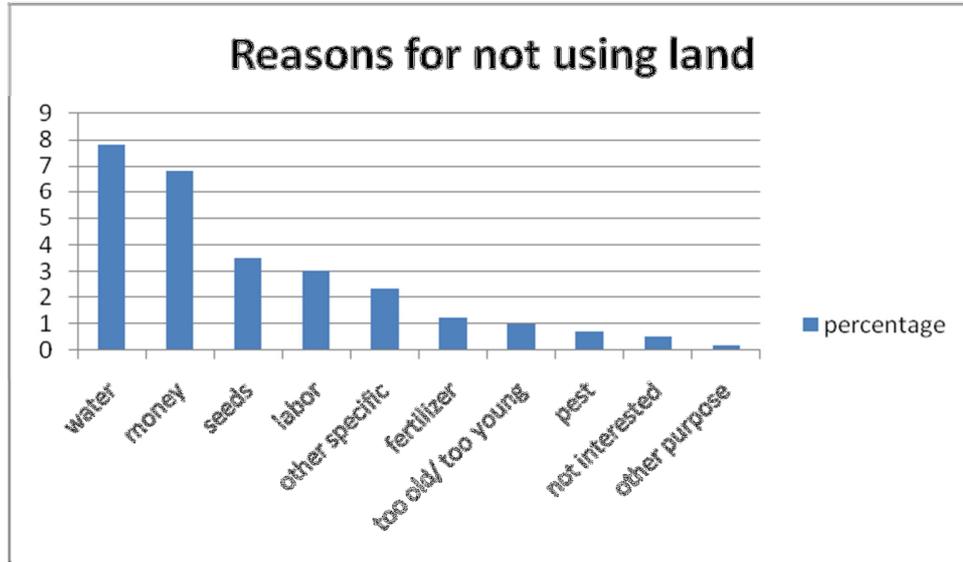


Figure 20. Reasons for not using land in Limpopo

D. FOOD PRODUCTION

(i) MOST IMPORTANT CROPS

PROVINCIAL LEVEL

The 5 most frequently grown crops are maize (31% of households), mangos (24.2%), spinach (15.4%), pawpaw's (15.4%) and tomatoes (14.2%). May and Carter (2009) mention that the 2 most important crops that were grown by the households in South Africa are Maize (77%), spinach (25%). Subtropical fruits are grown by fewer households (11%) in the country. But this data accounts for the whole of South Africa while the data from surveys only covers Limpopo which is considered as the fruit basket of South Africa.

DISTRICT LEVEL

For the five most important crops that were mentioned above, the percentages of households that cultivate these are shown in figure 21. The district of Vhembe has the highest percentages of crop production. However, the biggest producers of mangos are the households in Sekhukhune.

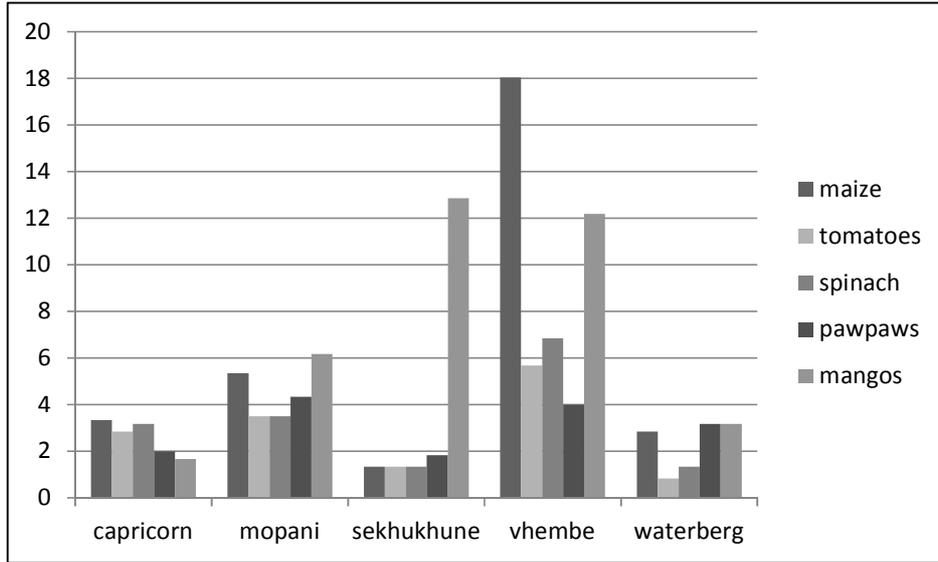


Figure 21. Percentage of households that grow crops per district

It can be concluded that the largest producers for all types of crops are in Vhembe. For the staple crops the second largest producers of maize are in Capricorn, but for the vegetables and the fruits the second largest producing households are in Mopani.

In the section below the different types of crops: staple crops, vegetable crops and fruit crops are discussed separately.

(ii) STAPLE CROPS

➤ PRODUCTION

In the province of Limpopo the most popular crop cultivated is maize (25.4% of total sample) , peanuts (6%) and beans (4.5%) are the second and third most popular staple. Table 11 presents the average harvest of these 3 staple crops. The average harvested amount per district is given in table 12.

Table 11. Harvested amount of staple crops in the previous year (kg)

Crop	Average amount harvested (kg)
Maize	170
Peanuts	14
Beans	3.58

Table 12. Average amount of staple crops harvested in the previous year (kg)

District	Amount of maize harvest in kg	Amount of peanuts harvested in kg
Capricorn	291.57	0
Mopani	65.45	7.04
Sekhukhune	9.41	0
Vhembe	464.46	62.96
Waterberg	13.59	0.68

The table shows that staple crop production is largest in Vhembe followed by Capricorn. Both Capricorn and Sekhukhune don't produce any peanuts. In Sekhukhune and Waterberg the average household production of maize and peanuts is the lowest.

The Limpopo department of agriculture (LDA) report (n.d.) on crop production in Limpopo mentions that The Vhembe district has major trading, tourism, game farming and agro-processing opportunities. While The Sekhukhune district is economically the most marginal district in the Province, but has major potential in mining and agriculture and the Waterberg district has potential in agriculture, mining and tourism. So in Vhembe the produced crops can be immediately processed, whereas this is not the case in any of the other districts. In Sekhukhune the low production is probably a consequence of the lack of access to inputs. Waterberg has potential but this does not show in this data yet.

➤ CONSUMPTION

CONSUMPTION PER HOUSEHOLD MEMBER

The consumption per household member of the produced staple crops was computed by dividing the consumption of the staple crops in kg by the total household size.

As shown in table 13, consumption of maize is highest (69 kg). The consumption of own produced peanuts (20kg) and beans (9 kg) is much less. The report on crop production in Limpopo mentions that maize is the staple food in the Province of Limpopo.

Table 13. Average consumption in kg per household member of produced staple crops in previous year

Type	Average kg/ household member
Maize	68.59
Peanuts	19.95
Beans	8.88

SUBSISTENCE RATIO

The subsistence ratio reflects the share of food production that is consumed by the household itself. It is computed by dividing the amount consumed in kg by the total amount harvested in kg.

In general the percentage of people selling crops is only 1.17% (table 7) which will result in high subsistence ratios. Table 14 shows that the ratio is highest for maize, almost half of what is harvested is

consumed by the household. For beans the subsistence ratio is equal to 1, indicating that the whole harvest is consumed by the household.

Table 14. Subsistence ratio for staple crops

Type	Subsistence ratio
Maize	0.45
Peanuts	0.21
Beans	1
Average	0.55

➤ MARKET VALUE

AMOUNT OF HOUSEHOLD THAT SELL STAPLE CROPS

The percentage of households that sell staple crops is very low (<5%) as shown in table 15. This is to be expected since most is used for own consumption.

Table 15. Percentage of households selling staple crops

Type	Percentage
Maize	4.51
Peanuts	2.00
Beans	1.17

INCOME FROM SELLING STAPLE CROPS

It can be seen in table 16 that over the last year income from selling beans was highest (9417 rand). The income of peanuts (1244 rand) is lowest. The LDA report (n.d.) on crop production in Limpopo mentions that there has been a decrease in production of groundnuts attributed to poor weather conditions, the problem of labor and management, high cost of mechanization and diseases.

Table 16. Average income from selling staple crops in previous year

Type	Average income (Rand)
Maize	2094.59
Peanuts	1244.17
Beans	9471.43

(iii) VEGETABLES

➤ PRODUCTION

Spinach is the most popular vegetable crop in the province of Limpopo (13.9% of households), followed by tomatoes (6.5%) and other leafy vegetables (6.3%). Tomatoes and cabbage are harvested in the largest amount by the households.

Also people were asked how many m² the household uses to grow vegetables. From table 17 it can be concluded that the average m² that the household uses for cultivating is largest for cabbage, followed by tomatoes.

Table 17. Average harvested amount of vegetables in kg and amount of land dedicated for its cultivation

Type	Average amount harvested (kg)	m ²
Tomatoes	305.16	1526.35
Cabbage	117.25	2498.26
Onions	2.17	496.53
Spinach	10.90	523.29
Other leafy vegetables	5.15	1221.35

Based on the amount of m² used for growing vegetables and the total land that was available for growing crops, the share of the total land that is used to cultivate vegetables was computed.

As can be seen in table 18 cabbage comprise the largest share of the total cropping land (17.65%) followed by tomatoes (8.74%).

Table 18. Share of vegetable plot dedicated to specific vegetable crop

Type	Share of land in percentage
Tomatoes	8.74
Cabbage	17.65
Onions	6.92
Spinach	4.30
Other leafy vegetables	6.02

There was only a significant difference between the districts in the harvested amount of vegetables for cabbage and other leafy vegetables (One way Anova). For the latter the average amount produced is given in table 19. Next to this, also the average amount produced is given for tomatoes and spinach since they are considered as one the 5 most important crops in the province (see section 2.4.1)

Table 19. Average vegetable production per household in kg and amount of land dedicated to its cultivation per district

District	Amount of cabbage harvested in kg	Amount of other leafy vegetables harvested in kg	Amount of tomatoes harvested in kg	Amount of spinach harvested in kg	M ² of land for tomatoes	M ² of land for cabbage	M ² of land for onions	M ² of land for spinach
Capricorn	0.17	0.85	3.42	20.69	288.52	0.27	6.33	32.18
Mopani	1.03	6.46	14.22	36.96	30.25	3.79	14.78	24.11
Sekhukhune	21.24	0.03	2.14	0	8.68	8.47	8.48	8.36
Vhembe	563.01	18.13	34.31	1399.77	729.36	802.38	163.59	330.85
Waterberg	0	0.19	0.15	0.01	0.48	0.6	0.63	0.92

When looking at the average amount harvested in kg/per household it can be concluded that Vhembe is the largest producer of vegetables (highest harvested amount for all 4 represented vegetables in table 19). The second largest producer is Mopani as can be seen in table 19. In Waterberg however there is no production of cabbage and the average amount produced of the other vegetables is also very small. The explanation for the difference in agriculture giving in section 2.4.2.1 applies here as well. The LDA report (n.d.) on crop production in the province Limpopo also mentions that The Mopani district is important in mining and has the greatest potential for employment in agriculture and tourism. This potential is especially reflected in the production of vegetables but less for staple crops (see table 4). Especially in mopani agriculture is constrained by the lack of fencing (Mpandeli and Simalenga,n.d.).

The average amount of m² dedicated to growing vegetables is the largest in Vhembe (highest amount in table 19; in Capricorn the area for growing tomatoes is also quite large (289 m²)). For all the districts except Vhembe and Capricorn for tomatoes the amount of dedicated m² is below 100 m².

The total amount of land available for growing crops is largest for Vhembe (2.91 ha), followed by waterberg (1.55 ha). For the other 3 districts the area available for growing crops is around 1.3 ha.

The share of that land that is used for growing vegetables is for all the districts very low and is always below 10%. This is because most of the people grow vegetables in their backyard which is generally very small in comparison to the amount of land that is available for growing all kinds of crops (usually communal and backyard). In Vhembe the share of land used for vegetables is largest, this was also reflected in the biggest amount of vegetable production (see table 20).

Table 20. Share of vegetable plot dedicated to specific vegetable crop per district

district	Share of land (%) for tomatoes	Share of land (%) for cabbage	Share of land (%) for onions	Share of land (%) for spinach	Share of land (%) for other leafy vegetables
Capricorn	4.11	0	1.34	0.19	0.01
Mopani	2.25	0.85	0.57	1.15	0.02
Sekhukhune	0.36	0.34	0.35	0.51	0.17
Vhembe	2.74	4.25	1.39	1.77	1.64
Waterberg	0	0	0	0	0.02

➤ CONSUMPTION

CONSUMPTION PER HOUSEHOLD MEMBER

The consumption per household member of the produced vegetables was computed by dividing the consumption of the vegetables in kg by the household size. Table 21 shows how tomato is the most important crop for household consumption (10.09 kg).

Table 21. Average consumption of produced vegetables (in kg per household member in one year)

Type	Average kg/HH member
Tomatoes	10.09
Cabbage	1.61
Onions	0.39
Spinach	1.55
Other leafy vegetables	2.39

SUBSISTENCE RATIO

The subsistence ratio reflects the share of food production that is consumed by the household itself. It is computed by dividing the amount consumed in kg by the total amount harvested in kg.

The subsistence ratio for the vegetables ranges from 0.27 to 0.69. For tomatoes almost 70% of the harvested amount is consumed by the household, while for cabbage this is only 30% (see table 22).

Table 22. Subsistence ratio for vegetables

Type	Subsistence ratio
Tomatoes	0.69
Cabbage	0.27
Onions	0.63
Spinach	0.60
Other leafy vegetables	0.50
Average	0.54

➤ MARKET VALUE

AMOUNT OF HOUSEHOLD THAT SELL VEGETABLES

Household tend to mainly sell either tomatoes (7.68%) or spinach (7.68%) (see table 23).

Table 23: Percentage of people selling vegetables

Type	Percentage
Tomatoes	7.68
Cabbage	4.34
Onions	3.51
Spinach	7.68
other leafy vegetables	4.67

INCOME FROM SELLING VEGETABLES

Based on table 24 we conclude that the income from selling vegetables during the last year was largest for tomatoes (34601 rand) and cabbage (33128 rand).

Table 24. Average income from selling vegetables in the past year

Type	Average income (rand)
Tomatoes	34600.65
Cabbage	33128.46
Onions	2431.81
Spinach	2189.57
Other leafy vegetables	2120.68

(iv) FRUITS

➤ PRODUCTION

The most important fruit crops in Limpopo are mangos (18.9% of households cultivating) and pawpaw's (12.4%) Other fruit crops such as avocado, banana, naartjes and guava are cultivated by fewer households.

As can be seen in table 25 the average production on household level is largest for mangos (about 212 kg), followed by avocados(21.28 kg).

Table 25. Average fruit production in the previous year (kg)

Type	Average amount harvested (kg)
Mangos	212.42
Avocados	21.28
Naartjes	12.23
Oranges	13.66
Peaches	0.91
Bananas	11.46
Papaws	3.31
Guavas	2.26

The different districts only differ in average production levels for papaws, guavas and mangos. For these, the average amount harvested in kg is given in table 26.

Just as with vegetable production Vhembe is also the largest producer followed by Mopani. However fruit production is least important in Capricorn where this was Waterberg for vegetables.

Table 26. Average amount of fruit harvested in kg per year

District	Amount of papaws harvested in kg	Amount of guavas harvested in kg	Amount of mangos in kg
Capricorn	0.97	0.91	2.05
Mopani	6.02	2.83	147.52
Sekhukhune	0.32	0.40	0.62
Vhembe	7.07	5.29	900.63
Waterberg	2.16	1.83	8.46

➤ CONSUMPTION

CONSUMPTION PER HOUSEHOLD MEMBER

The consumption per household member of the produced vegetables was computed by dividing the consumption of the vegetables in kg by the household size.

Own consumption is highest for avocados (51 kg), mangos (29 kg) and naartjes (29 kg). Next to these two, bananas are also consumed quite a lot, 26 kg is on average consumed per person (table 27).

Table 27. Average consumption in kg of produced fruits (per household member in one year)

Type	Average kg/HH member
Naartjes	29.24
Oranges	10.38
Peaches	2.37
Bananas	26.27
Pawpaws	4.15
Avocados	51.14
Guavas	4.18
Mangos	29.24

SUBSISTENCE RATIO

The subsistence ratio reflects the share of food production that is consumed by the household itself. It is computed by dividing the amount consumed in kg by the total amount harvested in kg.

For fruits the subsistence ratio ranges from 0.71 to 0.97, so for fruit it can be concluded that 70% or more of the production is used for own consumption by the household. For fruits like peaches, pawpaws and avocados the ratio is almost 1, meaning that almost the entire harvest is consumed by the household (see table 28).

Table 28. Subsistence ratio for fruits

Type	Subsistence ratio
Naartjes	0.88
Oranges	0.87
Peaches	0.97
Bananas	0.89
Pawpaws	0.97
Avocados	0.95
Guavas	0.71
Mangos	0.72
Average	0.87

➤ MARKET VALUE

AMOUNT OF HOUSEHOLD THAT SELL FRUITS

Mango is the most popular marketing crop (8.85% of households sell mango) as shown in table 29.

Table 29. Percentage of people that have an income from selling crops

Type	Percentage
Naartjes	1.17
Oranges	2.17
Peaches	0.00
Bananas	1.17
Pawpaws	0.50
Avocados	2.84
guavas	0.50
Mangos	8.85

INCOME FROM SELLING FRUITS

Table 30 shows how the income from fruit marketing is largest for mangos (8637 rand), followed by naartjes (3502 rand) and avocados (2684 rand).

Table 30. Average income from selling fruits in the past year

Type	Average income (rand)
Naartjes	3502.14
Oranges	700.69
Peaches	0
Bananas	745.71
Pawpaws	1322.17
Avocados	2684.35
Guavas	210.97
Mangos	8636.87

(v) CONCLUSION FOOD PRODUCTION

In our sample 57% of households are involved in crop production. The most frequently grown crops are maize (31% of households), mangos (24.2%), spinach (15.4%), pawpaws (15.4%) and tomatoes (14.2%).

The average production yield on household level in the previous year was largest for tomatoes (305 kg) followed by mangos (212kg), maize (170 kg), cabbage (117 kg) and avocados (21 kg).

All crops display quite large average subsistence ratio (amount of production consumed/ total production). Subsistence ratios tend to be largest for fruits (87%), followed by staple crops (55%) and vegetables (54%). This indicates that in general people tend to produce fruit mainly for own consumption while for staple crops and vegetable half of the production is consumed by the household and the other half is sold.

When considering marketing the most important crops are mango (8.85% of households involved in marketing), tomato (7.68%), spinach (7.68%), other leafy vegetable (4.67%), maize (4.51%) and cabbage (4.34%). Average incomes on household level are highest from selling tomatoes (34601 rand), cabbage (33128 rand), beans (9417 rand), mangos (8637 rand), naartjes (3502 rand), avocados (2684 rand). The LDA report (n.d.) on crop production in the province of Limpopo mentions that income by principal products is highest from animal production R2 011 million (51% of the Province’s agricultural income), followed by horticulture at R1 264 million (32%), field crops (R653 million), forestry (6.6 million), and ‘others’ at R0.157 million.

E. LIVESTOCK PRODUCTION

LIVESTOCK PRODUCTION AT PROVINCIAL LEVEL

Livestock ownership can be a very important asset. The type and number of animals owned by a household can give essential information on the food security situation of a household. Figure 22 presents the presence of livestock production across all 5 districts in the Limpopo province. In total 50% of the sample is involved in livestock production. The most important livestock owned by most households in the province are poultry, goats, cattle and pigs. More than 30% of households own poultry and about 22% possess goats or cattle while less than 5% own pigs, sheep or fish.

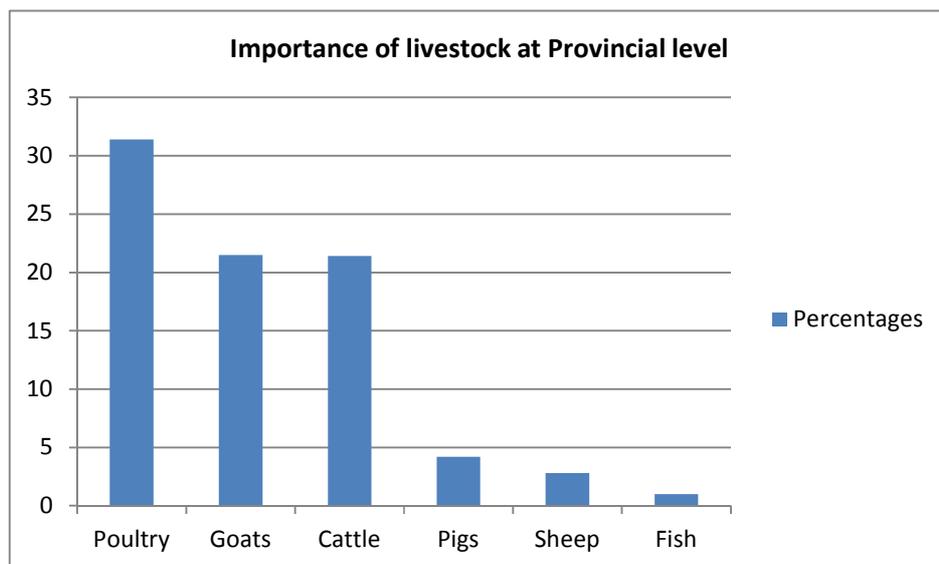


Figure 22. Share of households involved in livestock production in Limpopo

LIVESTOCK PRODUCTION AT DISTRICT LEVEL

Figure 23 indicates the proportion of households that own livestock in percentages. Across all districts more than half of the households own livestock except in Waterberg where only about 21% of households own livestock. The Vhembe district has the highest proportion of 68.3% of households owning or farming with livestock.

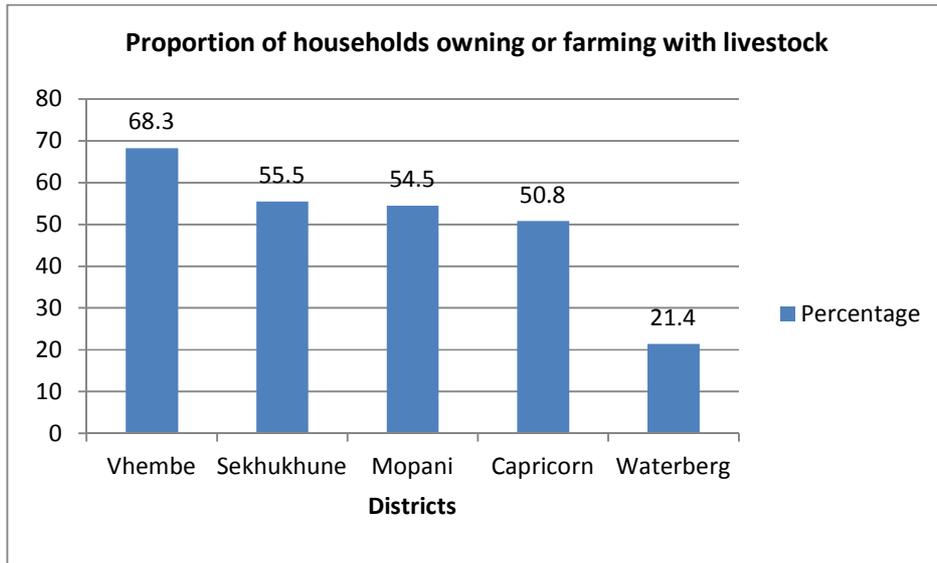


Figure 23. Share of households involved in livestock production in Limpopo

(i) DIFFERENT KINDS OF LIVESTOCK OWNERSHIP AT DISTRICT LEVEL

Poultry is the most popular type of livestock in all districts. In Vhembe district, 68% of households own poultry. In Mopani and Sekhukhune (55%) and Capricorn (51%). However in Waterberg only about 21% of all households surveyed own or farm with poultry.

The ownership of cattle is highest in the Vhembe district (30.8%), followed by Mopani (24%), Capricorn (23.8%) and Sekhukhune (20.7%). However in Waterberg only about 8% of all households surveyed own or farm with cattle.

Capricorn and Vhembe districts have the highest proportion of households owning goats (about 29%). This is followed closely by Sekhukhune (27.7%). In Mopani, a few households own goats while in Waterberg, the households surveyed possess the least number of goats. It was mentioned that Sekhukhune district has a semi arid climate and vegetation that is suitable for goat production since goats are browsers and can withstand dry conditions.

A few households own pigs across most of the districts. About 11% of households in Vhembe district own pigs while in Capricorn, Mopani and Sekhukhune, less than 5% of households own pigs. What is striking is that none of the households surveyed in Waterberg own pigs. Sheep and fish production are less significant in most of the districts. Figure 24 clearly depicts the different livestock units owned in all the 5 districts.

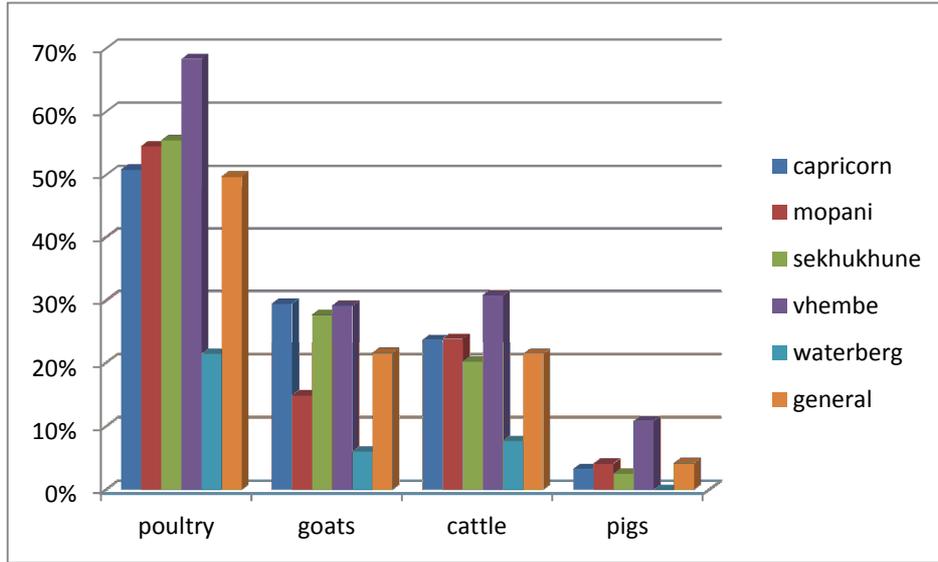


Figure 24. Share of households owning different kinds of livestock per district

(ii) AVERAGE LIVESTOCK

Average livestock units have been calculated only for the households that do own the specific type of livestock. Figure 25 gives an overview for the different types of livestock. When a household owns poultry, it owns on average 16 animals. When a household owns cattle, it owns on average 11 cattle. When a household owns goats it owns on average 10 goats. It is clear that poultry is the most popular livestock over all the districts. Furthermore when a household owns cattle, the herd size is quite big (on average 11 animals). For goats, sheep and pigs this can also be included. This indicates that livestock production is an actual investment choice the household makes. When they do decide to get involved in livestock production, they tend to make quite some investment and don't just have one or two animals on the side.

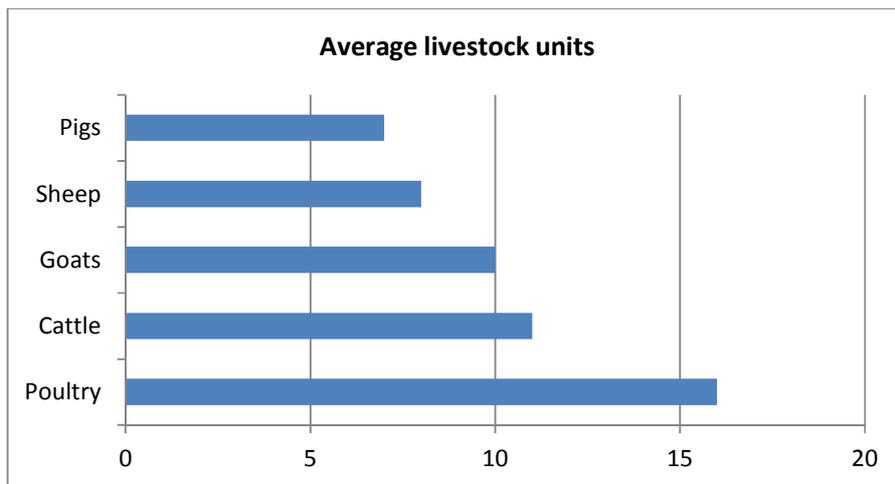


Figure 25. Average livestock units in Limpopo

(iii) MARKET VALUE OF LIVESTOCK

There is a high variation in the market value of livestock depending on the kind of animal. The average selling price of cattle is about R3, 450 which is higher than all the other important livestock. On average the selling price of goat (R714) is higher than that of sheep (R700) and pigs (R412). The average selling price of poultry is around R25. The market values are indicated in Figure 26.

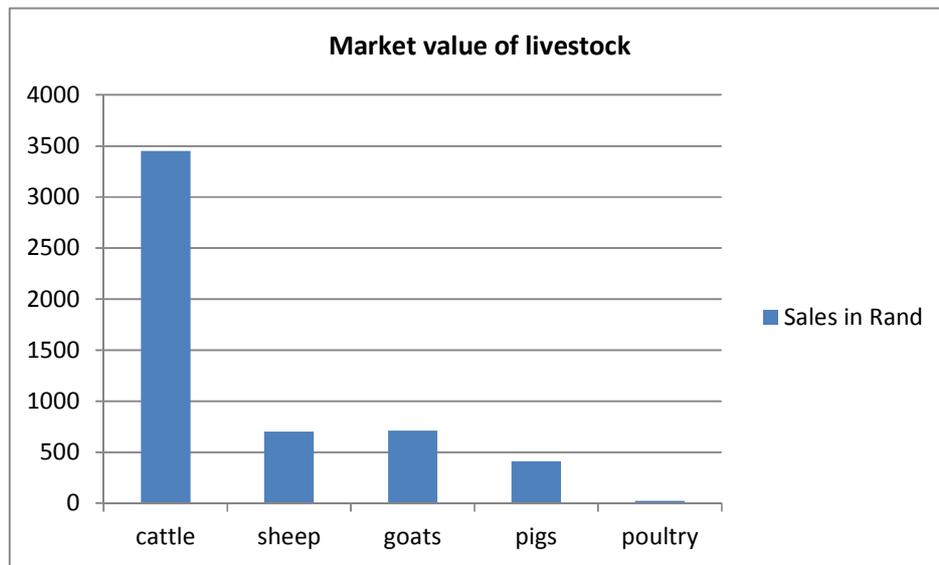


Figure 26. Market value of livestock in Limpopo

4 HOUSEHOLD INCOME LEVEL

A. MONTHLY INCOME LEVEL

On average, a household in our sample has an income of R1609 per month (SD: R845). Figure 27 shows the income distribution of households per month on provincial level. Of all households, 7.6% indicated to have less than R500 per month, while at the same time 7.6% of the households in our survey received an income above R7500.

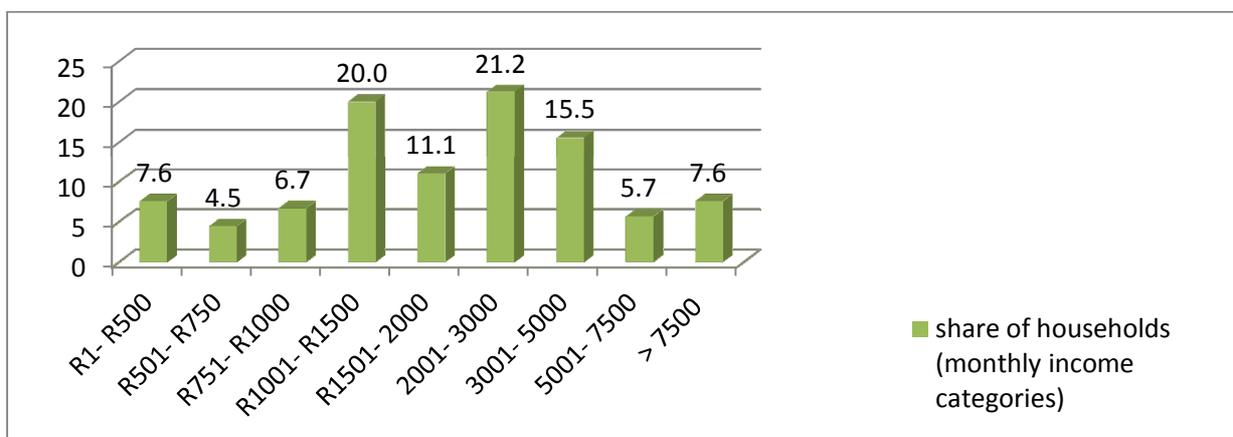


Figure 27. Monthly income distribution of households in Limpopo

Figure 28 presents the income distribution of households per month at district level. It shows that households in the district of Mopani have the lowest incomes per month, as almost 20% of the surveyed households indicated to receive less than R500 per month. Households in the districts of Sekhukhune and Vhembe are in general better off, as 43.4% of the households in Sekhukhune and 43.4% of the households in Vhembe reported to have an income higher than R3000 per month.

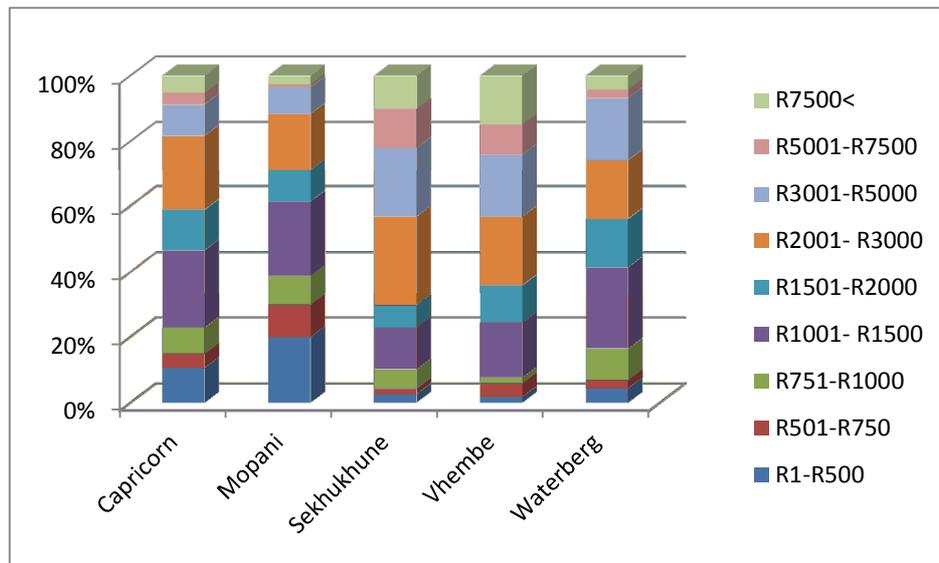


Figure 28. Monthly income distribution of households per district

B. HOUSEHOLD INCOME SOURCES

(i) TYPES OF INCOME SOURCES

When households were asked what sources of income they had per month, 75% of the households indicated to receive grants/ gifts, while 31% of the respondents receive some kind of formal salary. Farming income and remittances were also recognized as an income source for 15% of households and 13% of households respectively. Figure 29 shows the share of households who receive a certain source of income.

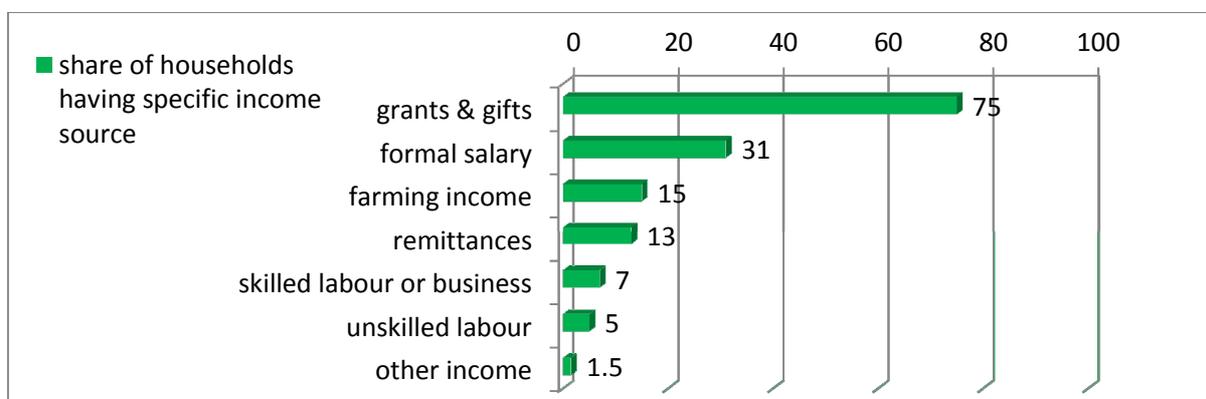


Figure 29. Share of households having specific income source in Limpopo

Figure 30 presents the different sources of income at district level. It shows that in all districts, grants/gifts are the most frequently received income source for households, with Waterberg being most reliant on this type of income (almost 90% of the households in Waterberg reported to receive grants/ gifts). Furthermore, the figure shows that almost half of the respondents in Vhembe receive income out of farming, while in Sekhukhune more than 40% of households receive a formal salary.

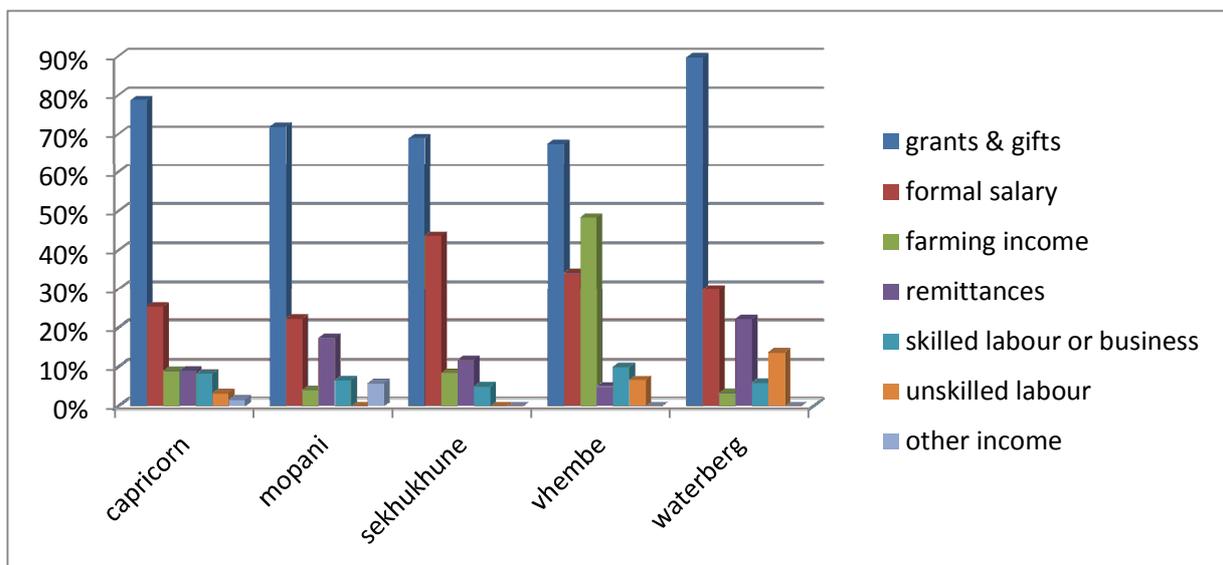


Figure 30. Share of households having specific income source per district

(ii) MAIN TYPES OF INCOME SOURCES

GRANTS

During the survey, respondents were also asked to rank the sources of income according to importance. From this, it became clear that for 57% of the households at provincial level, grants are the main income source. Figure 31 shows the different types of grants, including pensions/ old age grant, child support grant and other social grants (such as Foster Care, Disability, etc.). Of the households who have a grant as a main income source, 64% indicated that this comes from pensions, 27% reported that it comes from child grants and the other 9% receive their main income source from other social grants.

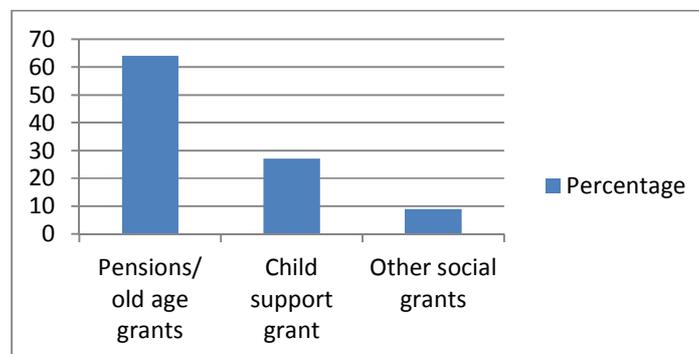


Figure 31. Share of households reporting grants as main income source- overview of the different grants

FORMAL INCOME

Formal salary is the main income source for 26.2% of the households in our sample. At district level, Sekhukhune had the highest percent (43.7%) of households receiving formal salary as a main income source, whereas Mopani has the lowest percent (22.3%) of households receiving formal salary as the main income source (see figure 32). Collectively with grants/gifts, formal salary contributes to the livelihood of 82.2% of our sample.

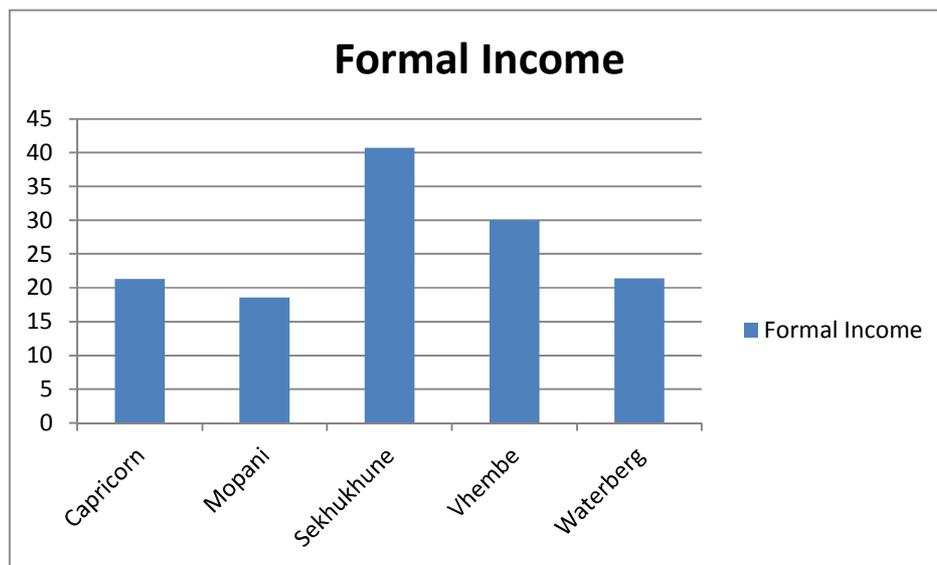


Figure 32. Formal salary as main income source per district

REMITTANCES

Forty three percent of Limpopo households have members who have migrated to work or find employment. Of all migrants, only 25.5% send money to their household of origin. Sekhukhune district has the highest portion (28.6%) of migrants sending remittances to their household of origin; whereas Capricorn has the lowest (23%), (See Table 31). On average, households receive R1183.31 per month as remittances, mainly through the bank.

In Limpopo province, 5% of households report that remittances are the most important household income source. This has significantly decreased from 20.8% observed during the S.A general household survey (Statssa, 2009).

Table 31. Percentage of households receiving remittances from migrants

Province	% household obtaining remittances	District	% household obtaining remittances	Municipalities	% household obtaining remittances	
Limpopo	25.5	Capricorn	23.0	Blouberg	25.0	
				Molemole	20.4	
		Mopani		23.1	Giyani	36.1
					Maruleng	10.0
		Sekhukhune		28.6	Fetakgomo	28.3
					Tubatse	28.8
		Vhembe		26.7	Mutale	20.0
					Thulamela	33.3
		Waterberg		26.5	Mookgopong	22.4
					Mogalakwena	30.5

5 STRESSES, SHOCKS AND COPING STRATEGIES

A. COMMON SHOCKS AND STRESSES

The incidence of shocks was calculated on the basis of self reported responses (see figure 33). Though households did mention experiencing two or more shocks and/ or stresses at the same time, the most common one remains increasing food prices, which was reported among 69 % of the respondents. The other common shocks reported are of idiosyncratic nature (i.e. are at individual or household level, and have high inter- household variance) such as increasing household size, and chronic illness. High food production costs and incidences of drought were also mentioned as common stresses, particularly among small scale producers who depend on rainfall for production.

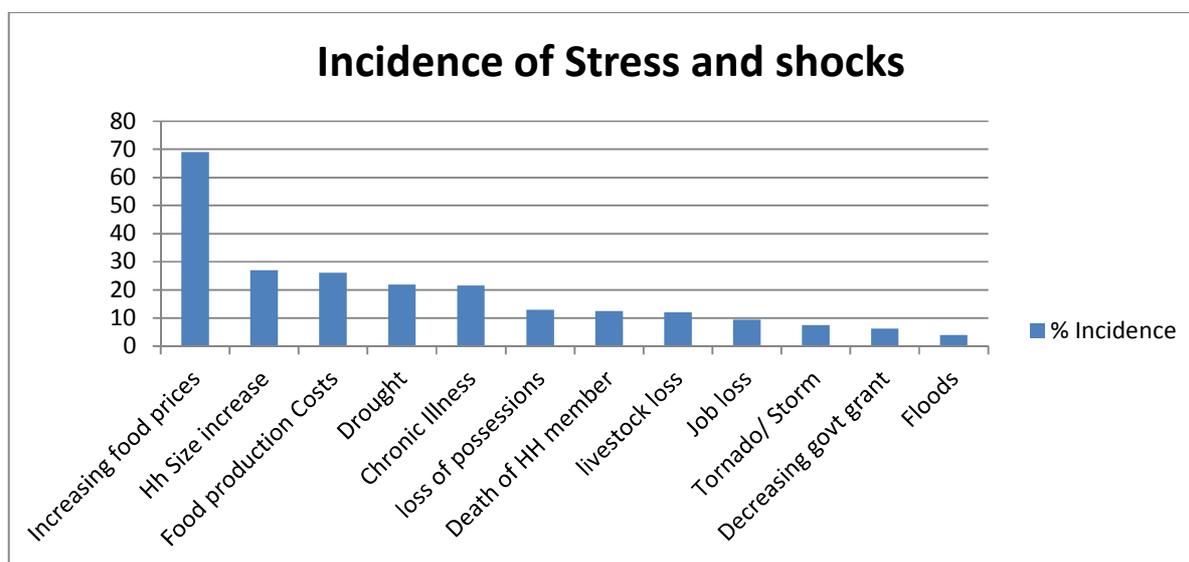


Figure 33. Common shocks and stresses reported in Limpopo

B. COPING WITH SUDDEN AND SEVERE DECREASE IN INCOME

Given the importance of income as a key determinant of food security, particularly in South Africa (Kirsten et.al., 2007), respondents were asked whether their households had been confronted with a sudden and severe decrease in income in the past. A large percentage of them (70%) reported having not experienced the shock, while 30% of them answered positively to the question. The latter were then questioned on the common coping strategies adopted in response to sudden severe decrease in monthly income. Households reported the adoption of both income smoothing and consumption smoothing mechanisms; with the latter being more popular. Consumption smoothing mechanisms are those strategies that are employed after the shock have occurred, for example, reducing food consumption and borrowing food from friends and relatives, both of which are the most popular at 33 % and 32% respectively. Income smoothing strategies, on the other hand are those mechanisms that are employed just before the impacts of the income variation shock occur, these include market based strategies, such as reducing spending, using one's own savings and taking loan from both formal and informal institutions. Also included among income smoothing strategies are mechanisms of diversifying one's income sources, such as migrating to find work and taking on additional sources.

Table 32. Coping strategies for sudden and severe decrease in income

	Coping Strategy	% Respondents adopting strategy
Income Smoothing	Reduce spending	31
	Use own savings	14.9
	Loan from Mashonisa	6.9
	Selling livestock	5.7
	Take loan from formal institutions	5.7
	Migrate to find work	3.8
	Take on additional work	2.7
	Stop or reduce loan payment	2.4
	Average	9.1375
Consumption Smoothing	Borrow food from relatives	33.3
	Reduce food Consumption	32.5
	Receive gifts	13.7
	Selling assets	3
	Seeking professional counseling	1.4
	Average	16.78

C. COPING STRATEGIES FOR FOOD SHORTAGES

Past studies have documented household's coping strategies, the aim of which is to capture people's behavior in response to short term insufficiency of food (Maxwell, 1996: Davies, 1996: Hamilton et.al, 1997). The studies are in view of the fact that the mechanisms that households employ in response to short term food insufficiency can tell a story about that household's capacity to withstand shocks and risks that trigger food shortages. The capacity of households to withstand shocks or manage risk is dependent on the magnitude and severity of the risk as well as the households' assets, including social capital,¹ I. Figure 34 below summarizes the common strategies that were mentioned by respondents. The most common one, adopted by almost 60% of the households, is that of borrowing food from neighbors and relatives. This can be interpreted as a clear indicator of the households' reliance on social capital which is not surprising given that Limpopo province is largely rural. The other common strategies mentioned by the respondents include short term dietary changes, and reducing or rationing consumption, as well as maternal buffering, i.e. restricting consumption in favor of children, all of which are less severe in that they are not damaging to livelihoods; as per the suggestions of literature on the subject (see Maxwell 1996, and Mjonono, Ngidi & Hendriks, 2009). It is however disturbing that 'buying food on credit' was also a popular coping mechanism among respondents (accounting for 50%) mainly because it increases households' vulnerability to permanent indebtedness. Interestingly though, more drastic measures such as feeding working members at the expense of non-working members (who would in most cases be children), and taking children out of school were unpopular among respondents;

¹ Social capital refers to the institutions, relationships, and norms that shape the quality and quantity of a society's social interaction. Key sources of social capital in the context of social and economic development include family ties, and social interaction among neighbours and friends. There is increasing evidence that there is more reliance on social capital in rural, than in urban areas (World Bank, 2001)

accounting for less than 1% in total. The reason for this may be traced to the accessibility to government child grant scheme, as well as the National School nutrition programmes (see next section).

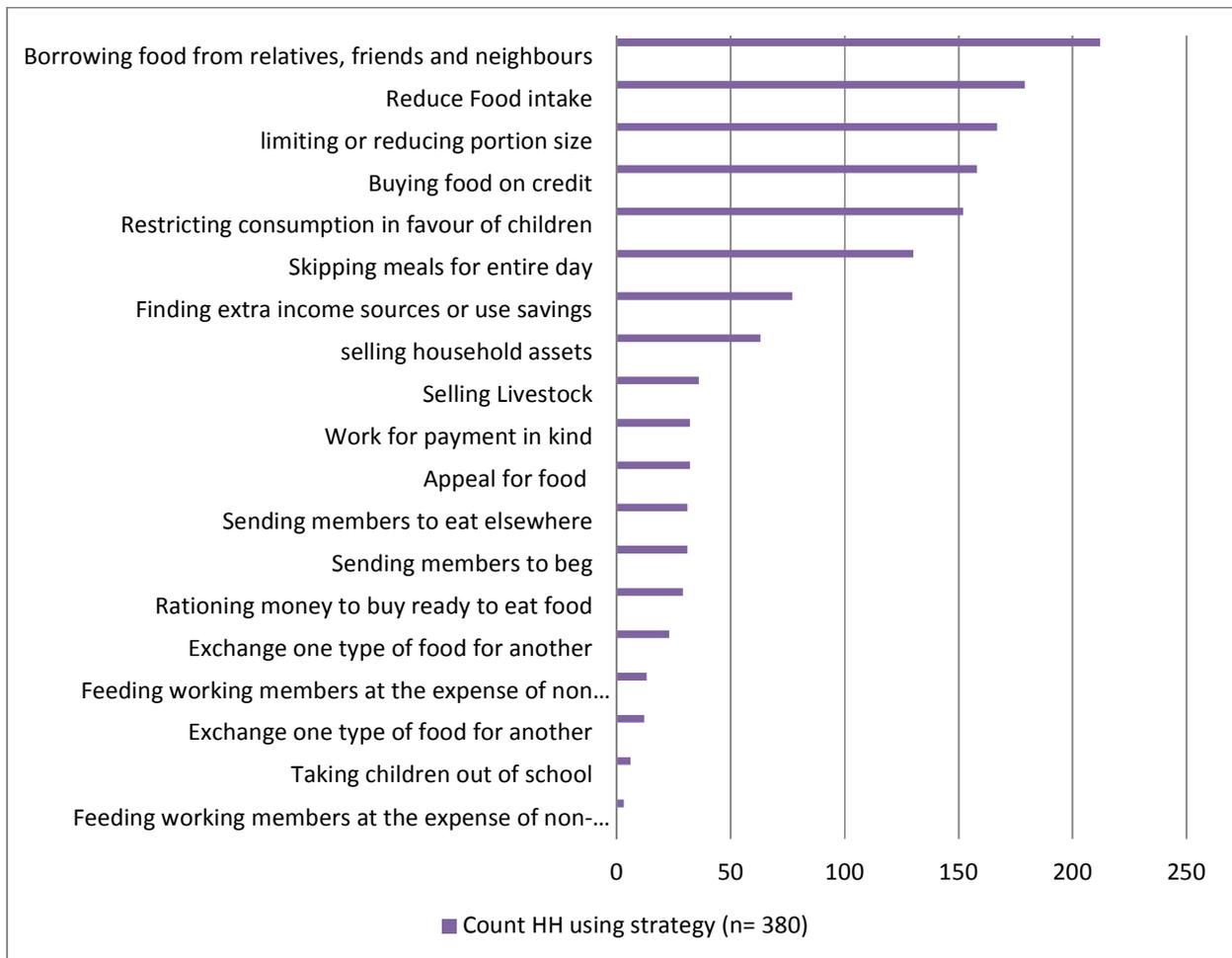


Figure 34. Common coping strategies for food shortages in Limpopo

D. AID PROGRAMMES

To help communities manage risk and also improve their welfare, government has embarked on different programmes as listed below on Table 33, which aim at either (i) enhancing or building livelihoods² (e.g. Agricultural Starter Pack programme and Land restitution programme), and (ii) protecting livelihoods (safety nets), (e.g. National School Nutrition programme and Food parcel scheme.)

The list of programmes was read out to respondents, and they were asked whether they were beneficiaries to any of the programmes. The most popular is the National School nutrition programme,

² "Livelihoods" is a term used to explain the means of making a living, and it comprises the capabilities, assets (including both material and social) and activities required for a means of living.

benefiting 48% out of a total of 599 respondents. Safety nets are meant to be short term strategies aimed at strengthening the capacity of most vulnerable individuals or households to absorb shock, and they should ideally be accompanied with long term livelihood enhancing strategies. The access of long term livelihood enhancing strategies, amongst respondents is however disappointing at an average of less than 3% . Of all the livelihood enhancing strategies, The Agriculture Starter Programme is the most highly accessed, with 6.7% reportedly benefiting from it.

Table 33. Access to government Agriculture and Food Security Programmes

	Programme	% Beneficiary
Livelihood protecting	National School Nutrition Programme (NSNP)	48.1
	Food Parcel Scheme (FPS)	2.5
	Expanded Public Works Programme (EPWP)	2.2
	Poverty Relief Programme (PRP)	2
	Unemployment Insurance Fund (UIF)	1.8
	Municipality implemented food security projects (FSP)	3.8
	Average	10.07
Livelihood Enhancing	Agriculture Starter Pack Programme	6.7
	Land Restitution Programme	3.7
	Comprehensive Agricultural Support Programme	1.5
	Integrated Sustainable Rural Development Programme	0.5
	Land Care Programme	0.3
	Land Redistribution for Development Programme	0.2
	Average	2.15

6 IN-DEPTH ANALYSIS OF FOOD SECURITY

A. GENERAL DESCRIPTION OF FOOD SECURITY CATEGORIES

In this section we use univariate analysis to discuss the different categories of food security. This will lead to a general description of the different categories and will allow a comparison of the categories. These initial analysis provide a basis for the identification of actual determinants of food insecurity in the Limpopo area. This identification is presented in the second section of this chapter. In this section multivariate analysis are used to identify the actual variables that determine, explain and predict the food security status of a household.

Human capital	Farming system	Access to resources	Household income
<ul style="list-style-type: none">• Household size• Education level• Gender head• Dependency ratio• Migrant workers	<ul style="list-style-type: none">• Subsistence food production• Livestock production	<ul style="list-style-type: none">• Land• Water• <u>Schooling</u>	<ul style="list-style-type: none">• Income per capita• Remittances per capita• Type of income

(i) HUMAN CAPITAL

Looking at the influence of human capital³ on food security in the Limpopo province, we could identify the variables which significantly determine the household's food security status.

From the analysis it became evident that gender is an important factor in ensuring food security as we found high significant differences among male and female headed households ($p < 0.001$). From the food secure households, 22.1% was found to be female headed. On the other hand, female headed households made up 45.9 % of severely food insecure households. From that we can say that female headed households tend to be more food insecure comparatively to male headed households with other empirical evidence. Kabbani et al. (2005) reason that the difference between male and female headed agricultural households comes from the difficulty for women in African culture to access land, livestock and other productive assets.

Furthermore, the average household size also plays an important role in ensuring food security as means of the food security status differ highly significantly from each other ($p < 0.001$). As food secure

³ Human Capital refers to the human characteristics, education and set of skills that determine the labor availability to the household.

households have on average 5.689 members and moderately and severely food insecure 6.3419 and 6.9490 respectively, we can assume that the size of households tends to increase with the level of food insecurity.

The level of education of the household head is another variable which determines the household's food security status significantly ($p < 0.001$). From results of the analysis shown in table 34, it is observed that households with diploma or degree are more likely to be food secure. From theory we know that education does not only open up opportunities for better paid off-farm jobs which in return has a positive effect on income but it also helps household heads to better allocate resources to increase productivity (Pankomera et al. 2009). In addition, the results of this analysis at hand showed that households whose head enjoyed no schooling are more prone to fall into severe food insecurity (40.5%).

Although education is an important determinant of the household's food security status in Limpopo, it cannot be interpreted isolated from other factors. It is observed in the analysis that even in food secure households the share of non-schooling headed households (21.5 %) is higher than those headed by a person who holds a diploma or degree (15.7 %) (see figure 35).

Another interesting phenomenon can be observed when looking at the distribution of those households which are headed by someone that has visited courses and received certificates for formal training as these households tend to be more food secure than food insecure. Other levels of education are distributed roughly evenly across food security categories.

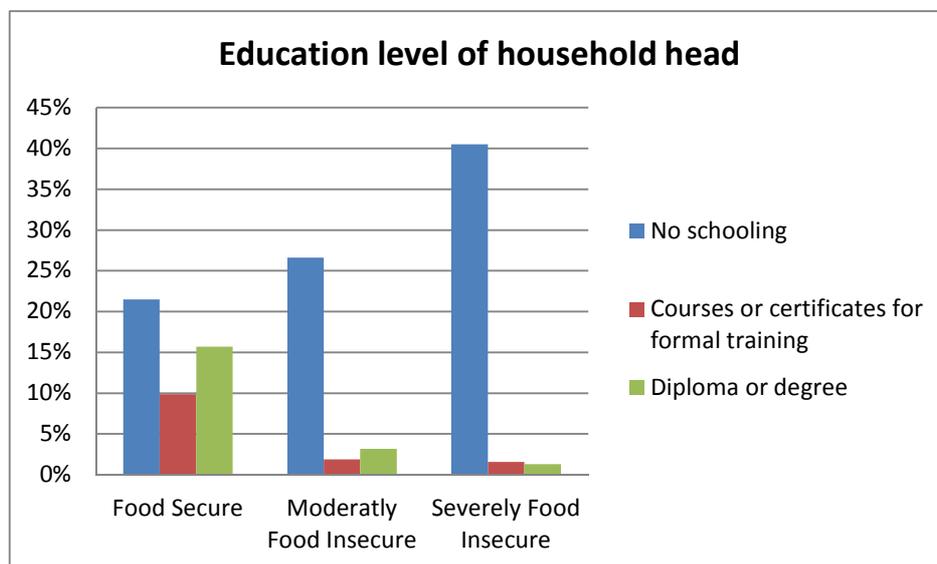


Figure 35. Education level of households heads by Food Security Status

Several empiric studies have come to the result that the household dependency ratio⁴ is positively related with the probability for a household to fall into food insecurity (Ojogho, 2010). Similar results have been found in the Limpopo district where the dependency ratio differs significantly among levels of

⁴ The Dependency ratio is calculating the share of non-income earners in the household.

food security ($p < 0.001$). The dependency ratio in severely food insecure households is higher (0.84) than in food secure households (0.79). Therefore, income earners of severely food insecure households tend to take care of a higher number of household members who do not have an income source.

The average age of the household's head, the presence of migrants to the household and the amount of time the household has already been living in the respective area do not determine the household's status of food security.

Table 34. Human Capital by Food Security Status

		HFIA Category					Test
		Unit	Food Secure	Moderately Food insecure	Severely food insecure	Total	
Female headed households	Female	%	22.1 %	39.0 %	45.9 %	39.2%	$\chi^2 = 20.769^{***}$
Average household size		Members	5.7	6.3	6.9	6.5	F = 147.006 ^{***}
Education level of household head	No schooling	%	21.5	26.6	40.5	32.9	$\chi^2 = 78.158^{***}$
	Junior primary	%	13.2	16.2	16.8	15.9	
	Senior primary	%	11.6	19.5	13.3	14.6	
	Some Secondary	%	16.5	17.5	18.1	17.6	
	Completed high school	%	11.6	14.9	8.4	10.8	
	Courses or certificates for formal training	%	9.9	1.9	1.6	3.4	
	Diploma or degree	%	15.7	3.2	1.3	4.8	
Average age household head		years	57.8	56.5	55.9	56.5	F = 309.010
Dependency Ratio			0.79	0.83	0.87	0.84	F = 0.619 ^{***}
Presence of contributing migrant workers		%	31.1%	27.7%	21.7%	25.2%	$\chi^2 = 4.911$
Average presence of HH in the area			34.05	32.11	30.91	31.90	F = 764.721

(ii) FARMING SYSTEM

From analyzing the farming systems of households in the Limpopo district it became evident that the own vegetable and fruit production does not contribute to food security.

The production of spinach and guavas has been identified to contribute significantly to the food security status in the household. The results in table 35 show that 20.5 % of food secure households and 11.1 % of the severely food insecure households were found to produce spinach. Although the results can lead to the assumption that spinach production positively affects the food security status, it is difficult to generalize results as food secure households have the capacity to produce more cost intensive crops.

Guavas on the other hand, seem to be mostly produced in severely food insecure (13.1 %), followed by food secure (8.2 %) and lastly moderately food insecure households (5.8 %) (see figure 36).

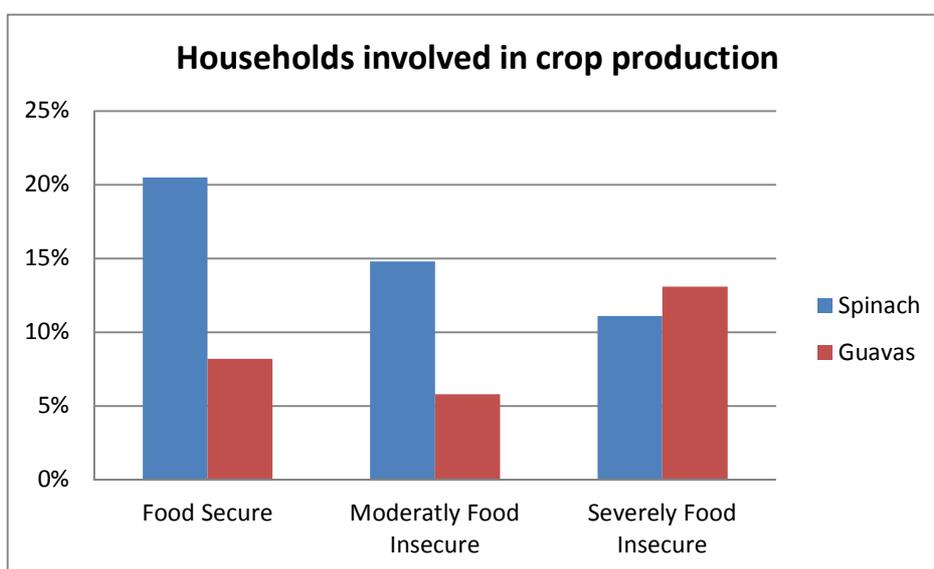


Figure 36. Households involved in crop production by Food Security Status

However, the total amount of crops cultivated plays a significant role in ensuring a household's food security. The results of the analysis in table 35 reflect that on average, food secure (2.7) and severely food insecure (2.1) households tend to cultivate more crops than moderately food insecure (1.9) households.

Not only the crop index but also the livestock index determines the household's food security significantly ($p=0.001$). However, with an average of 4.1 livestock units moderately food insecure households were found to produce more livestock than food secure and severely food insecure households.

Analyzing livestock production in detail, it became evident from the results shown in table 35 that the production of four animals individually affects food security. Poultry production which is amongst one of the animals to determine food security, is mainly carried out by moderately and severely food insecure

households. 58.1 % of moderately food insecure households have replied to produce poultry of any kind. Other households produce less poultry with food secure households producing less of all (42.6 %).

On the other hand, cattle production appears to be an activity which is mainly carried out by food secure and moderately food insecure households. In detail, also here the share of households involved in this production type is the highest among moderately food insecure households (27.7 %) and about 17 % of food insecure households replied to carry out this type of farming activity.

The raising of goats is an activity mainly shared among moderately and severely food insecure households. Almost 30 % of moderately food insecure households are involved in this activity, while only about 15 % of food secure households have responded to carry out goat production.

In comparison to other types of livestock production, fewer households are involved in pig production which also affects the level of food security significantly. The results show that it is an activity mostly carried out in food secure and moderately food insecure households with 8.2% and 5.2% respectively. Only 1.6% of severely food insecure households are involved in pig production.

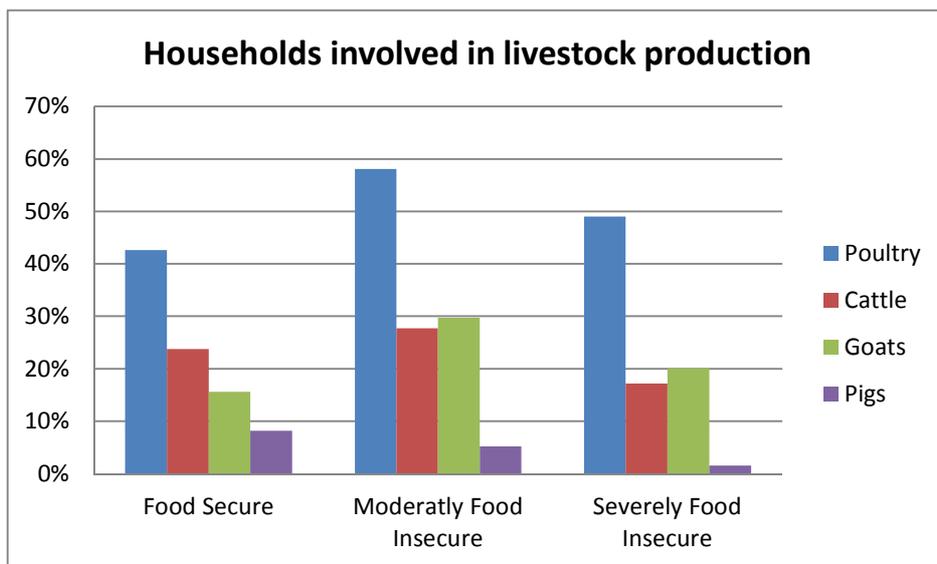


Figure 37. Households involved in livestock production by Food Security Status

Table 35. Farming systems by Food Security Status

		Unit	HFIA Category			Total	Test
			Food Secure	Moderately Food insecure	Severely food insecure		
Food Production	Maize	kg/(Hh*year)	64.5	34.4	67.1	57.7	F = 0.407
	Mango		30.9	36.9	19.4	27.2	F = 1.362
	Pawpaw		4.8	3.6	3.5	3.9	F = 0.433
	Spinach		2.0	1.3	1.1	1.4	F = 1.253
	Tomatoes		7.3	10.5	8.5	8.4	F = 0.096
Type of Crops Produced	Maize	%	28.7	24.5	27.7	27.1	$\chi^2 = 0.738$
	Mango		32.8	27.1	23.2	26.2	$\chi^2 = 4.214$
	Pawpaw		20.5	12.9	16.9	16.6	$\chi^2 = 2.885$
	Spinach		20.5	14.8	11.1	14.0	$\chi^2 = 6.466^{**}$
	Tomatoes		16.4	10.4	11.8	12.4	$\chi^2 = 2.462$
	Guavas		8,2	5,8	13,1	10,2	$\chi^2=6,626^{**}$
	Crop Index	Total units/Hh.	2.7	1.9	2.1	2.2	$\chi^2 = 48.978^{**}$
Livestock production	Poultry	%	42.6	58.1	49.0	50.1	$\chi^2 = 6.801^*$
	Cattle		23.8	27.7	17.2	21.3	$\chi^2 = 7.429^{**}$
	Sheep		3.3	4.5	1.9	2.9	$\chi^2 = 2.610$
	Goats		15.6	29.7	20.1	21.7	$\chi^2 = 9.007^{**}$
	Pigs		8.2	5.2	1.6	3.9	$\chi^2 = 11.152^{***}$
	Fish		1.6	0.6	1.0%	1.0%	$\chi^2=0.695$
	Livestock Index	Total units/Hh.	3.0	4.1	1.7	2.6	F = 7.121 ***

(iii) ACCESS TO RESOURCES

Access to resources is a key determinant of the food insecurity status of the households in the province of Limpopo. As developed by Schmidhuber and Tubiello (2007), food security comprises four key dimensions of food supplies: availability, stability, access, and utilization. Access covers access by individuals to adequate resources to acquire appropriate foods for a nutritious diet.

In addition, access to affordable infrastructure such as piped water, electricity and transport may act as an effective catalyst for increasing food security (de Klerk et al., 2004). The results of the study show that land and financial capital are the most significant resources in the province of Limpopo which play a role in the establishment of the food security status of households, but also electricity and water.

Regarding land and as it is shown in table 36, access to cropping land is not a determinant of the households' food security status rather than the size of cropping land used by the household. It is observed that land size diminishes as food insecurity raises as food secure households use an average size of land of 1.68 ha and severely food insecure households 0.79 ha for crop production.

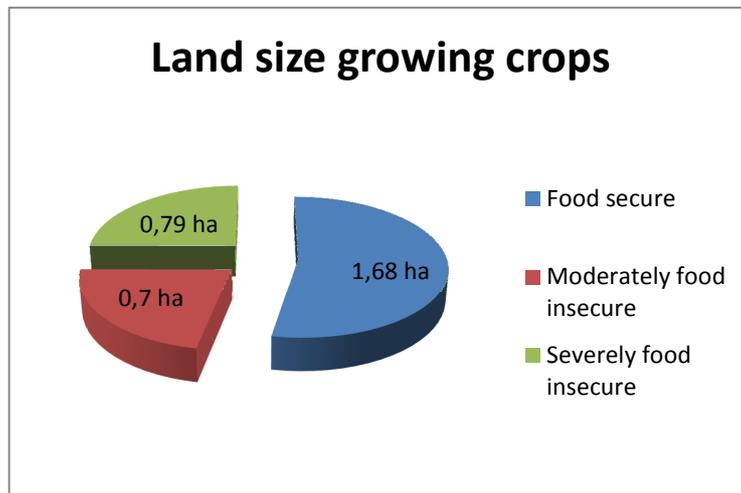


Figure 38. Land size by Food Security Status

In addition to land, financial capital of households, in particular savings and burial insurances, affect significantly the food security status of households. The results shown in table 3 indicate that the amount of households with saving accounts and burial insurances increases with the improvement of the food security status. In the province of Limpopo, 69.7% of the food secure households hold saving accounts and 57.3% a burial insurance, while 36.9% of severely food insecure households have money in a saving account and 56.6% invest in a burial insurance.

Besides, a significant difference is found in the amount of households with access to electricity and their food security status. In the province of Limpopo, there are more food secure households with access to electricity (97.5%) than moderately (93.5%) and severely food insecure households (89.3%). These differences can be explain considering that with higher income it is easier to access to electricity.

Water is also a significant resource, in particular in regard to fetching and carrying water every day. We could observe that there are less households which have to fetch water on a daily bases as their food security status improves. Accordingly, 52.9% of moderately and severely food insecure household and 40.7% food secure households have to fetch and carry water daily.

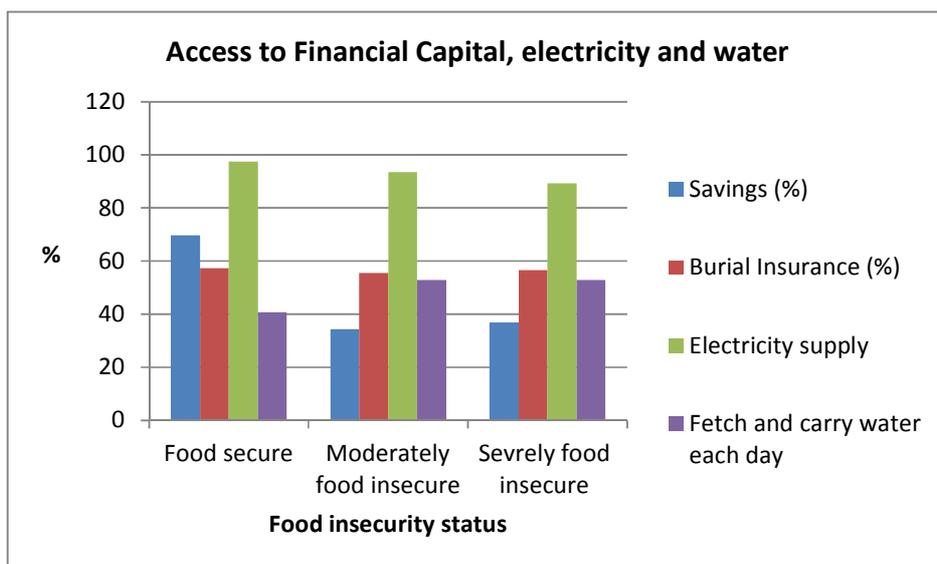


Figure 39. Access to financial capital, electricity and water by Food Security Status

Table 36. Access to resources by Food Security Status

		Unit	HFIA category			Total	Test
			Food secure	Moderately food insecure	Severely food insecure		
Land	Access to cropping land	%	39.1	36.6	35.4	36.5	$\chi^2 = 0.455$
	Land size growing crops	ha	1.68	0.70	0.79	0.95	F= 7.462 ***
Financial Capital	Savings	%	69.7	34.4	36.9	43.0	$\chi^2 = 55.605$ ***
	Burial Insurance		57.3	55.6	56.6	56.5	$\chi^2 = 13.204$ **
Electricity	electricity supply	%	97.5	93.5	89.3	92.1	$\chi^2 = 8.636$ *
Water	Fetch and carry water each day	%	40.7	52.9	52.9	49.6	$\chi^2 = 5.058$ *

(iv) INCOME

Families with financial resources to escape extreme poverty suffer rarely from chronic hunger, while poor families not only suffer the most from chronic hunger, but also entail the segment of the population mostly at risk during food shortages and famines (FAO, 2003). Moreover, household income is an important determinant of per capita calorie intake, because higher income level groups can purchase more appropriately required nutritious food compared to low-income (Uzma and Muhammad, 2004).

The study shows that household's income also determines the level of food security in a significant way. The results show that a higher income goes hand in hand with an increased food security status of the households. Food secure households have an average monthly income of about 1,121 Rand per household member while severely food insecure households earn about 350 Rand per member.

Moreover, monthly remittances received by the households are also found as a significant determinant. As in the case of monthly income, it can be observed that the household's food security status improves as the amount of monthly remittances received increases respectively. Food secure households receive higher average monthly remittances (3,584 Rand/Hh member) than moderately (1,966.3 Rand/Hh member) and severely food insecure households (1,114.9 Rand/Hh member).

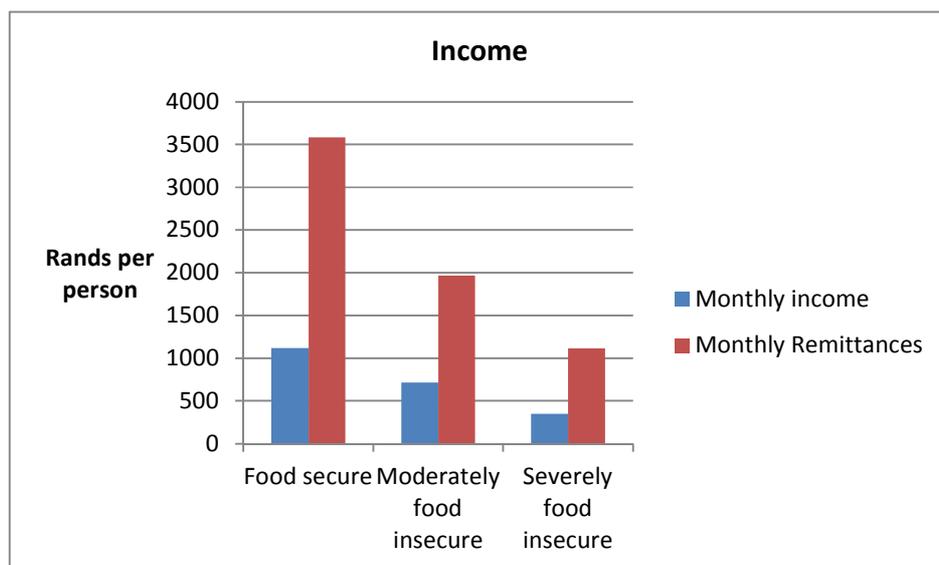


Figure 40. Income levels by Food Security Status

In addition, there are significant differences in the main type of source of income amongst households with different food security status. In this regard, formal salary is the main source of income for 48.3% of the food secure households. The importance of formal salary as main source of income for households decreases with their food security status.

Moreover, the main source of income for moderately and severely food insecure households are grants and gifts which account for 58.7% and 63.5% of the households respectively. These results let us

conclude that the importance of grants and gifts tends to decrease with an improved food security status.

In Limpopo province, households also rely on other main sources of income such as remittances, farm income and income from skilled and unskilled labor as also other forms of income. Remittances are the main source of income for 7.5% of food secure households, 6.5% of moderately food insecure and 3.5% of severely food insecure households.

The results also reveal that farm income is a more important source of income for moderately food insecure households (7.1%) followed by severely food insecure (5.8%) and food secure households (3.3%). From that we can conclude that farming activities as income generating activity is of most importance to moderately and severely food insecure households.

Income from skilled labor activities represents the main source of income for 4.5% of the moderately food insecure households, 3.3% of food secure households and 2.9% of severely food insecure households.

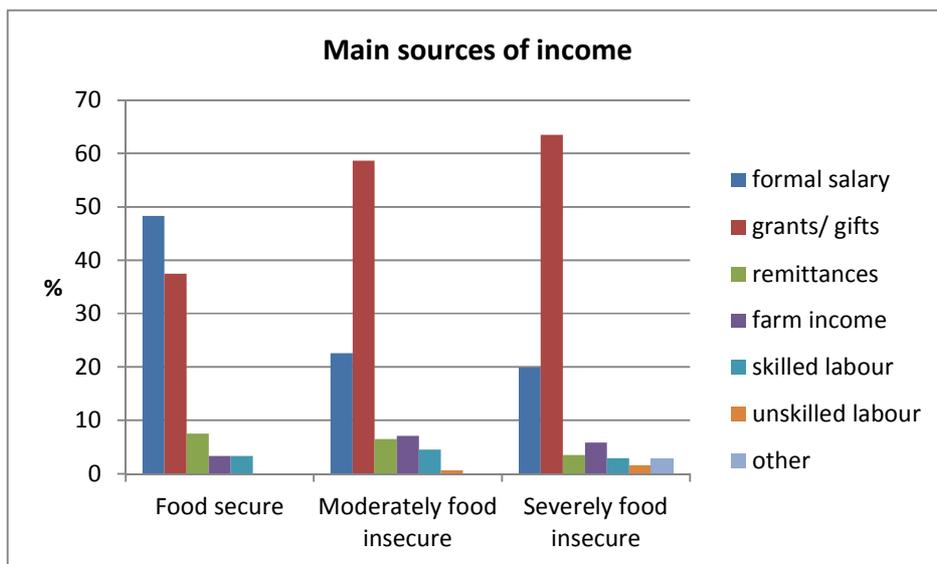


Figure 41. Main sources of income by Food Security Status

Table 37. Income by Food Security Level

		Unit	HFIA category			Total	Test
			Food secure	Moderately food insecure	Severely food insecure		
Income	Monthly income	Rand/ person	1,120.8	716.0	350.4	609.2	F=18.365***
	Monthly Remittances		3,584.0	1,966.3	1,114.9	1,952.2	F= 12.063 ***
Type of income	formal salary	%	48.3	22.6	19.9	26.4	$\chi^2 = 26.808$ ***
	grants/ gifts		37.5	58.7	63.5	56.9	
	remittances		7.5	6.5	3.5	5.1	$\chi^2 = 54.505$ ***
	farm income		3.3	7.1	5.8	5.6	
	skilled labour		3.3	4.5	2.9	3.4	
	unskilled labour		0.0	0.6	1.6	1.0	
	other		0.0	0.0	2.9	1.5	

(v) EXPENDITURE

The household's monthly food expenditure is also seen as a major determinant for food security in Limpopo. In this regard it is observed that severely food insecure households spend on average less money per month for purchasing food (110.5 Rand/Hh member) than moderately food secure (141.0 Rand/Hh member) and food secure households (243.5 Rand/Hh member).

In addition to that, it became evident that severely food insecure household spend less on different food products than other households while this amount tends to increase with the improved level of food security. Expenditure for food products comprises money spent on cereals, bread and meat.

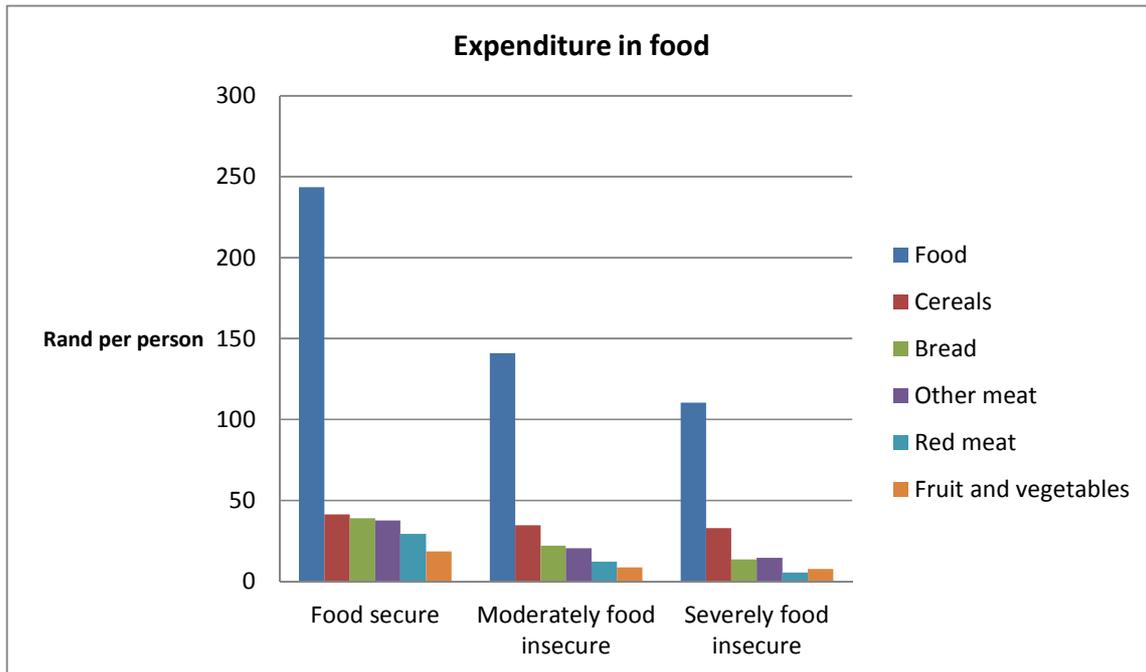


Figure 42. Monthly expenditure in food by Food Security Status

According to Smith (2002), the percent of total household expenditure spent on food is an effective measure of vulnerability. Households that spend a high portion of their income on food are very likely to be food insecure. In Limpopo province, the analysis showed that the share of monthly food expenditure over the household's total monthly expenditure is lowest for food secure households. In this case, food expenditure makes up 54.8% of the total household's outlay, while moderately and severely food insecure households experience a higher share of food expenditure with 65.2% and 69.6% respectively.

To that end, food secure households spend more in food in absolute terms while they spend less on food in relative terms compared to moderately and severely food insecure households.

In the most African countries, cereal based farming system is common. In particular, maize and wheat are the staple diet of the poor in South Africa (Altman et al., 2009). As it is shown in figure 43, cereal is an essential part of the diet of severely food insecure households showing high shares of expenditure in cereals (35.1%) out of the total monthly expenditure of the households, while food secure households spend 19.1% of the total expenditure in cereals. In addition, food secure household tend to spend more money on other food products showing higher expenditure shares in bread, red and other meat than moderately and severely food insecure households.

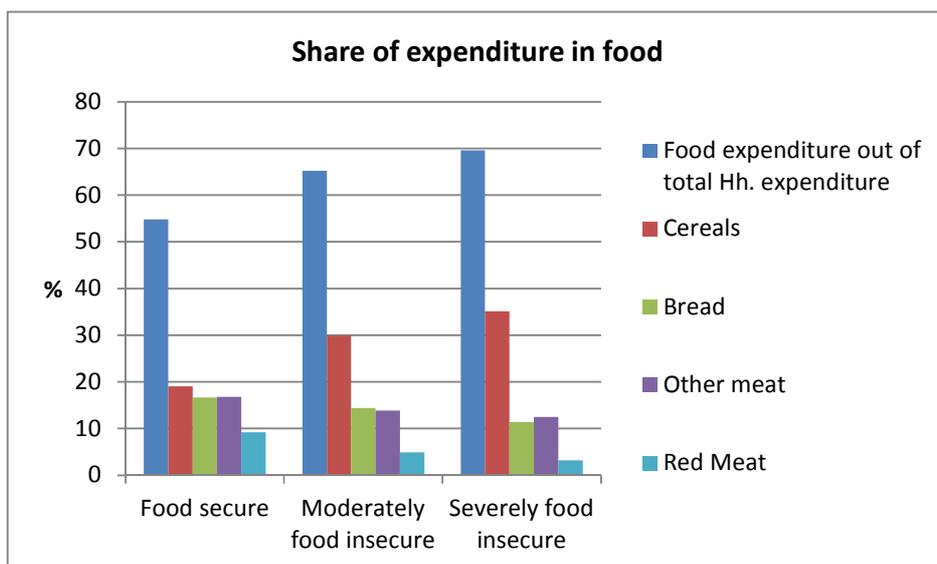


Figure 43. Share of monthly in food stuff by Food Security Status

Table 38. Expenditure by Food Security Status

		Unit	HFIA category			Total	Test
			Food secure	Moderately food insecure	Severely food insecure		
Monthly Expenditure on food products	Food	Rand/ person	243.5	141.0	110.5	146.0	F=47.819***
	Cereals		41.3	34.7	32.9	35.1	F=4.404*
	Bread		39.0	22.2	13.8	21.2	F=39.298***
	Other meat		37.7	20.4	14.7	21.0	F=41.327***
	Red meat		29.5	12.1	5.4	12.2	F=20.262***
	Fruit and vegetables		18.5	8.7	7.8	10.2	F=15.145***
	Eggs		9.1	4.9	4.8	5.7	F=15.478***

	Rootstubers		8.7	3.6	3.5	4.6	F=24.920***
	Dairy		8.0	6.3	4.7	5.8	F=14.882***
	Legumes		6.0	2.8	2.1	3.1	F=12.982***
Share of monthly food expenditure on food groups	Food expenditure out of total Hh. expenditure	%	54.8	65.2	69.6	65.3	F=17.518***
	Cereals		19.1	29.9	35.1	30.4	F=29.246***
	Bread		16.7	14.4	11.4	13.3	F=7.941***
	Other meat		16.8	13.9	12.5	13.8	F=5.812**
	Red Meat		9.2	4.9	3.2	4.9	F=30.568***

(vi) CONCLUSION

The following table gives an overview of the factors which have been identified as significant determinants to the level of food security in Limpopo.

Table 39. Significant determinants of food security in Limpopo

Human Capital	Farming system	Access to resources	Household income	Household food expenditure
<ul style="list-style-type: none"> •Gender •Hh size •Dependency ratio •Level of education 	<ul style="list-style-type: none"> •Spinach & Guava production •Crop index •Livestock index •Production of poultry, cattle, goats, pigs 	<ul style="list-style-type: none"> •Cropping land size •Savings & Burial insurance •Electricity supply •Daily fetching & carrying water 	<ul style="list-style-type: none"> •Monthly income •Type of main source of income •Remittances 	<ul style="list-style-type: none"> •Monthly expenditure •Share of monthly expenditure on food groups

Most results of the study at hand are in line with theory and empiric evidences. However, one surprising result was the fact that the growing of vegetable and fruit production was found not to contribute to food security. As subsistence farming allows households to consume their own products, one would expect significant differences in the different categories of food security.

Furthermore, one of the main conclusions to be highlighted is that food secure households earn higher incomes than moderately and severely food insecure households.

It is important to notice that some variables have proved to be interdependent, especially in regard to the higher monthly income of food secure households and the new household opportunities it comes with. In addition to that, the households' level of income can also influence their access to land, to financial resources such as savings and burial insurances, to electricity supply and water; all of which are assumed to be main determinants to food security. Therefore it is important to perform additional multivariate analysis that take into account this interdependence and allow us to identify the actual determinants of food security.

B. DETERMINANTS OF FOOD SECURITY

In this final section we try to identify the actual determinants of food security in the Limpopo area. In the previous sections of this chapter we have compared households with a different food security status to understand how they differ from one another. This was an initial step in identifying the actual determinants of food security using the HFIAS score.

The HFIAS score is not normative, i.e. it measures the frequency of a behaviour without reference to a baseline. Yet, it captures much of the risk on food insecurity due to access problems in a very straightforward way, which is more comprehensible for the respondents. Furthermore, as the data is collected cross-sectional (and random), its aim is to assess the food security status if problematic and not changes compared to a baseline. Each separate question in the HFIAS gives additional information on the specific problems a household faces.

The HFIAS score, and hence HFIAS categories, are only one of the pointers of food insecurity we take into account. To name some, and holding on to our four components of food insecurity (accessibility, availability, utilization and stability) as an analytical framework, we intend to extend our analysis to assess the determinants on the following food insecurity pointers:

- accessibility is/will also be proxied by, e.g., income (per capita or adult equivalent (AE)), expenditure levels (per capita or AE), both as proxies of purchasing power, share of expenditure on food in total expenditure, livelihood strategies, the relative importance of pensions and the share of income earners.
- availability: contribution of own food production relative to level of food purchase vs. household food requirements, estimation of food available (in kJ) from own production and purchase vs. food requirements (although we need to stress that only a rough estimation is possible due to potential estimation problems), most critical hungry months
- utilization: household diet diversity index, average number of meals by adults and children, crop index, livestock index, access to water and sanitation
- stability: number of hungry months in a year, importance of perceived risk factors, coping strategies, reliance strategies.

As mentioned, food insecurity is a multidimensional livelihood outcome, as is poverty, with multiple determinants. For each of the above pointers, the importance of a set of appropriate determinants at household level is to be estimated, including household characteristics, household assets (human, natural, financial, physical, social, cultural), and location indicators. The analysis presented in the report is a first step towards checking the robustness of the joint effect of these determinants, and these for sure need to be tested for econometrical issues. The potential problems are econometrical and to be adjusted with more sophisticated econometric models, and applied to several pointers of food insecurity. We are searching for the indicators, based on the household's resources and decisions, not based on the food security outcomes.

Linked to the difficulty of assessing or capturing a multidimensional livelihood outcome, is the use of a correct econometrical model. The regression model in the draft report is a first econometrical attempt. Yet, it provides clues towards the significance of the determinants of the risk on food insecurity while confirming the partial analysis. The robustness of the results will be checked by running similar models for the different indicators mentioned above.

The contribution of a regression analysis is that it takes into account multiple components/determinants that may to some extent interact. Yet, rightfully, the determinants in the model need to be checked for endogeneity and multicollinearity. The endogeneity problem will be checked by the robust checks, but also by instrumenting the potentially endogenous independent variable. Income is mentioned to be endogenous, as it may induce problems due to reverse causality. A two-stage econometrical approach, whereby income is instrumented, will test if the results are potentially influenced by this problem of endogeneity. The multicollinearity problems need to be addressed by multiple models that are built by each time introducing new variables which enables checking again robustness. Yet, such econometrical approaches will be modeled in an in dept analysis in the near future.

The question 'what if a household has a high income and so do not have to farm?' is exactly what a multiple regression model will capture by including both the variables on income and those related to the extent of farming. If both are important, the coefficients will come out significant (and probable positive). A possible interaction term could be added to the analysis, and should be checked. Variables for livelihood are considered in the model, i.e. dummies for farming practices, income sources and so on. But some endogeneity and multicollinearity issues should still be checked.

In the near future we will add another aspect to secure econometrical robustness with the use of different econometrical models, apart from a (normal) regression on the HFIAS score, we will introduce a tobit model which accounts for the upper and lower boundaries of the score. Another possible model is a multinomial logit model on the HFIAS categories. All models may include an instrumented income variable.

It should be acknowledged that the regression analysis of the HFIAS score is a first step towards a more comprehensive analysis. Robust checks are needed to capture the multidimensionality of food security and to assess the multiple determinants at household level. This requires the use of several livelihood

outcomes and other food insecurity pointers as well as several econometrical models with checks to exclude endogeneity and multicollinearity problems.

To identify these determinants we have performed two different multivariate analysis: a regression analysis and cluster analysis. These two analysis are based on completely distinct methodologies, therefore a combination of both provides a good cross-check and ensures the robustness of our results.

(i) REGRESSION ANALYSIS

A regression analysis is used to identify the correlation between different variables. More specifically it identifies the ability of a list of explanatory variables to explain and predict the behavior of another variable. In this analysis we would like to see how household variables such as education level and household income are able to predict and determine the households food insecurity score.

This method is more complex and more accurate than a univariate analysis, performed in the previous part, as they comprise more variables and therefore avoid problem related to correlations etc.

Table 40 shows the results for the regression analysis including different aspects of human capital, food production, access to resources and household income. The dependent variable is the Household Food Inaccess Score, which ranges from 0 to 27. For each explanatory variable a coefficient is presented, this coefficient represents the ability of the explanatory variable to explain and predict household food insecurity. A negative coefficient results in a negative contribution of that variable to food insecurity, which entails a positive contribution to food security.

Table 40. Regression analysis (dependent variable HFIAS score, R=0.57, N:=599)

	Coëfficient	Test value
constant		5.42***
HUMAN CAPITAL		
Household size	0,202	5,21***
Age household head	-0.19	-4.37***
Education level (household head)	-0.23	-4.69***
Gender (household head)	0.08	2.06**
Dependency ratio (income earners/total hsize)	0.004	0.092
FOOD PRODUCTION		
Maizeproduction (dummy)	-0.01	-0.27
Mango production (dummy)	-0.05	-1.14
Pawpaw production (dummy)	-0.04	-1.03
Spinach production (dummy)	-0.08	-1.85*
Tomatoe production(dummy)	-0.01	-0.22

Cattle (dummy)	-0.06	-1.55
Goats (dummy)	0.04	0.91
Poultry (dummy)	0.06	1.45
ACCESS TO RESOURCES		
Cropping land size (ha)	-0.05	-1.24
Distance to water source (m)	0.08	2.24**
HOUSEHOLD INCOME		
Monthly income per capita (Rand/month)	-0.09	-2.14**
Formal income (dummy)	-0.12	-2.51**
Grants & gifts (dummy)	0.10	2.12**
Unskilled labour income (dummy)	0.17	4.65***
Remittances (dummy)	-0.16	-4.19***
Skilled labour or entrepreneurial activity (dummy)	0.05	1.18
Farm income(dummy)	-0.07	-1.60

*10% significance level, **5% significance level, ***1% significance level.

The results show that human capital and household income seem to be the most important determinants. Food production and access to land do not appear to be determinants of food security in this sample as their coefficients are not significantly different from zero (see results of tests in final column). This entails that households who produce crops or farm with livestock do not have a higher probability of being food secure.

Smaller households with older, male and more educated household heads seem to have a lower on the food insecurity score. A higher monthly income leads to higher food security levels and when a household has formal income and remittances as its most important income sources, its probability of being food secure is higher. Contrarily when a household is more dependent on grants & gifts and income from unskilled labor employment it seems to be more vulnerable to food insecurity issues. This shows how formal employment should be promoted over employment entailing unskilled labor activities.

(ii) CLUSTER ANALYSIS

In a cluster analysis different cases are grouped based on their similarities related to specific variables. This analysis shows how an objective software algorithm would group the cases based on the different aspects we wish to analyze. We use this analysis to group the cases based on two different types of variables: firstly the determinants we have proposed and discussed in the previous sections and secondly some indicators of food insecurity. This cluster analysis will provide a cross-check for our assumptions and previous findings.

The K-means cluster analysis method has been used, which measure the distance between cluster centers and tries to maximize it. We have excluded households with an exceptionally high income per capita as these outliers negatively impact the results of the cluster analysis.

Table 41. Cluster analysis (K-means method, N=541)

	Cluster 1 (N=384)	Cluster 2 (N=132)	Cluster 3 (N=25)	Test
Education level (1-7)	2	3	5	38.56***
Total household size	7.4	5	5.1	11.82***
Dependency ratio	0.87	0.81	0.67	34.14***
Land size (ha)	0.8	1.3	1.5	0.95
Crop index (Σ crops cultivated)	2.1	2.4	3.6	2.34*
Livestock index (Σ different animal types)	2.1	2.8	5.0	25.13***
Income per capita (Rand/month)	240	830	1900	1898***
Grants & gifts as income source (dummy)	0.86	0.64	0.32	
Food insecurity score (0-27)	12	6	4	17.66***
Food expenditure (share of total monthly expenditure)	0.62	0.54	0.37	27.38***
Expenditure on cereal (share of total monthly food expenditure)	0.39	0.24	0.17	15.35***

*10% significance level, **5% significance level, ***1% significance level.

Three cluster were created and most variables are significantly different for the different clusters.

The first cluster entails the largest amount of households (N=384). These households contain on average 7 members and household heads on average have only obtained junior primary schooling. There are few income earners in the household as the dependency ratio is extremely high. These households cultivate little crops and livestock and depend heavily on grants and gifts for their livelihood. On average they have an income of around 240 Rand per person per month. The food insecurity indicators show how these households have the highest food insecurity score compared to the other clusters. They tend to spend more than 60% of their total budget on food and 40% of the food budget is spend on staple food such as cereals.

The third cluster contains only 25 households. These households score higher on human capital indicators such as schooling, generally the household head has completed high school and activity rates of the household (inverse of the dependency ratio) are higher compared to the other clusters. This leads to a higher monthly income per capita and a lower dependency on grants and gifts. These households also tend to be more involved with crop and livestock cultivation. This all results in a lower food insecurity score, a smaller share of household budget being allocated to food and less importance of staple food in the total food expenditure.

The second cluster includes 132 households which are generally located in between the two extremes mentioned earlier. On average the heads of these households have obtained senior primary schooling however dependency ratios are still quite high (0.8) which entails that the households contains many

unemployed or non-working members. Grants and gifts still remain important sources of income for these households, which makes them vulnerable for food insecurity and poverty. Although these households score lower on the food insecurity score than the first cluster they still tend to spend more than half of their household budget on food.

This cluster analysis shows how households with low human capital, low production levels, low income and dependent on unsustainable income sources tend to have a more negative food security status. While the contrary is also true. This shows how the variables that were selected in the initial univariate analysis and regression analysis to tend to determine, explain and predict the food security status on household level.

(iii) CONCLUSION

In the previous section we have selected and analyzed different types of variables representing different aspects of a household that might explain and determine the food security status of a household. The figure below provides an overview of the initial variables that were included.

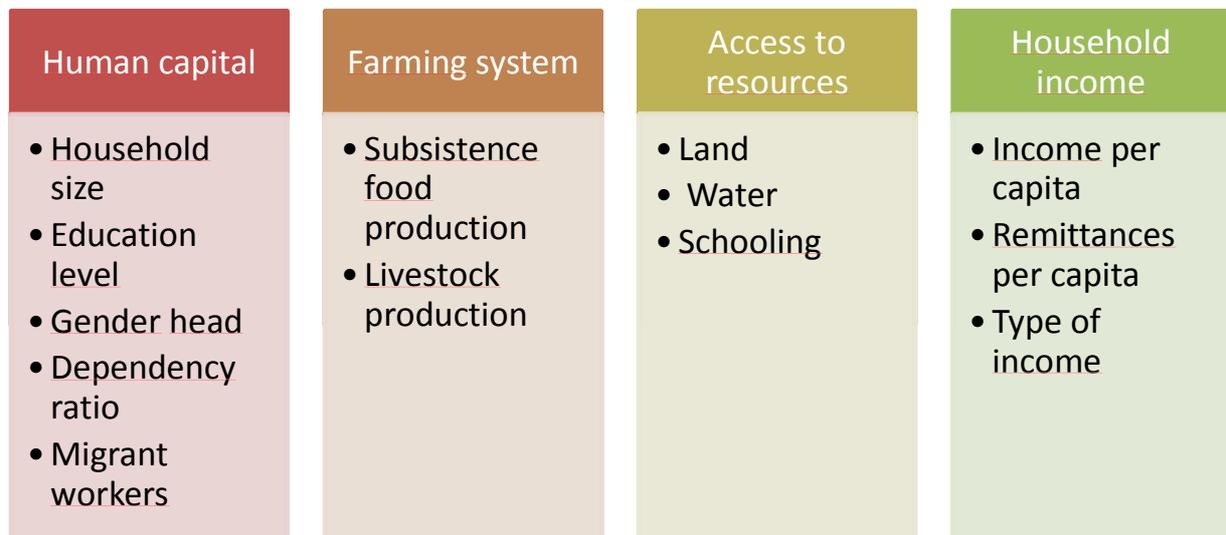


Figure 44. Determinants of Food Security Status

Our regression and cluster analysis have shown that depending on the analysis all four of these categories do contain determining factors.

The most important determinants of the food security status of a household in this area are:

- Education
- Household income
- Dependency on grants & gifts
- Access to sustainable income sources

CONCLUSION

This report presents the findings of a research project that aimed at assessing the situation of rural households in the Limpopo province. The project builds on inputs University of Pretoria, the University of Stellenbosch, the University of Antwerp, University of Ghent, the NAMC (National Agricultural Marketing Council) and Limpopo Department of Agriculture. Qualitative and quantitative data was gathered over 5 districts in Limpopo province during the month of August 2011. Approximately 600 households were interviewed to gather information related to the household composition, food consumption, food production, household income, access to resources and shocks and stresses. From this data specific measures of food security and poverty were derived and used for analysis.

Our findings show that 52% of the households we interviewed are severely food insecure and 32% are living of less than 1\$US a day per person. The Mopani district seemed to have highest poverty rates (50%) while the Vhembe district can present the lowest poverty rates (19%). The average household income in the area is R1600 (SD: R845). The most important income sources in the area are: grants, formal income and farm income. Half of the households are involved in agricultural activities. Poultry, maize, mango and cattle are the most important agricultural activities. Our results are in line with those obtained by other studies (including the National Food Consumption Survey of 2005; Prahalat & Hart, 2006; StatsSA 2005/2006) as is shown in the tables below.

National Food Consumption Survey – fortification baseline (NFCS-FB) 2005	Limpopo, 2011
1 in 2 households experienced hunger	✓ 53% severely food insecure
1 in 3 households were at risk of hunger	✓ 26% moderately food insecure
1 in 5 households were food secure	✓ 21% food secure

	Household size	US\$/ per capita/ per day
Prahalat & Hart, 2006/ NFCS, 2005	5	\$0.59
StatsSA 2005/ 2006		\$0.60 (poorest 10%) \$1.32 (2 nd poorest 10%)
Current study	6-7	32% have less than \$1 60% have less than \$2

Second, the links we expected to find, eg. the relationship between income and the food security status, and between education and the food security status, to name just a few, are clearly found, which indicates that our results are internally consistent and also in line with what literature suggests.

Third, the tendencies of very high food insecurity levels are found consistently in the data. Even if these results would be exaggerated and biased towards a negative representation of the situation, the food insecurity situation remains dire and problematic.

To identify the determinants of food security several univariate and multivariate analyses were used. These analyses show how the most important determinants of food security on household level can be grouped into i) human capital, entailing mainly education, household size and gender of the household head, ii) household income, iii) type of employment the household has formal employment vs unskilled employment and iv) dependency on grants and gifts.

From these findings we can draw some conclusions related to policy priorities for improving food security levels in rural areas. The promotion of rural education can contribute to a large extent to improving food security levels as education is significantly correlated to food security. A second important policy area is related to the labour market. Policies should be focused on creating an open, viable and dynamic rural labour market with sustainable employment opportunities.

The fact that dependency on grants & gifts is a determining factor for the household food security status indicates that currently grant policies might be failing. The grants that households receive are not providing sufficient resources (money) to ensure a good food security status. This might be due to several reasons:

- the low level of the grants
- the perverse incentives they create related to fertility rates and household composition
- the lack of incentives they create to invest in other income opportunities
- the impact they have on intra household income distribution and decision-making processes in the household.

Furthermore we see that female headed households tend to be more vulnerable to food security issues than male headed households. Household food production does not seem to contribute to a higher food security status. This entails that currently households who might have lower access to external income are not able to compensate this by producing food for subsistence purposes.

From these findings we can distillate some policy priorities which are presented in the figure below.

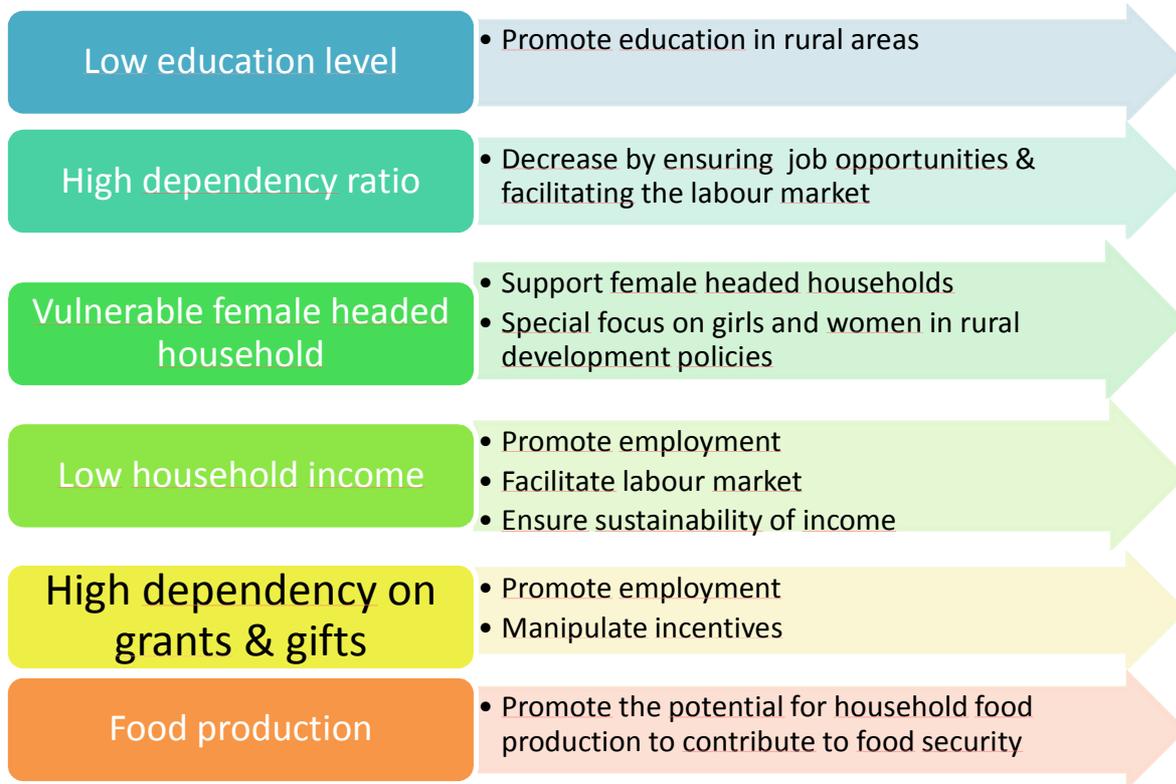


Figure 45. Policy priorities

It is clear from this figure that the promotion of rural education and the facilitation of the rural labor market seem to be the two main policy areas and priorities that can contribute to increasing food security levels in the Limpopo Province.

BIBLIOGRAPHY

Altman, M. et al. 2009. Household food security status in South Africa. In: *Agrekon*, vol. 48, no. 4

Altman, M., Hart, T.G.B. and Jacobs, P.T. (2009). Household food security status in South Africa. *Agrekon*, Vol 48(4): 345 – 361.

Anselin, L. 2006. Spatial econometrics. In: T. Mills and K. Patterson, Editors, *Palgrave Handbook of Econometrics vol. 1*, Palgrave MacMillan, Basingstoke (2006), pp. 901–969. . In: T. Mills and K. Patterson, Editors, *Palgrave Handbook of Econometrics vol. 1*, Palgrave MacMillan, Basingstoke (2006), pp. 901–969.

Anselin, L. 2003. GeoDa™ 0.9 User's Guide. Spatial Analysis Laboratory, Department of Geography and National Centre for Supercomputing Applications, University of Illinois, Urbana-Champaign, Urbana, IL 61810.

Ballantine, N., Rousseau, G.G. & Venter, D.J.L. (2008). Purchasing behavior as a determinant of food insecurity in Klipplaat. *Journal of Family Ecology and Consumer Sciences*, 36, 1- 8.

Antle, J.M. 1995. Climate Change and Agriculture in Developing Countries. *American Journal of Agricultural Economics* 77: 741-746.

Benhin, J. K. A. 2006. Climate change and South African Agriculture: impacts and adaptation options. CEEPA Discussion Paper No. 21, July. Centre for Environmental Economics and Policy in Africa, University of Pretoria.

Centre for Environmental Economics and Policy in Africa (CEEPA), 2006. Climate change and agriculture in Africa.

Cline, W. 1996. The impact of global warming on agriculture: Comment. *Am. Econ. Rev.* 86:1309-1311.

Coates, J. et al. (2006). Comparison of a qualitative and quantitative approach to developing a household food insecurity scale for Bangladesh. *Journal of Nutrition*, 136, 1420S- 1430S.

Coates, J., Swindale, A. and Bilinsk, P. (2007). Household Food Insecurity Access Scale (HFIAS) for measurement of food access: *Indicator guide*, version 3. Washington, D.C.; Food and Nutrition Technical Assistance Project, Academy for Educational Development, page 18.

Darwin R. et al. 1995. World Agriculture and Climate Change, Economic Adaptations (Department of Agriculture, Washington, DC) Agricultural Economic Report 703.

Davies, S. (1996). Adaptable livelihoods. Coping with food insecurity in the Malian Sahel. MacMillan Press, London.

De Klerk, M., Vogel, C., De Swardt, C. and Kirsten, J. (2004). *Food security in South Africa: Key policy issues for the medium term*. Human Sciences Research Council, Integrated Rural and Regional Development Position Paper.

Department of Environmental Affairs and Tourism (DEAT). 2004. United Nations Framework Convention on Climate Change (UNFCCC) – South Africa's Initial National Communication, Pretoria.

Department of Agriculture (2007). The FIVIMS Livelihood Survey of 2006.

Deschenes, O., and M. Greenstone. 2007. The economic impacts of climate change: evidence from agricultural output and random fluctuations in weather. *Am. Econ. Rev.* 97:354-385.

DGRV (Deutscher Genossenschafts-undRaiffeisenverband e.V.). 2003. *Burial societies in South Africa: History, function and scope*. DGRV SA Working Paper Series No 2 - September 2003, (pp 1). In Coetzee, G.K. 1997. *Institutional change in rural financial markets*. Unpublished PhD thesis. Pretoria: University of Pretoria.

- Dinar, A., R. Mendelsohn, R. Evenson, J. Parikh, A. Sanghi, and K. Kumar. (eds.) 1998. Measuring the impact of climate change on Indian agriculture. 266 p. World Bank Technical Paper No. 402. World Bank, Washington, D.C., USA.
- Downing, T.E., 1991. Assessing socio-economic vulnerability to famine: frameworks, concepts and applications. FEWS Working Paper 2.1. USAID, Washington. 102 pp.
- Downing, T.E., 1992. Climate change and vulnerable places: global food security and country studies in Zimbabwe, Kenya, Senegal and Chile. Res. Rep. N. 1, Envir. Change Unit, Oxford.
- Du Plessis, J. 2003. *Maize production*. Directorate Agricultural Information Services, Department of Agriculture in cooperation with ARC-Grain Crops Institute, Potchefstroom.
- Durand, W. 2006. *Assessing the impact of climate change on crop water use in South Africa*. CEEPA Discussion Paper No.28, Centre for Environmental Economics and Policy in Africa, University of Pretoria.
- Du Toit, A.S., Prinsloo, M.A., Durand, W. & Kiker, G.A. 2000. *Vulnerability of maize production to climate change and adaptation assessment in South Africa*. Contribution to the Vulnerability & Adaptation project of the South African Country Study on Climate Change. Department of Environmental Affairs & Tourism, Pretoria.
- Faber, M., Schwabe, C. & Drimie, S. (2009). Dietary diversity in relation to other household food security indicators. *International Journal of Food Safety, Nutrition and Public Health*, 2 (1), 1- 15.
- Falkingham J and Namazie C. 2002. Measuring health and poverty: a review of approaches to identifying the poor London Department for International Development Health Systems Resource Centre (DFID HSRC).
- FAO (2008). Report on use of the Household Food Insecurity Access Scale and Household Dietary Diversity Score in two survey rounds in Manica and Sofala Province Mozambique 2006 – 2007. *FAO Food Security project GCP/MOZ/079/BEL*. Version 2, page 5
- FAO, 2008. Deriving food security information from national households budget surveys. Experiences, Achievements, Challenges.
- FAO. 2006. The State of Food Insecurity in the World 2006, Rome.
- FAO. 2002 The State of Food Insecurity in the World 2001.
- FAO. 2002. World Agriculture: Toward 2015/2030, Summary Report, Rome.
- FAO. 2003. The digital soil map of the world (DSMW) CD-ROM. Food and Agriculture Organization, Italy, Rome.
- FAO 1998. Guidelines for National Food Insecurity and Vulnerability Information and Mapping systems (FIVIMS): Background and principles. Comity on world food security, Twenty-four Session, Rome, 2 – 5 June 1998.
- Filmer D and Pritchett LH. 2001. Estimating wealth effect without expenditure data – or tears: an application to educational enrollments in states of India. *Demography* 38:115–32.
- Fischer et al. 2002. Climate Change and Agricultural Vulnerability, Special Report Prepared as a Contribution to the World Summit on Sustainable Development (International Institute for Applied Systems Analysis, Laxenburg, Austria).
- FIVIMS (2005). Report on survey in Sekhukhune to pilot the development of a food insecurity and Vulnerability Modelling system (FIVIMS) for South Africa, page 50-54

- Frongillo, E. & Nanama, S. (2006). Development and validation of an experience-based measure of household food insecurity within and across seasons in Northern Burkina Faso. *Journal of Nutrition*, 136, 1409S- 1419S.
- Gbetibouo, G.A. and Ringler, C. 2009. Mapping South African Farming Sector vulnerability to Climate Change and Variability. A Subnational Assessment. IFPRI.
- Gerald N et al. 2009. Climate change; Impact on agriculture and cost of adaptations. International food policy research institute, Washington D.C.
- Gregory P et al. 2005. Climate change and food security. *Phil. Trans. R. Soc. B* 360:2139-2148.
- Gwatkin DR, Rustein S, Johnson K, et al. 2000a. Socio-economic differences in Brazil Washington, DC HNP/Poverty Thematic Group of the World Bank.
- Gwatkin DR, Rustein S, Johnson K, et al. 2000b. Socio-economic differences in Ethiopia. Health, Nutrition, and Population in Ethiopia Washington, DC HNP/Poverty Thematic Group of the World Bank
- Gwatkin DR, Rustein S, Johnson K, et al. 2000c. Socio-economic differences in Nigeria. Health, Nutrition, and Population in Nigeria Washington, DC HNP/Poverty Thematic Group of the World Bank.
- Hamilton, W., Cook, J.T., Thompson, W., Buron, L., Frongillo, E. Jr., Olson, C., Wehler, C. (1997). Household food security in the United States in 1995. Office of Analysis and Evaluation, Food and Consumer Service, United States Department of Agriculture, Washington, USA
- Hanson K, McPake B, Nakamba P, Archard L. 2005. Preferences for hospital quality in Zambia: results from a discrete choice experiment. *Health Economics* 14:687–701.
- Hewitson, B. 1999. Regional Climate Change Scenarios. Prepared for the SA Country Studies Programme.
- Hewitson, B., Engelbrecht, F., Tadross, M. & Jack, C. 2005a. General Conclusions on Development of Plausible Climate Change Scenarios for Southern Africa. In: Schulze, R.E. (Ed) *Climate Change and Water Resources in Southern Africa: Studies on Scenarios, Impacts, Vulnerabilities and Adaptation*. WRC Report 1430/1/05. Chapter 5, pp. 75-79. Water Research Commission, Pretoria.
- Hewitson, B., Tadross, M. & Jack, C. 2005b. Climate Change Scenarios: Conceptual Foundations, Large Scale Forcing, Uncertainty and the Climate Context. In: Schulze, R.E. (Ed) *Climate Change and Water Resources in Southern Africa: Studies on Scenarios, Impacts, Vulnerabilities and Adaptation*. WRC Report 1430/1/05. Chapter 2, pp. 21-38. Water Research Commission, Pretoria.
- Houweling TAJ, Kunst AE, Mackenbach JP. 2003. Measuring health inequality among children in developing countries: does the choice of the indicator of economic status matter? *International Journal for Equity in Health* 2:8.
- IPCC. 2000. Special Report on Emissions Scenarios, Summary for Policy Makers, Working Group III, International Panel on Climate Change (Cambridge Univ Press, Cambridge, UK).
- IPCC. 2001. Climate Change: Impacts, Adaptation and Vulnerability, Contribution of Working Group II to the Third Assessment Report of the Intergovernmental Panel on Climate Change (Cambridge Univ Press, Cambridge, UK).
- IPCC. 2001b. Impacts, adaptation, and vulnerability. p. 1032. In McCarthy, J., O. Canziani, N. Leary, D. Dokken, and K. White (eds.) *Climate change 2001. Contribution of Working Group II to the Third Assessment Report of the Intergovernmental Panel on Climate Change (IPCC)*. Cambridge University Press, Cambridge, UK.
- IPCC, et al. (2007): *Climate change 2007: Impacts, adaptation and vulnerability. Contribution of working group II to the fourth assessment report of the Intergovernmental panel on climate change*. Cambridge, UK.

- Kabbani, N. et al. (2005). *Survey results on hunger and food insecurity in Yemen*. Paper presented at the Economic Research Forum for the Arab Countries (ERF), Iran and Turkey.
- Kelly, D.L., C. Kolstad, and G.T. Mitchell. 2005. Adjustment costs from climate change. *J. Environ. Econ. Manag.* 50:468-95.
- Kirkland, T., Kemp, R., Hunter, L. & Twine, W. (2011). Toward improved understand of food security: a methodological examination based in rural South Africa. Population program. Institute of behavioral science: University of Colorado Boulder
- Kirsten, J., May, J., Hendriks, S., Lyne, M., Machethe, C., and Punt C. (2007). The Poverty alleviation and food security role of Agriculture in South Africa. In Bresciani, F. & Valde, A. (Eds) *Beyond food production: the role of agriculture in poverty reduction*. FAO, P188-221.
- Kline, P. 1994. *An Easy Guide to Factor Analysis*, Routledge, London.
- Korenberg E. et al. 2004. Climate Change and Public Health in Russia in the XXI Century, Proceedings of a Workshop, eds Izmerov NF, Revich BA, Korenberg EI (Adamant, Moscow), pp 54–67.
- Kurukulasuriya, P., R. Mendelsohn, R. Hassan, J. Benhin, M. Diop, H. M. Eid, et al. 2006. Will African agriculture survive climate change? *World Bank Econ. Rev.* 20(3):367-388.
- Kurukulasuriya, P., and R. Mendelsohn. 2006. Modeling endogenous irrigation: The impact of climate change on farmers in Africa. Center for Environmental Economics and Policy in Africa (CEEPA) Discussion Paper No. 8. Special Series on Climate Change and Agriculture in Africa.
- Limpopo department of agriculture(LDA) (n.d.). Crop Production in the Limpopo province. A study report of agricultural industry in the Limpopo province http://www.lida.gov.za/index.php?option=com_content&view=article&id=293:reports-study-reports-study-of-agricultural-industry-in-the-limpopo-province&catid=63:downloads&Itemid=234 Accessed date: 23/08/2011.
- Lindelow M. 2002. CSAE Working Paper Series 2002–15Oxford: Centre for Study of African Economies, University of Oxford Sometimes more equal than others: How the choice of welfare indicator can affect the measurement of health inequalities and the incidence of public spending.
- May, J. & Carter, M. (2009). Agriculture: Analysis of the NIDS Wave 1 Dataset. Discussion Paper no. 6. University of Kwa- Zulu Natal. P18.
- Maxwell, D. 1996. Measuring food insecurity: The frequency and severity of "coping strategies." *Food Policy* 21: 291–303.
- Maxwell, S. and Frankenberger, T. 1992. Household food security: Concepts, indicators, measurements. IFAD and UNICEF, Rome.
- Maxwell, D. (1996). Measuring food insecurity: the frequency and severity of 'coping strategies'. *Food Policy* 21 (3). pp. 291–303
- McMichael A. et al. 2003. Human Health and Climate Change in Oceania: Risk Assessment, Department of Health and Aging, Canberra, Australia.
- Melgar-Quinonez, H. et al. (2006). Household food insecurity and food expenditure in Bolivia, Burkina Faso, and the Philippines. *Journal of Nutrition*, 136, 1431S- 1437S.
- Mendelsohn, R., W. Nordhaus, and D. Shaw. 1994. The impact of global warming on agriculture: A Ricardian analysis. *Am. Econ. Rev.* 84:753-771.

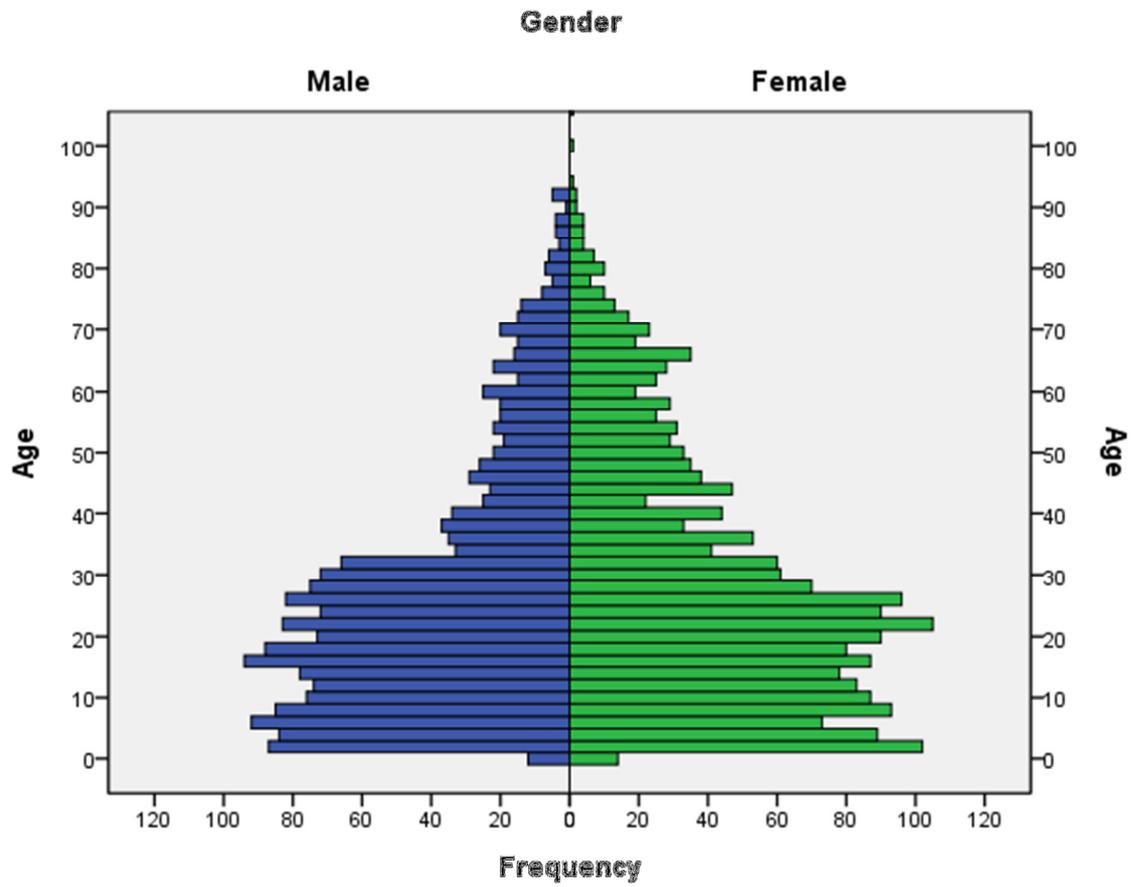
- Mendelsohn, R., W. Nordhaus, and D. Shaw. 1999. The impact of climate variation on U.S. agriculture. p. 55- 74. *In* Mendelsohn, R., and J. Neumann. (eds) *The economic impact of climate change on the economy of the United States*. Cambridge University Press, Cambridge, UK.
- Mendelsohn, R. (ed) 2001. *Global warming and the american economy: A regional analysis*. Edward Elgar Publishing, UK.
- Mendelsohn, R., A. Dinar, and A. Sanghi. 2001. The effect of development on the climate sensitivity of agriculture. *Environ. Dev. Econ.* 6:85-101.
- Mendelsohn, R., and A. Dinar. 2003. Climate, water, and agriculture. *Land Econ.* 79:328-341.
- Mendelsohn, R., A. Basist, F. Kogan, and P. Kurukulasuriya. 2007a. Climate analysis with satellite versus weather station data. *Clim. Change* 81:71-83.
- Mendelsohn R., and S.N. Seo. 2007. An integrated farm model of crops and livestock: Modeling Latin American agricultural impacts and adaptations to climate change. *World Bank Policy Research Series Working Paper 4161*. 41 p. World Bank, Washington DC., USA.
- Mjonono, M., Ngidi, M., and Hendriks, S. (2009). Food insecurity coping strategies at Embo. In Hendriks, S., and Lyne, C. (Eds). *Does food security improve when smallholders access a niche market?*. African Centre for Food Security. Pietermaritzburg, South Africa: ACFS
- Mpandeli, S., Simalenga, T., Siambi, M. et al . Constraints and challenges to agricultural development in Limpopo Province, South Africa. *Agricultural Research Council-Institute for Soil, Climate and Water*, Pretoria, South Africa. P4.
- Nel, J.H. and Steyn, N.P. (2002). Report on South African food consumption studies undertaken amongst different population groups (1983- 2000): *Average intakes of the foods most commonly consumed*. Pretoria, South Africa.
- Ojogho, O. (2010). Determinants of Food Insecurity among Arable Farmers in Edo State, Nigeria. *Agricultural Journal, Volume 5. Issue 3*. Pages 151 – 156.
- Oketch, J., Paterson, M., Maunder, W. & Rollins, N. (2011). Too little, too late: comparison of nutritional status and quality of life of nutrition care and support recipient and non-recipients among HIV-positive adults in KwaZulu-Natal, South Africa. *Health Policy*, 99 (3), 267- 276.
- Pankomera, P. et al. (2009). *Household Food Security in Malawi: Measurements, Determinants, and Policy Review*. Conference at International Research on Food Security, Natural Resource Management and Rural Development. University of Hamburg, Germany.
- Quiggin, J. and J. Horowitz. 1999. The impact of global warming on agriculture: A Ricardian analysis: A Comment. *Am. Econ. Rev.* 89(4): 1044-1045.
- Reilly, J., W. Baethgen, F. Chege, , S. van de Geijn, L. Enda, A. Iglesias, *et al.* 1996. Agriculture in a changing climate: impacts and adaptations. p. 427- 468. *In* Watson, R., M.
- Reilly, J., N. Hohmann, and S. Kane. 1994. Climate change and agricultural trade: who benefits, who loses? *Global Environ. Chang.* 4(1):24-36.
- Rosenzweig, C., and D. Hillel. 2005: Climate change, agriculture and sustainability. p. 243-268. *In* Lal, R., N. Uphoff, B.A. Stewart, and D.O. Hansen (eds.) *Climate change and global food security*.
- Rosegrant M et al. 2008. International model for policy analysis of agricultural commodities and trade (IMPACT): Model description. IPFRI, Washington.

- Rule, S. *et al.* Page 53 (2005). A Report on Survey in Sekhukhune to Pilot the Development of a Food Insecurity and Vulnerability Modelling System (FIVIMS) for South Africa
- Schmidhuber, J. and Tubiello, F.N. 2007. Global food security under climate change. Ed. William Easterling, Pennsylvania State University, University Park, PA.
- Shewmake, S. 2008. Vulnerability and the Impact of Climate Change in South Africa's Limpopo River Basin. University of California, Davis - Departments of Economics and Agricultural Resource Economics, *IFPRI Discussion Paper No. 00804*.
- Seo, S. N., R. Mendelsohn, and M. Munasinghe. 2005. Climate change and agriculture in Sri Lanka: A Ricardian valuation. *Environ. Dev. Econ.* 10:581-596.
- Seo, S.N., and R. Mendelsohn. 2008a. Climate change impacts and adaptations on animal husbandry in Africa. *African Journal of Agricultural and Resource Economics*.
- Seo, S.N., and R. Mendelsohn. 2008b. Measuring impacts and adaptations to climate change: A structural Ricardian model of livestock management in Africa. *Agr. Econ.* 38:1-15.
- Seo, N.S., R. Mendelsohn, A. Dinar, R. Hassan, and P. Kurukulasuriya 2008. A Ricardian analysis of the distribution of climate change impacts on agriculture across agro-ecological zones in Africa. World Bank Policy Research Working Paper.
- Smith, L. (2002). *The use of household expenditure surveys for the assessment of food insecurity*. International scientific symposium on measurement and assessment of food deprivation and under-nutrition. Rome, Italy.
- Taylor, T., Kidman, R. & Thurman, T. (2011). *Household resources and access to social grants among orphans and vulnerable children in KwaZulu-Natal, South Africa*. Tulane University School of Public Health and Tropical Medicine.
- Stern N (2007): The economics of climate change, the stern review. Cambridge, UK.
- Swindale, A. & Bilinsky, P. (2006). Development of a universally applicable household food insecurity measurement tool: process, current status, and outstanding issues. *Journal of Nutrition*, 136, 1449S- 1452S.
- Tubiello, F.N. and Knight, B. 2005. Impact of Climate Change, Variability and Weather Fluctuations on Crops and Their Produce Markets, *ed Knight B (Impact Reports, Cambridge, UK), pp 70–73*.
- UNDP. 2007. Human development report 2007. International cooperation at a crossroads: aid, trade and security in an unequal world New York Oxford University Press for the United Nations Development Programme (UNDP).
- Washington, W., J. Weatherly, G. Meehl, A. Semtner, T. Bettge, A. Craig, W. *et al.* 2000. Parallel climate model (PCM): Control and transient scenarios. *Clim. Dynam.* 16:755-774.
- Webb, P. *et al.* (2006). Measuring household food insecurity: why it's so important and yet so difficult to do. *Journal of Nutrition*, 136, 1404S- 1408S.
- Wonjin L. and Masakazu N. 2009 Development of Food Security Index Introducing information on the Market Situations , *Agricultural Information Research*, 18: 60-64 .
- World Bank (2011). South Africa. <http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/AFRICAEXT/SOUTHAFRICAEXTN/0,,menuPK:368082~pagePK:141159~piPK:141110~theSitePK:368057,00.html>
- World Bank. (2000). World Development Report 2000/01- Attacking poverty. Washington, DC, USA: World Bank

X. Dai *et al.* (eds.) Climate change 2001. Contribution of Working Group II to the Third Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, UK.

Zinyowera, R. Moss, and D. Dokken (eds.) Climate Change 1995: Intergovernmental Panel on Climate Change Impacts, Adaptations, and Mitigation of Climate Change. Cambridge University Press, Cambridge, UK

Annex 1 Population pyramid



Annex 2 Working population

