

**AN ASSESSMENT OF FACTORS AFFECTING FOOD SECURITY AMONG
SMALL HOLDER FARMERS IN ZAMBIA'S CHIBOMBO DISTRICT**

**A Research Report presented to the Department of Agricultural Economics and
Extension Education of the University of Zambia.**

By

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LIST OF ACRONYMS

ASIP	Agricultural Sector Investment Program
CSO	Central Statistics Office
ERC	Economic Reform Credit
FAO	Food and Agriculture Organization
FRA	Food Reserve Agency
FSRP	Food Security Research Project
GRZ	Government Republic of Zambia
IMF	International Monetary Fund
JAICAF	Japan Association for International Collaboration of Agriculture and forestry
JCTR	Jesuit Centre for Theoretical Reflection
MACO	Ministry of Agriculture and Co-operatives
MAFF	Ministry of Food and Fisheries
NAMBOARD	Ministry of Food and Fisheries
SAP	Structural Adjustment Program
UNCTAD	United Nations Conference on Trade and Development
WFP	World Food Program
ZDHS	Zambia Demographic and Health Survey

ABSTRACT

AN ASSESSMENT OF FACTORS AFFECTING FOOD SECURITY AMONG SMALLHOLDER FARMERS IN ZAMBIA'S CHIBOMBO DISTRICT.

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Food security is a basic need of every household. Most of the staple food and other foods consumed in the urban are mainly produced by smallholder farmers. The main objective of this study was to assess the factors that affect food security among smallholder farmers in Chitanda. The hypothesis was that smallholders are vulnerable to food insecurity despite collectively producing most of the food consumed by the majority of the population. The explanatory variables considered were age of household head, sex of household head, education level, household size, off-farm income, farmer input support, size of land owned, production assets, access to nearest surface road, storage chemicals and cooperation in acquisition of inputs with the dependent variable being food security. A total of 150 smallholder farmers were sampled and interviewed using a self administered questionnaire. The data was coded and entered using SPSS. A probit regression analysis, ran in STATA, was used to explain the relationship between food security and the independent variables by use of marginal effects.

The results showed that the coefficient of determination (R-squared), the proportion of variation in dependent variable explained by independent variables was 22%. The model also showed that farming experience, input support, household size and production assets were important in contributing to food security among households. Holding other variables constant, a one year increase in the farming experience would increase the probability of food security by 3%. Likewise, holding other variables constant, an increase in household size by one member would increase the probability of food security by 5%. A percentage increase in assistance with farm input support would increase the probability of food security by 2.3% and a percentage increase in production assets would increase the probability of food security by a small margin of 0.73%.

Extension education should be directed towards encouraging the smallholder households to engage in income generating activities to increase their financial security as well as food security. Similar future studies should be done with larger sample sizes as well as using multi-method approaches in both data collection and analysis.

CHAPTER 1: INTRODUCTION

1.1 Background

Household food security and consequently national food security is the aspiration of every government. This could be achieved through domestic production, imports and strategic reserves. Due to the pressures of balance of payments and therefore demand for foreign exchange, developing nations put emphasis on domestic production of staple food to satisfy domestic demand in both national consumption and strategic reserves. Policy attention has thus focused on the improvement of rural hold food security with a view of translating this into national food security and hence national growth.

Agricultural production in Zambia is largely rain fed and is based on smallholder family farming systems. Over 80% of smallholder farmers nationwide own less than 5 hectares of land. The Zambian government agricultural policy has for the past several decades focused on fertilizer subsidies and targeted credit programs to stimulate small farmers' agricultural productivity, enhance food security and ultimately reduce poverty. Improving maize productivity has been a major goal of government policy. Over 70% of the 900,000 smallholder farmers grow maize as their major staple crop and they are responsible for 65% of the maize production in the country. Maize is the single greatest source of cash income from the sale of agricultural products (Zulu, Jayne, and Beaver. 2007).

In 2002, the Zambian Government launched programs and policies under the framework of its Poverty Reduction Strategy Paper (PRSP) which, in the agricultural sector, includes: the Fertilizer Support Programme (FSP) out-grower schemes, land and infrastructure development, technology development, agriculture extension, and maize marketing in support of smallholder farmers (GRZ 2004; World Bank 2002a, 2002b). Despite government's efforts over the past decades, overall fertilizer consumption has expanded slowly and average maize yields remain at the level of 1.2 to 1.8 tons per hectare. Maize yields vary greatly among households, but 75% of households obtain between 0.7 and 2.5 tons per hectare. Several recent assessments of the implementation and effectiveness of the

FSP conclude that FSP has had little impact in terms of increasing maize production and enhancing household incomes and livelihoods (CSPR 2005; CDFA 2008; Agricultural Consultative Forum 2009). Several factors were identified as responsible for reducing the effectiveness of the FSP including late delivery of inputs to farmers, mismanagement by those in charge of distributing inputs, diversion of program inputs, low output prices, poor crop marketing arrangements, and poor transport facilities. These studies underscore the need, among other things, for a better understanding of the factors affecting food availability in rural households, so as to inform policy processes aimed at achieving sustainable increase in food security and smallholder incomes.

1.2 Problem Statement

Food insecurity represents a major key factor under laying the cause of malnutrition, death and disease. Thus it makes a very interesting area of research. Despite ample food production and large food surpluses during the years of better harvest, rural farmers always remain the most vulnerable to food insecurity. It is believed that the inability of small-scale farmers to retain enough food stocks reflects the inadequate levels of production by poor households and the poor storage capacity and food distribution systems. This is evident at national level, where government has yet to provide an effective approach to ensure that food is available to see people through drought and other times of poor harvests such as through establishing strategic grain reserves from national food production surpluses during years of good harvest (GRZ/UN, 1996).

It is assumed that the problems of food security are caused by the neglect of agriculture and rural development and the impact of poor agricultural pricing policies. It has been argued by the SIDA Evaluation Report (2002) that small traders ('brief- case traders') have largely taken over the role of state-supported institutions in the local purchasing of maize throughout the country.

The generally low prices paid for maize in the first half of marketing season is also assumed to cause food insecurity. This is because the small-scale farmers are assumed to resort to

selling off food crops in large quantities to meet their daily needs without considering how much they will need before the next harvest, leaving them the most vulnerable food insecure group in the population .A lot of research has focused on determining the effects of policy on food security and have found that it has not been adequate in alleviating food insecurity among smallholder farmers. It is however important to note that issues of food insecurity tend to vary with respect to existing social economic factors in a given environment. It is therefore necessary to undertake studies to better understand these factors in order to determine and prescribe effective policy on rural household food security.

1.3 General Objective

The general objective of the study was to determine the factors that affect household food security among smallholder farmers in Chitanda area.

1.4 Specific Objectives

1. To find out the kinds of foodstuffs grown to meet food requirements among households to ensure adequate food.
2. To determine the factors that affect the availability of adequate food among households.

1.5 Study Significance

The relevance of this study is that, it is going to give insight on how small-scale farmers would be helped to re-orient their agricultural production towards meeting their food requirements. It will further ensure that small-scale farmers are assisted with strategies that will help them to remain food secure at household and individual levels. These strategies will help the agricultural planners and the government design and implement effective policies and develop sustainable institutional measures to ensure household food security at all times regardless of the period in the year. A quantitative approach to the adoption of the study is essential because it not only identifies the factors but also provides information on the

significance of each factor that may affect favorable, affordable and reliable approaches to ensuring food security in rural households.

1.6 Study Scope

The study looked at the food security situation among rural households in four villages in Chitanda area of Chibombo District in Central Province. The four villages included Ngobola, Shimwete, Kasankamana and Mulilo. Household food security was determined by ability to access adequate food throughout the period between 2006 and 2009 crop harvest leaving out the flood year of 2008. The study area was a specified location and therefore a specified limited sample of 150 households was used due to limited time and funds available given the vastness of the area of study, sparse population, rainy season and transportation constraints. Most questions in the questionnaire in data collection were closed ended hence the respondents' true convictions may not have been fully captured. . Furthermore, the gathering of information from some farmers was difficult using structured questionnaires because of low illiteracy levels. This affected the interviewing process with farmers especially among households without common language with the research assistant. In such cases, an interpreter was used and this meant using more time for data collection. Another constraint was that of poor record keeping by the farmers, especially those for the quantities of crop yields.

1.7 Structure of the Report

The research report has five chapters. In chapter 1 the background to the study is given by presenting a short description of every nation's aspiration to ensure national food security and the relevance of smallholder farmers in the production of staple food. The relevance of the study is also explained.

Chapter 2 reviews literature that was relevant to the study beginning with the definition of the dimensions of food security. It then looks at the general situation of food security worldwide before narrowing down to Africa and finally Zambia. The role played by

smallholder farmers and some problems they face is also reviewed. Chapter 3 presents the methodology used in the study. Procedures used in carrying out the research are also outlined. In chapter 4 the results of the study are presented and discussed systematically. Their interpretation and implications are also discussed. Finally, in chapter 5, conclusions are drawn and outlined according to the study findings from which recommendations are made.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter reviews literature that was relevant to this study. It begins by defining food security explaining its different dimensions. It also takes a view at general worldwide food security trends and then narrows it down to the *Zambian scenario*.

2.2 Definition of Food Security

“Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life”. This widely accepted definition points to the different dimensions of food security i.e. availability, adequacy, accessibility, safety and nutritious: The availability of sufficient quantities of food of appropriate qualities, supplied through domestic production or imports (including food aid). Access by individuals to adequate resources (entitlements) to acquire appropriate foods for a nutritious diet. Entitlements are defined as the set of all those commodity bundles over which a person can establish command given the legal, political, economic and social arrangements of the community in which he/she lives (including traditional rights - e.g. access to common resources), utilization of food through adequate diet, clean water, sanitation, and health care, to reach a state of nutritional well-being for which all physiological needs are met. This brings out the importance of non-food inputs in food security. It is not enough that someone is getting what appears to be an adequate quantity of food if that person is unable to make use of the food because he or she is often falling sick. To be food secure a population, household, or individual must have access to adequate food at all times. They should not be at risk of losing access to food as a consequence of a shock (e.g. an economic or climatic crisis), or cyclically (e.g. during a particular period of the year – seasonal food insecurity). The concept of stability can therefore refer to both the availability and access dimensions of food security.

2.3 World Food Security Trends

Despite ample food production and large food surpluses in developed countries, hundreds of millions of people still struggle for their daily food needs. The United Nations Food and Agriculture Organization (FAO) estimates that one out of every eight people in the World suffers from chronic malnutrition (Berck et al 1993).

The World Bank further estimates that almost 400 million people suffer from a severe food deficiency and an additional 350 million cannot afford even the minimum diet necessary for good health (World Bank 1986). At global level, food scarcities are manifested in a number of ways. The most dramatic one is when the entire food supply in a region is wiped out by drought, flood, war, political strife or other disasters.

Far more wide spread and persistent, though not as visible is chronic malnutrition. Hundreds of millions of people in Africa, South East Asia, and Latin America live in such dire poverty that they cannot secure even a minimally adequate diet (Berck et al 1993). Hunger and malnutrition also result from temporary lapses in the food delivery system, such as domestic harvest failures and price increases that do not develop into outright famine. These deepen the suffering of chronically undernourished and force small areas to cut their diets below the minimum levels necessary for good health.

In 1996, the World Food Summit strengthened international resolve to achieve global food security and intensify ongoing efforts to eradicate hunger in all countries, with an immediate view to reducing the number of undernourished people to half their present level by no later than 2015 (DFID, 2002). At the millennium Summit in 2000, 191 countries redefined this target into a Millennium Declaration Goal, which set out to 'halve, between 1990 and 2015, the proportion of people who suffer from hunger'.

Over the past three decades, world food production has grown faster than population growth. The remarkable growth in food availability achieved in developing countries, more than halved the proportion of undernourished from 37 to 17 in 1997 to 1999, respectively. If

available, food could be distributed evenly, each person would be assured of 2700 calories a day, (Drimie et al 2007).

However, despite these international commitments to resolving food insecurity and the real achievements in global food security, the gap between the aspiration of eradicating hunger and the continuing reality of approximately 800 million or more, under nourished people is stark. On a global scale, progress is being made in reducing the absolute number of hungry people in the world, but this is not happening fast enough to achieve the Millennium Declaration Goal. World food is neither evenly distributed, nor fully consumed, among, or within, countries (Drimie et al 2007).

2.4 Food Security Trends in Sub-Saharan Africa

Gusten (1984) and Kajoba (1993) are of the view that, “the performance of the agricultural sector in Africa in the 1960’s was impressive and satisfactory. Export production grew in real terms almost 2 percent annually, and food production expanded at 2 percent plus, and was able to meet the existing requirements of the continental population”. This population was estimated by the United Nations to stand at “254 million people, which was equivalent to 8.5 percent of the world’s population on about 22 percent of the world’s land area”, (Church et al 1964).

During the period 1990 to 1996, a new flash point of hunger and food insecurity has emerged. In Sub-Saharan Africa, the number of undernourished people doubled between 1969 and 1992 to 215 million people, and the proportion of the population who were undernourished rose from 38 to 43 percent (FAO, 2001). Thus while remarkable progress has been made in some developing countries in reducing chronic hunger and abject poverty, particularly in east and southern Asia, the situation of Sub-Saharan Africa continued to deteriorate through the 1990’s (FAO, 1999).

The situation in this region (Sub-Saharan) is similar to that of Asia in the early 1960’s, with wide spread poverty and malnutrition, large national food deficits and increasing higher

dependence on food imports and other concessionary aid. However, the problem of food insecurity varies in severity across the African continent. Although West Africa has the largest population of any sub-region, it has the lowest number of undernourished people. East Africa has more than twice as many undernourished people (FAO, 2001).

Southern Africa's food security has also deteriorated with the number of food insecure people in this region doubling during the 1980s from about 22million people in 1979/1981 to 39million in 1990/1992.

The severe food shortages and hunger that recently struck countries in the Southern African Development Community (SADC) region, particularly in Malawi, Zimbabwe, Zambia, Lesotho, Swaziland and Mozambique, have been described as the 'worst' food crisis in a decade (WFP/FAO, 2002). The region has suffered from a lethal mix of food shortages, lack of access to basic social services and an alarmingly high prevalence of HIV/AIDS as-all contributing to the growing numbers of vulnerable people in rural and urban Southern Africa.

Besides, several reports from WFP/FAO missions that were undertaken in the SADC region in 2002, 14million people were living on the brink of starvation and faced serious food shortages until the region's next main harvest in April 2003(WFP/FAO, 2002).

The FAO/WFP argue that food output and availability in Southern Africa in 2002/3 was affected by a number of factors such as poor rainfall, economic problems and inflation, mismanagement and poor governance and also the HIV/AIDS pandemic.

It has been argued by Scholars that erratic rainfalls were the major cause of the reduced production of cereals in the region. In contrast to the previous drought of 1992, when a complete lack of rainfall devastated crop production as well as livestock, rains in parts of the region were near normal and livestock herds had not been unduly affected. However, dry spells extended across large sections of the SADC region. Regional variations in rainfall were reflected most clearly in Zambia, Lesotho, Malawi, and Mozambique where production levels in some parts of these countries were below normal and in some parts crops failed completely.

The problems such as macro economic performance, inconsistent food policies, successive years of conflict, chronic malnutrition and the highest HIV/AIDS prevalence rates in the world, increased the vulnerability of the region. The purchasing power had fallen with the result that certain households faced an acute food shortage, taking one meal a day, if any. In Mozambique, a year of flood was followed by a year of drought, which had severe effect on food security.

In addition to mismanagement and poor governance, Griffiths and Binns 1988 in Kajoba (1993) are of the view that the overwhelming causes of the serious food crisis in Africa are political and social rather than environmental. They argue that real progress can be achieved if there is political will to invest in rural agricultural development to combat poverty, suffering and to ensure relative food security.

De Souza and Foust, (1979) as quoted by Kajoba (1993) argue that, “Certain political economic decisions which are taken by African leaders undermine food security and have contributed to food insecurity”. For example, during the drought that hit the Sahel countries in the 1970s in which about 100,000 people starved to death, these countries (including Chad, Mali, Senegal, Mauritania, Niger, Burkina Faso and Nigeria), were producing enough food and were net exporters of barley, beans, peanuts, fresh vegetables, and beef, despite protein malnutrition among its children that was about the worst in the World.

2.5 Zambian Food Security Trends

Zambia’s agriculture can be divided into cash and food crops. Maize is the staple food hence being the major food and cash crop in the farming communities. It receives a lot of support from the government in terms of subsidized seed, fertilizer and guaranteed markets after harvest. Other cash crops include fresh flowers, paprika, tobacco, cotton, sugar, wheat, soybeans, sorghum, sunflower and tea among others. The country is considered to be food secure if there is enough maize stocked. Despite small-scale farmers contributing greatly to the national food security they are the most food insecure for most part of the year.

Zambia like many countries in the Eastern and Southern African region is undergoing rapid transition and adjustment in its agricultural sector. Before liberalization, the pricing and marketing of agricultural commodities were highly controlled by the state based on a system initiated in the 1930s. “The country moved forward with a bold program of macroeconomic and sectoral reform in the early 1990s” (Agriculture Consultative Forum Annual Report 2002 – 2003).

However the agricultural reform process and its effects on food security have been controversial. While policy reform had produced some notable achievements, it has been increasingly recognized that political objectives have influenced the course of reform implementation and the government in its efforts to design and implement growth promoting the agricultural and food security policies and programs.

“Agriculture is a dominant economic activity in Zambia and the sector generates between 18% and 20% of the Gross Domestic Product (GDP) and provides livelihood for more than 60% of the labour” (GRZ, 2004). The increase in agricultural food production in rural areas will therefore result in overall poverty reduction and increased food security (Kalinda 2002).

According to CSO (1994), the small scale farmers contribute about 60% to the total output with 40% being produced by the commercial subsector (medium and large scale farmers). In terms of crops produced by small scale farmers, the most significant are maize (accounting for more than 65% percent) sorghum, millet and cassava, groundnuts and mixed beans. Commercial farmers on the other hand concentrate on high value crops such as wheat, tobacco, coffee and horticultural crops for exports.

Despite the growth in the agricultural sector, “many small holder farmers are still affected by seasonal food shortages and there are some evidence that this is worsening” (SIDA Evaluation Report 2002). Typically, climate and input shortages are blamed although compared to many other African countries, farmers in Zambia have a highly favourable situation.

Arguing on similar lines, Kajoba (1993) notes that, although no famine has been experienced in Zambia, the country experiences maize meal and sugar shortages due to poor distribution, and yet it has an adequate capacity to feed itself.

According to the ZDHS (2000 – 2002), the situation on food security is that 36% of households have always and often had enough to eat, 19% have seldom or never had enough to eat and are chronically insecure throughout the country. Furthermore, within the male headed households, another factor contributing to food security is how income is distributed and used within the household. Commonly the husband generates and retains control over the household cash income and only passes on a portion to the wife for household expenses such as food, health, education and clothing. However, depending on how the cash income is divided between husband and household, this can cause a household with hypothetically adequate income to experience food insecurity.

IFAD (1993) states that there are food shortages from September to March among small-scale farmers; this was also noted by the World Bank. When a calendar of food availability was drawn, it showed a big 'bulge' around harvest time and a clear 3-month crisis period (December to February). Clearly all the principal food crops go on the same annual cycle, with harvest in mid-year. The calendar for an average household in normal year shows food stocks completely run down by December with people surviving on other foods. January and February are the worst months of food shortages in rural households. People resort to buying food, if they have money and doing casual work to raise money. By March maize can be eaten 'fresh' on the cob and pumpkins start to be ready for consumption. During the month of April, groundnuts harvesting begins. In May sweet potatoes are ready for harvesting. The months of June, July and August are the times of abundance, with all the major food crops harvested. In September food stocks start to decline. By the end of October there is little food from the farms. People start using cash income, doing casual work on others' farms and relying on income generating activities such as beer brewing, retailing and others (World Bank: 1994).

Lack of storage facilities is also a problem to smallholder farmers. According to Kajoba (1993), the provision of adequate storage facilities is very important since it has been estimated that during the 1970s, weevils, birds and rodents destroyed more than one million bags of maize produced each year worth four million pounds sterling. The food insecurity is not necessarily the consequences of droughts, floods and inadequate food productions as was believed, it is however the consequences of other factors such as lack of buying power of households (Kalinda: 2002). According to a National-Level Supplementary Rural Livelihood Survey (CSO/MACO/FSP, 2008), among the poor households, on-farm maize retention and consumption went down from 2003 to 2008. In contrast there were significant improvements for better off households who increased area planted and production by over 30 % and maize sales by 60 % over the four year period.

CHAPTER3: RESEARCH METHODOLOGY

3.1 Introduction

In this chapter the area of study is reviewed and also the procedures used in carrying out the study to achieve the study objectives are presented. It first outlines the sampling criteria used and the method of data collection and analysis and then explains the specification analysis.

3.2 Sampling Criteria

A sample of 150 households were randomly selected from four villages in Chitanda. These were Ngobola, Kasankamana, Shimwete and Mulilo. Random sampling was done using village registers out of which 38 households were selected each from Kasankamana, Shimwete and Mulilo. 36 households were selected from Ngobola Village. A farm household was used as a sampling unit.

3.3 Methods of Data Collection

Secondary data was collected from the internet, CSO, Zambia National Farmers Union and Ministry of Agriculture and Cooperatives. This data provided most of the information in the literature review as well as the approximate number of the general population in the study area. Primary data was collected using structured questionnaires.

3.4 Data Processing and Analysis

The data from questionnaires was analyzed using the Statistical Program for Social Sciences (SPSS) to generate tables, pie charts and bar charts. Microsoft excel was used to organize the inputs and STATA was used to estimate parameters.

3.5 Model Specification

The model used was the Probit Model in the form:

$$y_i = \begin{cases} y_i^* & \text{if } y_i^* > 0 \\ 0 & \text{otherwise} \end{cases} \quad (1)$$

where

$$y_i^* = \beta X + \mu_i \quad \mu_i \sim N(0, \sigma^2) \quad (2)$$

Where; y_i = food security

edu= education level of household head

farmexp= farming experience

accestinp= farmer's access to input

productionass= production assets

off farm inc= farmer's other income

cooperation= cooperation in input acquisition

sex= sex of household head

inpt= farmer input support

chemicals= use of storage chemicals

hectares= size of land owned

road= access to the nearest surface road

U_i = error term

The model was chosen arbitrary based on economic theory. The variables retained in the equation were determined by running different regressions on the data and performing basic diagnostic checks such as the signs of the coefficients and marginal effects based on economic theory.

This report also tested for autocorrelation and multicollinearity in order to take care of the consequences of their presence. In the presence of autocorrelation, the OLS estimators remain consistent and asymptotically normally distributed but they are no longer efficient. As a consequence, the usual F and t tests cannot be legitimately applied. To test for

autocorrelation, the Breusch-Godfrey test was used. However, if multicollinearity is present, regression coefficients are indeterminate and their standard errors infinite (as the case of pure multicollinearity). In the case of near perfect multicollinearity regression coefficients are determinate and their standard errors are very large (Gujarati, 1995). To test for multicollinearity the Variance Inflating Factor (VIF) test was used with a confirmation of the presence of multicollinearity if the VIF is at least greater than 10 (see test results on page 26)

CHAPTER 4: STUDY FINDINGS AND DISCUSSIONS

4.1 Introduction

This chapter presents and discusses the study findings. It begins with a presentation and discussion of the demographic characteristics of the respondents. It also presents the descriptive findings as generated in SPSS. Finally, the chapter is concluded by discussion of the probit regression margin results.

4.2 Sex of Household Head

The sex of the household head can have a great influence on household food security. This may be as a result of gender bias in accessing credit support, growing of certain crops, gender roles, labour demands etc. This makes the sex of the household head an important aspect in understanding household food security. There were 50 female respondents in the sample representing approximately 33 percent and 100 male respondents, representing 67 percent. Table 1 clearly highlights this as shown below.

Table 1: Distribution of Respondents by Sex

Sex	Number	Percent
Female	50	33
Male	100	67
Total	150	100

Source: Own survey data

4.3 Farming experience of Household Heads

The farming experience of the household head is important in the study of household food security as it may influence certain farming decisions e.g. whether to grow more cash crops or food crops, labour intensive or non labour intensive crops. The details of the findings on farming experience are shown in the table below.

Table 2: Frequency distribution of years of farming of respondents

Years of farming	Frequency	Percent
0-5	6	4
5-10	30	20
10-15	46	31
15-20	30	20
20-25	22	15
25+	16	11
Total	150	100

Source: Own survey data

The table shows a combined majority of household head years in farming ranging between 5 and 25 years. The implication is that the more experienced in farming a household head is the more they are expected to be involved in decisions concerning household food and non food crop production.

4.4 Marital Status

The marital status of individuals has an influence on their food security. Married couples through combined efforts with their children and dependants work together to produce their food requirements and have an advantage in accessing credit support compared to unmarried ones. Therefore, marital status is an important aspect in understanding household food security. The research revealed that the majority of the respondents were married. There were 118 respondents who were married representing 79%. 12 respondents were either divorced or separated representing 8%, 14 were widowed representing 9% and 6 were single representing 4%. Details of these findings are shown in figure 1.

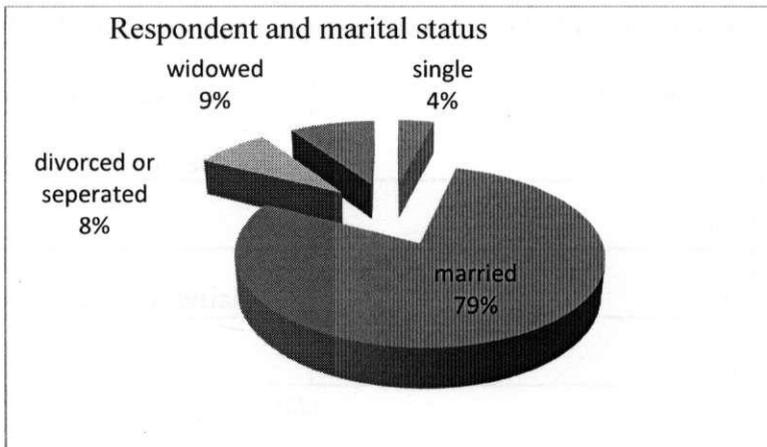


Figure 1 Percentages of marital status of respondents

The study findings showed that the percentage of married couples who were food secure was proportionately higher than that of unmarried individuals. This could possibly be also explained by the fact that married respondents outnumbered unmarried individuals by a large margin.

4.5 Education Level

The level of education is a very important variable in trying to understand how people apply their knowledge to ensure food security in their respective households. The findings of the research revealed that majority of respondents had gone as far as primary level. The tertiary and secondary level includes people with qualifications ranging from School certificates, diplomas, and degrees. There were 94 respondents who had gone through primary level representing 63% and those who had no education background level were 36 representing 24%. The least representation was secondary and tertiary education with 20 respondents representing 13%. Details are shown in the figures below.

Table 3: Frequency of educational level of respondents

Level of education	Frequency	Percent
Never been to school	36	24
Primary	94	63
Secondary & tertiary	20	13
Total	150	100

Source: Own survey data

4.6 Household Food Insecurity experience

The selected respondents from each of the four villages were asked whether they had encountered any household food insecurity (inadequate household food stocks) in the period from 2006 to 2009 harvest. The research revealed that majority had not encountered any food insecurity as evidenced by the results below. Out of 150 respondents a total of 119 representing 79% had not experienced any food insecurity and the remaining 31 representing 21% said they had experienced a period of food insecurity. Figure 2 shows the percentages of households experiencing food insecurity. It was found that the households that experienced food insecurity had fewer family members and had problems in accessing production input support. The percentage of food secure households was high at 79%. The food secure households owned production assets, had access to inputs either through input support or their own means.

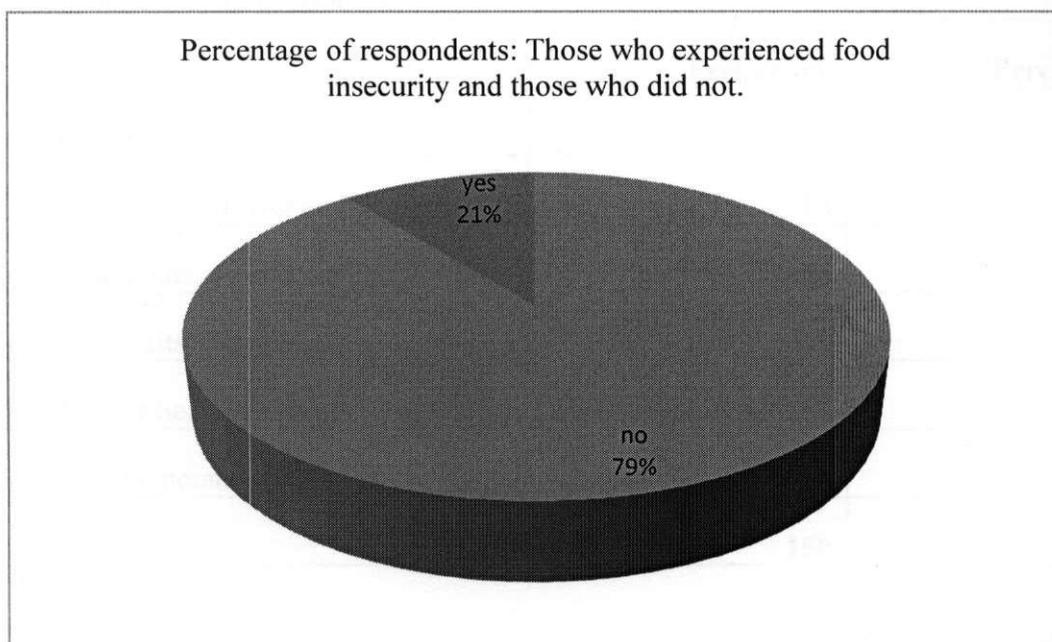


Figure 2: Pie chart of respondents with respect to whether they had experienced food insecurity

4.7 Crops grown in the area

The crops grown in the four sampled villages of Chitanda area included cassava, groundnuts, wheat, sorghum and sunflower. Carrots, Soya beans, Cotton, Tomatoes and Irish potatoes were other crops grown in the area including fruits like Oranges and Mangoes as shown in tables 4 below. The frequencies of crops grown among households were recorded as collective information regardless of which village a household belonged. The word 'combination' was used to describe the different crop mix each household was producing. From the table, it is shown that 38% of the households grew a combination of maize, groundnuts and soya beans to meet their household food requirements, while 12% were inclined towards growing a combination of maize, groundnuts, sunflower and wheat.

Table 4: Household crop production

Crops	Frequency	Percent
cassava, maize, groundnuts	14	9
Maize, groundnuts, sunflower and wheat	18	12
maize and groundnuts, soya beans	56	37
maize, cassava, fruits and groundnuts	38	25
maize, sorghum, wheat, cotton	16	11
sunflower, carrots, potatoes, tomatoes	8	5
Total	150	100

Source: Own survey data

Furthermore, 25% grew a combination of maize, cassava, fruits and groundnuts whereas 9% grew a combination of cassava, maize and groundnuts. In addition, 11% of the households had a combination of maize, sorghum, wheat and cotton while 5% grew a combination of carrots, sunflower, potatoes and tomatoes. A further look at the table shows that the majority of the farmers in all four villages grew a combination of maize, groundnuts and soya beans. This was the cropping combination in the area that was outstanding in assuring household food security. The table also shows that overall, 95% of the farmers grew the staple food, maize, to ensure food security.

Maize production in the area ranged from 0 to 1200 by 50kg bags. Some farmers sold all their maize produce while others kept all of it for consumption. It was also found that highly productive farmers were also the ones involved in production of Carrots, Irish Potatoes, Wheat and Tomatoes which they transported for sale. Groundnuts was found to be the second important crop grown in the area after maize to ensure food security with production yields ranging from 92 by 50kg unshelled nuts to less than a bag. Most of the groundnut harvest was kept for home consumption although a few sold or exchanged them in barter system.

Soya beans was the third most important crop specifically grown as a cash crop. Farmers sold most of the Soya beans they produced.

4.9 Main Meals per household per day

Another criteria for determining whether a household is food secure is by the number of main meal the members take. Usually a household is said to be food secure if it can provide three main meals per day, namely, breakfast, lunch and supper without the fear of food stocks running out. The study found that majority of the households had two meals per day at 72% while 28% had at least three meals. Part of the majority had two meals out of choice as they had to devote their time working in the in the fields. They had to get up early to work in the fields and did not consider breakfast important. Therefore the fact that a household had two main meals per day did not ultimately imply that they were food insecure. Some households had two meals per day simply because they could not afford three meals. The table below shows frequencies of number of meals households took per day.

Table 5: Number of Meals per day

	Frequency	Percent	Cumulative percentage
0	0	0	0
1	0	0	0
2	108	72	72
3	42	28	100
Total	150	100	

Source: Own survey data

4.9 Sex of Household Head

The sex of the household head was considered to be one of the factors that could influence food security. The findings of the research revealed that 34 (23%) farms were managed by females and the remaining 116 (77%) were managed by males. The findings also revealed that out of 34 female headed households, twelve (12) had encountered food insecurity in the last four years. On the other hand, of the total number of 116 male headed households, 19

admitted having encountered food insecurity in the past four years as shown by the frequency table below. This shows that 35% of the female headed households had experience food insecurity in contrast to 15% male headed households.

Table 6: Sex of household head

Sex of farm manager	Frequency	Percent (%)	Food insecure (%)
Female	34	23	35
Male	116	77	17
Total	150	100	

Source: Own survey data

The twelve female headed households that encountered food insecurity and the nineteen households headed by males lacked production assets like tractors, ploughs, oxen and family sizes were much smaller. The female headed households that experienced food insecurity included three from Mulilo and Shimwete respectively, five from Kasankamana and one, from Ngobola Villages. The male headed households included five from Shimwete, six from Kasankamana, four from Mulilo and Ngobola Villages respectively.

4.10 Non Farm Income

on-farm income is income generated from non-farm activities. It is an important aspect of household food security as it is used to supplement income from farming activities and it can also be used to source food in case of farming activity failure. Rural households mostly rely on rainfall to grow their crops and as such have to turn to non-farm activities during dry months of the year. The study found that 114 households generated their income through on-farm activities while 36 relied on both on-farm and off-farm income. Out of the 114 households that relied only on farming activities as a source of income, 18% had experienced

food insecurity while 31% out of 36 households that relied on both on-farm and off-farm income had experienced food insecurity. It was further found that the households that had experienced food insecurity did not have adequate production assets or had no such assets altogether. The households that experienced inadequate food while relying on farming activities were found to be those without adequate production assets and in some cases could not access farmer input support. Those that relied on both on-farm and off-farm income but still experienced food insecurity lacked adequate production assets and most were unmarried.

4.11 Access to Credit

The role of various institutions in providing credit facilities and input support to smallholder farmers is an important aspect in ensuring food security among households. The study showed that households relied on credit and input support from NGOs, Government Farmer Input Support Programme and loans from banks. Some households received transfers from relatives for use in acquiring their inputs. The farmer input support programme by the government had the greatest influence on food security among households as more households relied on it to access seed and fertilizer.

4.8 Use of Chemicals in storage

It was found that rodents and insects were the main pests affecting crops in storage. Farmers used rat poison and cats to get rid of rodents. Majority of farmers treated their maize crop for storage with insecticides against weevils. The farmers (79%) who used these measures were less exposed to food insecurity than those who did not (21%).

4.12 Regression Analysis

STATA was used to test for multicollinearity in which we accept the presence of multicollinearity if the Mean Variance Inflating Factor (VIF) is above 10.

Table 7 Output for the Test for Multicollinearity

VARIABLE	VIF	1/VIF
Input support	1.79	0.55804
Road	1.77	0.56475
Members	1.6	0.6241
Cooperation	1.5	0.66722
Production assets	1.43	0.69895
Sex	1.41	0.70872
Hectares	1.38	0.72375
Chemicals	1.24	0.80549
Education	1.22	0.82093
Off-farm	1.08	0.93007
Mean VIF	1.44	

Source: Own survey data

The results from the table above show that, the mean VIF is 1.44 for all the independent variables, implying that multicollinearity was not a problem since it is less than 10.

Table 8 Probit Regression Model Results

Variable description	Coefficients	Std errs	P > z	Marginal effects
Farming experience	0.3658376	0.01657	0.027	0.02916
Education	0.4767040	0.31355	0.128	0.05194
Family size (members)	0.5807756	0.25266	0.022	0.04802
Off Farm Income	0.1846420	0.01870	0.323	0.00619
Cooperation	0.4108478	0.45117	0.362	0.64324
Input support	0.2689364	0.11503	0.019	0.02196
Chemicals	0.2733239	0.34216	0.424	0.03136
Hectares	-0.0271485	0.04479	0.544	-0.00350
Sex	0.0081427	0.01801	0.651	0.00203
Road	0.0059161	0.01267	0.641	0.00068
Production assets	0.0818857	0.03131	0.009	0.00727
Number of observations	150			
Pseudo R ²	0.2224			
LR chi ² (11)	22.65			
Prob > chi ²	0.0198			

Source: Own survey data

Definitions:

- The standard error estimates the standard deviation in the unobservables affecting the dependent variable after the the effect of the dependent variable has been taken out.

- The p-value is a probability which summarizes the strength or weakness of the empirical evidence against the null hypothesis. Small p-values are evidence against the null hypothesis.
- Marginal effects of the probit model indicate that a unit increase in independent variable would increase or reduce the probability of dependent variable (food security) by the value of the parameter.
- $R^2 = 0.2224$; known as coefficient of determination measures the proportion of variation in the dependent variable Y (participation) that is explained by the independent variables X_i .

4.13 Discussion of the Regression results

The regression table above shows that the coefficient of determination (R-squared), the proportion of variation in dependent variable explained by independent variables was 22.24%. The model also shows that education level of household head, off farm activities, cooperation in acquiring inputs, access to storage chemicals, number of hectares owned, sex of household head and distance from the farm to the nearest surface road were insignificant to the model ($P > 0.05$), that is they were not important in the explanation of food security among households. This means that these variables, according to the model, did not have influence on food security among households at 95% confidence interval. The output shows that a one year increase in the household farming experience would increase the probability of food security by 3%. This means farming experience and not age of the farmer could improve household food security. An increase in household membership by one person with working capabilities would increase the probability of food security by 5%. A percentage increase in input support to the farm would increase the probability of food security by 2%. Furthermore it was found that, holding other variables constant, a percentage increase in household production assets would increase the probability of food security by a small margin of 0.7%.

CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the conclusion and recommendations of the study based on the findings and interpretations.

5.2 Conclusions

The study showed that the following crops were grown in Chitanda; Maize, Groundnuts, Cassava, Beans, Sunflower, Wheat, Soya beans, Sorghum, Cotton, Irish potatoes, Tomatoes and Sweet potatoes. Maize, Groundnuts and Soya Beans was the main crop combination among households. Maize was grown by most households due to its status as a staple food.

From the regression result, an increase in household membership had a positive effect on household food security. Likewise, a unit increase in the years of farming experience of the household head, access to input support and production assets would all marginally increase household food security among the households.

Thus, farmer's years of experience in farming was significantly important in contributing to food security ($P < 0.027$) with marginal effect of 3%. Household membership size was significantly important in contributing to household food security ($P < 0.05$) with marginal effect of 5%. Assistance through farm input support was significantly important in ensuring food security ($P < 0.05$) with a marginal effect of 2%. Production assets were significantly important in explaining food security ($P < 0.05$) with marginal effect of 0.73%. Therefore the factors that affect food security among households in the four villages, Ngobola, Kasankamana, Shimwete and Mulilo, were found to include household head farming experience, access to input support, number of household members and ownership of production assets.

The general household food security in the area showed 21% of the households having experienced food insecurity at some point in the past four years. Most of the households that experienced food insecurity lacked adequate production assets. Findings also showed that married couples were likely to be more food secure than unmarried individuals mainly due to combined efforts in farming activities. It was also found that the percentage of female headed households that experienced food insecurity was relatively twice as much as that of males headed households.

5.3 Recommendations

Extension education should be directed towards encouraging the smallholder households to engage in income generating activities so that they can increase their financial security as well as food security. This increased income could also be used to acquire farm production assets.

Farmer access to input support was seen to play an important role in ensuring food security among households. The facility should be improved to increase farmer coverage in the provision of inputs.

Since female headed households were twice likely to face food insecurity than their male counterparts, it is important for government and other stakeholders to put up institutional measures that enhance women participation in ensuring household food security.

Further research should be conducted in the area with larger sample sizes and a multi-method approach in data collection and analysis.

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APPENDIX

Questionnaire serial number:

APPENDIX 1

SOCIO-ECONOMIC FACTORS AFFECTING FOOD SECURITY AMONG SMALL SCALE FARMERS IN CHITANDA AREA, CENTRAL PROVINCE.

Department of Agricultural Economics & Extension Education
The University of Zambia

This questionnaire is for academic purpose only. Be assured that all the information you provide will be treated confidentially. Feel free to answer all the questions honestly. Your cooperation in this regard will be highly appreciated.

Instructions: Please write your responses in the tables, boxes and blank spaces provided.

1. Farm identification

1.1 District code **dist** District name: _____

1.2 Constituency code **const** Constituency name: _____

1.3 Ward code **ward** Ward name: _____

1.4 Farm code **farm** Name of the farm: _____

1.5 a) Name of farm owner _____

b) Sex of farm owner (0=Female; 1=Male)

sex

c) Which year was farmer owner born (e.g. 1967)

yob

1.6 Is the owner the main respondent?

rown

0 = No

1 = Yes → Go to question 1.8

1.7 a) Name of main respondent **resp** _____

b) Relationship to farm owner

rship

(Codes at bottom of Table 2.1)

Ensure that the main respondent is knowledgeable about the farm, and food related issues of the farm.

1.8 Do you understand the need to be food secure throughout the year ? **Prod**

0 = No → Fill in questions 1.9 through 1.13 and **End interview**

1 = Yes

1.9 Response status (1=Complete; 2=Do not know about food security; 2=Refusal; 3=Non-contact)

status

1.10 Date of enumeration (dd/mm/yy) **daten** /

1.11 Name of enumerator _____ Enumerator code **enum**

1.12 Date checked (dd/mm/yy) **datec** /

1.13 Name of field supervisor _____ Supervisor code **sup**

3.0 Nature of the farm

3.1 Basics

- 3.1.1. Which year did farming activities on the farm begin (e.g. 1947) **hh01**
- 3.1.2. How far is the farm from the nearest market town? **hh02** km
- 3.1.3. How far is the farm from the main (surfaced) road? **hh03** km
- 3.1.4. How long does it take to get to the main road by motorized vehicle in the
a) Dry season (minutes)? **hh04** minutes
b) Rainy season (minutes)? **hh05** minutes
- 3.1.5. For how many months in a year is the nearest main road accessible? **hh06** months
- 3.1.6. What is the main economic activity for this farm? (Pick one only)
1 = Fruits and vegetables 3 = Grains **hh07**
2 = Livestock/dairy 4 = Other, specify: _____
- 3.1.7. How many farm labourers did the farm hire during the past 12 months
a) Males? **hh08**
b) Females? **hh09**
- 3.1.8. Who manages this farm? **hh10**
1 = Farmer/owner 3 = Owner's child 5 = Co-owner of the farm
2 = Owner's spouse 4 = Farm manager 6 = Other, specify: _____
- 3.1.9. What is the sex of the one who manages this farm?
(0=Female; 1=Male) **hh11**
- 3.1.10. What is the roofing material for the main farm house made of?
1 = Iron/metal 3 = Tiles 5 = Grass/straw **hh12**
2 = asbestos 4 = Corrugated iron sheets 6 = Other, specify: _____
- 3.1.11. What is the wall material for the main farm house made of? **hh13**
1 = Burnt bricks 4 = Pole/bamboo 7 = Grass/straw
2 = Concrete blocks 5 = Pole and dagga 8 = Iron sheets
3 = Mud bricks 6 = Mud (mudhindo) 9 = Hard board
- 3.1.12. What is the door material for the main farm house made of?
1 = Standard door frame & door 2 = Traditional **hh14**
- 3.1.13. What is the floor material for the main farm house made of?
1 = Cement 3 = mud 5 = Other (specify) **hh15**
2 = Concrete 4 = Bear earth
- 3.1.14. Does the farm have running water/potable water in the house?
0=No 1=Yes **hh16**

3.3 Organizational capital

3.3.1 Are you a member or partner in a (0=No; 1=Yes).
 a) Cooperative **hh17** b) Association/farmer group **hh18** .

3.3.2 Does your farm collaborate with other farms in the following activities (0=No; 1=Yes).
 a) Buying inputs **hh19** b) Marketing of farm produce **hh20** .

3.3.3 Fill in the following table about the services received by the farm and their providers.

Service and its description		Has this farm ever received assistance with or info on ...? 0=No → Go to next service 1=Yes	Which year did you first receive help/info on...? Enter year (e.g. 2001)	Who is/was the most important supplier or organizer of this service? See codes below	Ask only if SR03=2 Is the farmer org. still active? 0=No 1=Yes	How did you receive (info on) this service? See codes below	Did you use or receive this service during the past year (October 2007 – September 2008)? 0=No 1=Yes
Service	Name/description	SR01	SR02	SR03	SR04	SR05	SR06
1	Technical assistance						
2	Training						
3	Inputs						
4	Credit						
5	Farm machinery services						
6	Disease control						
7	Food and nutrition management						
8	Land ownership						
9	Quality control						
10	Soil and water management						
11	Marketing						

Codes for service provider (SR03)

- 1= Fellow farmer(s)
- 2= Farmer organization
- 3= Private firm(s) or intermediaries
- 4= Government department
- 5= NGO or project
- 6= Bank

Codes for mode of service delivery (SR05)

- 1= Informal conversation
- 2= Radio program
- 3= Pamphlet/ newspaper
- 4= Workshop
- 5= Field Day
- 6= Demonstration plot
- 7= Other (specify)

3.3.4 Five years ago, did you belong to more, less of the same number of farmer organization?
 1=More 2=Less 3=Same 4=Not applicable **hh21** .

3.4 Physical capital/assets

3.4.1 Fill in the following table about the farm's ownership of physical assets.

Asset type		Does the farm have ...? 0=No→ Go to next asset 1=Yes	How many ... does the farm own?	Which year was the newest acquired? (e.g. 2007)	What is the current value of all ...? (ZMK)	How many did the household have in December 2009?
Asset	Name/description	AS01	AS02	AS03	AS04	AS05
1	Tractor					
2	Motor vehicle					
3	Tractor trailer					
4	Motor cycle					
5	Bicycle					
6	Ox cart					
7	Plough					
8	Slay					
9	Planter					
10	Grinding mill					
11	Wheel barrow					
12	Residential building					
13	Other implements					
14	Television					
15	Computer					
16	Land telephone line					
17	Mobile phone					
18	Bank account					
19	Lounge suit/Sofa					
20	Bed					
21	Water pumps					
22	Crop/animal Sprayer					
23	Electric stove					
24	Radio					
25	Non-residential building					
26	Kraals					
27	Scale					
28	Feed storage tank					
29	Animals (Dairy)					
30	Animals (Beef)					
31	Animals (Goats)					
32	Animals (Pigs)					
33	Animals (Chickens)					

3.5 Credit access

3.5.1 I now would like to ask you about the sources of funding that this farm uses and/or has used, and the farm's access to credits (2004 – 2009)

Fill in the following table about the farm's sources of funding and access to credit.

Source of funding or credit		Has the farm used ... to finance investment in capital items? 0=No 1=Yes	Does the farm usually use ... to finance inputs (e.g. feed, drugs, labour) 0=No 1=Yes	Did the farm use ... as a source of funding last year? 0=No 1=Yes	How much money did the farm receive from ... last year (ZMK)?
FUND	Description	CR01	CR02	CR03	CR04
1	Retained earnings				
2	Off-farm income				
3	Bank				
4	Family members, relatives				
5	Farmer group				
6	NGO or Project				
7	Government				
8	Intermediaries (buyers)				
9	Fellow farmers or informal lenders				
10	Other (specify)				

3.6 Household daily expenditure & Consumption

3.6.1 *Fill in the following table of how much the household spent on the following items*

ITEM		AMOUNT (ZMK)		
School fees		1st Term	2nd Term	3rd Term
1	School uniforms			
2	Private tuition			
3	Books/stationery			
4	Other school expenses			
5	Medicines			
6	Fees to medical personnel			
7	Payments to hospital			
Clothing & foot wear		Last 1 Month		Last 12 Months
1	Chitenges			
2	Clothing			
3	Tailoring charges			
4	Foot wear (shoes, sandals etc)			
Housing expenses		Last 1 Month		Last 12 Months
1	Rent			
2	Water			
3	Electricity			
4	Candles			
5	Paraffin			
6	Diesel			
7	Charcoal			
8	Fire wood			
9	Talk time			
10	Batteries for radio			
11	Batteries for light			
11	Toiletries(soap,washing,paste etc)			
Spent on food and/or consumed		Last 1 Month		Last 12 Months
1	Breakfast mealie meal			
2	Roller meal			
3	Hammer mealed meal			
4	Maize grain			
5	Grinding expenses			
Spent on/consumed from own produce		Cash purchases Last 1 Month		Own produce Last 1 Month
1	Maize grain/ Rice			
2	Chicken/ Fish/ Meat/ Kapenta			
3	Sweet potatoes			
4	Ground nuts/ Beans			
5	Tomato, Onion & vegetables			
6	(fresh/dried)			
7	(goat ,pig, game, cattle)			

3.8.0 *Land holding and use*

- 3.8.1 How many hectares of land do you or your spouse own? **hh21**_____
- 3.8.2 How many hectares in 2008/09 season were under
a) Maize production (hectares)? **hh22** Ha
- b) Other crops (hectares)? **hh23** Ha
- 3.8.3 How many hectares in 2009/10 were under?
a) Maize Production (hectares)? **hh24** Ha
- b) Other crops (hectares)? **hh25** Ha
- 3.8.1 Do you have a land title for any part of land you or your spouse own?
0=No 1=Yes **hh26**
- 3.8.2 Do you rent any land?
0=No → Go to question 3.8.5 1=Yes **hh27**
- 3.8.3 If yes, how many hectares do you rent? **hh28**_____
- 3.8.4 Do you own land that was given to you by someone else?
0=No → Go to question 3.8.7 1=Yes **hh29**
- 3.8.5 If yes, how many hectares do you rent? **Hh30**_____
- 3.8.6 Do you rent out land?
0=No → Go to question 3.8.9 1=Yes **hh31**
- 3.8.7 If yes, how many hectares do you rent? **hh32**_____
- 3.8.8 What is the purchase price of land (ZMK)?
hh33_____ per unit **hh34** (1=acre; 2=hectare; 3=lima)
- 3.8.9 If yes, what is the rental value of land (ZMK)?
hh35_____ per unit **hh36** (1=acre; 2=hectare; 3=lima)
- 3.8.10 What is the total land area used for cropping? **hh37**_____
- 3.8.11 From that total (q.3.8.11), how much is used for livestock feeding? **hh38**_____

END OF INTERVIEW

THANKYOU FOR YOUR COOPERATION