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CRSP Collaborative Research Support Programme

CSO Central Statistical Office

FSRP Food Security Research Programme

ZARI Zambia Agricultural Research Institute

ABSTRACT

Profitability of Smallholder Cowpea Production in Zambia

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Pulses represent an important group of edible leguminous crops with unique potential to address the health, income creation, and agricultural sustainability needs of developing countries in Sub-Saharan Africa, Latin America and Asia. In Zambia there is recent realization concerning the importance of pulses, hence increase in production by small holder farmers. Various studies are thus being undertaken to study different pulses. This study focused on the profitability of an important pulse crop in Zambia i.e. cowpeas. The general objective of this study was to determine the profitability of cowpeas were as the specific objective was to determine the factors that affect profitability of cowpeas. This was done by carrying out a gross margin and regression analysis. The data used in this study was secondary data from the third supplemental survey which was collected by Food Security Research Project and Central Statistical Office. STATA was used to analyze the data and carry out both the gross margin as well as the regression analysis.

The average gross margin was found to be positive. Several factors were found to affect profitability of cowpeas, such as production costs, yields, area planted, farm gate price and land tenure. Yields, land tenure and farm gate price had a positive influence on profitability were as production costs and area had a negative influence on profitability. Based on the results of the study production of smallholder cowpeas in Zambia was found to be profitable. The implications of these results were that more farmers should be encouraged to grow cowpeas not just for subsistence but for commercial production as well. Another recommendation was that value addition of cowpeas should be encouraged.

CHAPTER 1
INTRODUCTION

1.0 Background

Cowpeas (*Vigna unguiculata*) and other related pulses are very important leguminous crops as they are a source of affordable protein, carbohydrates, micro-nutrients, fiber and vitamins. They are increasingly playing a major role in improving farmers livelihoods. In addition to their contribution to nutrition and food security pulses are also major sources of income for smallholder farmers especially women (Muimui, 2010). Thus, they have the potential to contribute substantially to health, income creation, food security and agricultural sustainability of less developed countries such as Ghana, Nigeria, Zambia and several others in sub-Saharan Africa.

The fact that they are largely produced and consumed in regions of the world with high incidences of poverty makes these crops especially suited to make this contribution. Some of these countries have high incidence of poverty, for example Zambia has poverty levels of 73% (CSO). Farmers in these countries are able to produce cowpeas due to the crop's adaptability to marginal agro-ecologies and relatively high market value. Pulses are extensively cultivated by resource-poor smallholder farmers for both household food security and as a cash crop (CRSP).

The main growers of cowpeas in Zambia are smallholder farmers, who mainly grow them as food crops rather than cash crops. Cash crops are to a great extent grown by male farmers while food security crops such as cowpeas are grown by female farmers (Unit District Planning, undated). According to the 2004 supplemental survey (CSO/FSRP 2004) data, cowpeas are grown in all Zambian provinces although production is highly concentrated. The top four producing provinces account for about 83 percent of total output. Southern Province accounts for the majority of cowpea production (58 percent) followed by Central (11 percent), Northern (9 percent), and Lusaka (6 percent) provinces.

There is a growing potential market for cowpeas. In sub-Saharan Africa demand for cowpeas is at 20,000 metric tons per year and is projected to grow in excess of 40,000 metric tons over the

next 10 years (Muimui, 2010). According to the Zambia Central Statistical Office (CSO), cowpea production increased by 38.5 percent between 2006/07 and 2007/08 agricultural seasons (Agricultural Consultative Forum, 2008). Between 2000/01 and 2003/04 the number of farmers producing cowpeas grew from 13.0 percent to 17.2 percent (CSO). However, there is great need to transform the surging cowpea production in the rural areas from subsistence to profitable commercial systems. One of the factors that should be considered in transforming cowpea production to commercial production is the market value. Farmers tend to commercialize crops they perceive have a high market value thus the higher the market value the more the crop will be commercialized.

1.2 Problem Statement

Production of cowpeas in Zambia is expected to be of high value; this flows from the fact that cowpeas are low cost crops to produce because they require minimum inputs. Cowpeas tend to have higher output to input ratios as compared to crops such as maize (Auko, 2006).This implies that cowpeas should have a high market value in terms of profitability.

However little is known about the profitability of cowpea production in Zambia, because despite their great potential cowpeas have received little attention in terms of agricultural policy thrust and economic research (Auko, 2006). Most research on the crop has focused on characteristics such as yield enhancement through breeding, soil management and other agronomic properties (Tenywa, 1999). However other factors concerning pulses and in particular cowpeas are important such as production efficiency, market dynamics, consumer preference and indeed profitability because these factors have an influence on production.

There is also a dearth in knowledge concerning the factors that may have an influence on the profitability of cowpea production. According to a study that was done on the profitability of bean production in Honduras, some factors that were found to influence profitability were the farmer's characteristics, input use, labor use, costs, whether the farmers produced for sale or for home consumption as well as the methods of production (Tschering, 2002). However because of

the dearth in knowledge concerning the factors influencing profitability of cowpea production in Zambia it cannot be said that the same factors have an influence.

The fact that the profitability of cowpeas is not known, not only affects the farmers who produce cowpeas but it also affects all the stakeholders who may be interested in participating in the value chain of the crop. One of the factors that could be contributing to the dearth in knowledge on the profitability of cowpeas production could be poor data collection and record keeping. Most developing countries have a problem with keeping records; in a study that was done on the profitability of beans in Honduras one of the challenges was to explore options for improving the process for collecting and analyzing farm data. (Tschering, 2002).

1.3 Objectives

The overall objective of this study was to determine the profitability of cowpea production in Zambia.

The specific objectives of the study were to:

1. Determine whether cowpea production is profitable.
2. Identify the factors that affect the profitability of cowpea production.

1.4 Rationale

Carrying out a market value analysis of cowpea production to determine profitability is important as it may be one of the factors that influence production. Farmers are rational and thus they tend to make production decisions in favour of crops that will yield the most benefits to them, whether market and non market. Therefore information concerning profitability of cowpeas is essential because if production is found to be highly profitable then more farmers are likely to participate in production of cowpeas. An increase in production of cowpeas would be beneficial to the country because cowpeas have the potential to address health issues such as malnutrition as well as food security issues due to their high nutritional value. In addition increase in production will also improve farmers' livelihoods by increasing their incomes. Most

value chain stakeholders such as wholesalers, retailers and other intermediaries are driven by market value factors such as profits thus information concerning these factors is vital in influencing their decision to participate in a value chain. As the profitability analysis is carried out factors that affect market value will be determined, these factors can be used as a basis for policy and strategy development so as to enhance cowpea production.

According to Zambia Agricultural Research Institute (ZARI), in Zambia most studies that have been conducted on cowpeas and pulses in general have focused on improvement of agronomic characteristics such as enhancing yield and variety development thus this study will bring out information that will add to the current body of knowledge.

1.5 Structure of the Report

This report begins with an introductory chapter which gives a background on the subject matter of the study. It also gives the gist of the problem under discussion as well as the purpose of the study and its importance. Chapter two of this report summarizes past findings as well as information from the current body of knowledge that exists. The report then proceeds by discussing the methods and procedures that were used in this study in chapter three. This chapter, also includes the data collection methods and data analysis methods. A discussion on the research findings then follows in chapter four and the report ends with chapter five which covers the recommendations and conclusions.

CHAPTER 2
LITERATURE REVIEW

2.1 Introduction

Profitability analysis is a common tool used by many managers of different enterprises to make decisions on whether to participate in the enterprise or not. Many studies have been done concerning profitability of different enterprises in different fields. In agriculture profitability analyses are done on different crop and livestock enterprises. A large body of literature has investigated different aspects of cowpea production one of them being some aspects of profitability.

This section will summarize the existing empirical evidence on profitability of cowpea production. The first part of the review will identify studies that have been done concerning profitability of cowpea production. A summary of the studies are given in order to see what has been done so far. The second part of the review will identify different profitability analyses that have been carried out. This will be done in order to identify different methods that can be used to carry out profitability analyses.

Value and Profitability

There are many words to describe the meaning of value. According to the Webster dictionary, value can be described as relative worth, merit or importance; it can also be described as monetary or material worth or the worth of something in terms of the amount of other things for which it can be exchanged or in terms of some medium of exchange.

In this paper the definitions of value will be in terms of market value. Market value refers to the monetary worth of cowpeas i.e. the worth of cowpeas in terms of the amount of other things for which it can be exchanged or in terms of some medium of exchange. Thus it is taken as the profitability of cowpeas production. Profitability is simply the revenue earned from cowpeas produced less the cost of production.

2.2 Profitability of Cowpeas

Despite the fact that little is known about profitability of cowpeas production in Zambia, there are still some studies that suggest cowpea production is profitable. For example a study that was carried out on the value chain of cowpeas in Kano State in Nigeria suggested that cowpea vending is a profitable business and greater profits could be achieved by enlarging the scale of operation (Ibro,2008). These vendors are part of the supply chain of cowpeas in kuto and they were found to be profitable, however this study did not determine the profitability of farmers who produce and supply the cowpeas. Mishili (2009) also suggested that pulses have high market value in his study on the value of pulse production in West Africa. Deboer (2004) in the CRSP report on beans and cowpeas encouraged farmers to grow these pulses one of the reasons being their high market value. These studies all suggest that cowpea production is profitable but they did not consider the factors that influence profitability of cowpeas production.

2.3 Factors that Affect Profitability

There are many factors that may have an effect on profitability of any enterprise. In crop production most of the factors that affect profitability are the production costs, farm gate price, fertilizer usage, seed variety, tillage methods, labor, land tenure, power sources, extension services, remittances and farmer characteristics. Most of these factors have been considered in many studies on profitability . Some studies find some of these factors to have significant effect on profitability were as other studies find that these factors have insignificant on the profitability. For instance a study that was done on the profitability of sorghum in Tanzania found that the farm size, production costs, farm location, interaction between production costs and farm gate price as well as the interaction between the varieties used and fertilizer applied were significant. Surprisingly, farm size was negatively influencing the gross margin contrary to the literature. However, the interaction between Production cost and farm gate price was positive and significant while farm gate price alone was not significant. In addition, the variety used,

application of fertilizer and tillage method were not significant but the interaction between variety used and fertilizer application was positive and significant. (Erbaugh, 2008). Bagamba(1998) in studying the profitability of bananas found that the total farm size, total farm income, off-farm income, age of the farmer, weevil damage, interaction with government extension agents, gender of the farmer, distance from the farm to the tarmac, years spent in school and number of cattle owned had a significant effect on the profitability of banana production. Similarly in a study that was carried out on the market value of rice in Malaysia, the farm size, production costs, seed variety, tillage methods and power sources, farm price were found to be significant. In these studies some factors were common in affecting profitability of each of these enterprises; however some of the factors were specific in affecting a particular crop. Thus these factors affect the profitability in different ways depending on the enterprise in question.

2.4 Common Methods of Profitability Analysis

There are many methods that can be used to determine the profitability of an enterprise as well as identify the factors that influence profitability. Some of these methods include gross margin analysis, value of production and total revenue. However, gross margin analysis appears to be a common method used to determine profitability, this method of determining profitability has been used in many studies. Ahmad (2004), in studying the factors affecting the profitability and yield of carrot production in two districts of Punjab included a partial budgeting model that was used to determine profitability of carrot growing. This methodology included a gross margin analysis which was used to determine the costs of various inputs and the profitability of carrot cultivation. According to Ahmad (2004) the gross margin was used because of its accuracy in estimating profit. Factors affecting yield in this study were determined by carrying out a regression analysis using a Cobb-Douglas production function which was used due to its ease in computation and interpretation. In another research that was done on the profitability of sorghum farming in Tanzania, a gross margin analysis was also used to determine the profitability of sorghum. In this study gross margin analysis was done using Microsoft excel in which the total variable costs were subtracted from the total revenue. (Erbaugh, 2008). A regression model was then carried out in this study in order to test factors that might have influenced gross margin and

hence profitability of sorghum production. The gross margin variable was regressed on the farm size used to produce sorghum, farm gate price, farm production costs, farm location, the interaction between production costs and farm gate prices, seed variety used, technology used such as fertilizer, the interaction between seed variety and fertilizer applied and production technology used.

In another study that was done on the performance and profitability of the banana sub-sector in Uganda, a gross margin analysis was used to determine the profitability of banana production. The gross margin analyses involved cost benefit trade -offs where total variable costs were subtracted from total revenue.

Budgeting techniques were used to measure comparative advantage of various crops to the farmer in terms of income earned and return to family labor. Regression analysis was used to determine the factors affecting banana productivity and profitability in the study area. Yield of bananas was regressed against variables thought to influence farmers 'decisions to invest in agricultural production. Thus yield of bananas was regressed on the total farm size, total farm income, off-farm income, age of the farmer, weevil damage, interaction with government extension agents, gender of the farmer, distance from the farm to the tarmac, years spent in school and number of cattle owned. (Bagamba, 1998).

Gilbert (2001) carried out a study in which he compared gross margin analysis to total revenue in terms of which method was better in estimating profit. He concluded that gross margin was a more accurate estimate of profit compared to total revenue.

From these studies the most accurate and common method of estimating profits is gross margin analysis, where as the most common method of identifying factors that influence profitability is multiple regression in which gross margin is regressed on different factors expected to affect profitability.

2.4 Summary

From the literature on the studies above it is clear that there exists a gap in knowledge. The findings of these past studies did not assess all aspects of value for cowpea production. In addition the studies failed to identify factors that affect the value of cowpea production. It is also clear that gross margin analysis is a common tool that is used in determining profitability of an enterprise. However two methods of identifying the factors that affect profitability are mentioned above the first method is to regress yield on different variables. The results of this regression are then inferred to profitability hence yield acts as a proxy for profitability. The second method is to regress gross margin variable (Total Revenue- Total Variable Costs) directly on different factors expected to affect profitability.

2.5 Conceptual Framework

Till today, there is no complete agreement among economists about the nature and origin of profits. As a matter of fact, there is perhaps no topic in the whole economic theory which has been in such a confused and tangled state as the theory of profits (Ahuja, 2006). Some economists have described profits as non-functional income. Keynes, (undated) expressed the view that profits result from the favorable movements of the general price level. Robinson, Chamberlin and Kalecki (1967) associate profits with imperfect competition and monopoly. According to them the greater the degree of imperfection or monopoly, the greater the profits made. Profits have also been associated with uncertainty (Knight, 1957), innovations (Schumpter, 1960) and with risk bearing (Hawley, 1975).

In general each individual theory tends to omit some crucial points and fails to bring out some important economic phenomena having a relation with profits. The theory of profits as a dynamic surplus is one of the most popular concepts of profits first proposed by Clark (1987). According to this theory profits arise in a dynamic economy. Clark (1987) argued that in a stationary state where no changes in conditions of demand and supply are occurring, the prices paid to the factors on the basis of their marginal productivity would exhaust the total value

production and no profits would accrue to the producer (Ahuja, 2006). In competitive long run equilibrium, price equals average cost of production and therefore no pure profits are made.

If there are no changes in the conditions of demand and supply competitive equilibrium will persist therefore no profits will be made. On the contrary if due to changes in either demand or supply, price exceeds costs of production profits will emerge. If because of changes in demand and supply, price falls below costs then negative profits or losses will result. It is evident that changes disturb the equilibrium and thereby give rise to profits. In other words profits arise due to disequilibrium caused by the changes in demand and supply conditions. It should be noted that these disequilibrium profits arise from unanticipated changes in demand or cost conditions. If the changes could have been foreseen in advance, then suitable adjustments could have been made according to the anticipated changes so that forces of competition would have driven profits to zero.

According to Clark there are five changes that occur in a dynamic economy and which give rise to profits: i) changes in the quantity of human wants, ii) changes in quality of human wants iii) Changes in the methods or techniques of production, iv) Changes in the amount of capital, and v) Changes in the forms of business organization. These changes are constantly taking place and bring about the divergence between prices and costs of production and thereby give rise to profits which maybe positive or negative. If demand for a commodity increases due to the increase in population or increase in the incomes of the people or due to increase in consumer preference for the commodity, the price of the commodity will rise, and if cost remains the same, profits accrue to the producers of the commodity. On the other hand, cost of production may go down as a result of the adoption of a new technique of production, or as a result of decrease in price of the raw material, and if price remains constant or does not fall to the same extent, then profits would emerge.

Producers of cowpeas in Zambia carry out their production in a dynamic environment were prices and costs change due to different factors such as seasons, government policies etc. The changes that occur in order to cause a divergence between prices and costs affect producers. For example farmers are constantly faced with changing costs of inputs thus this affects their

profitability. In addition farmers are also faced with demand and preferences of different varieties of cowpeas and thus affect their profitability. The farmer is also affected by the market price of cowpeas. On the basis of this, it is expected that production of cowpeas is likely to be affected by farm prices, costs of production, tillage methods, power sources, farm size, quantity of cowpeas harvested, age, gender, level of education and location.

CHAPTER 3
METHODS AND PROCEEDURES

3.1 Introduction

This section outlines the methods that were used in this study as well as the data collection and data analysis methods. The chapter begins with the gross margin and regression analysis that were used in this study describing why these methods were used and how they were used. It then proceeds to describe how the data was collected and analysed.

3.2 Methods

Gross margin analysis and multiple regression were used in this study. Gross margin was used to determine profitability of cowpea production. It refers to the total income derived from an enterprise less the variable costs incurred in the enterprise. Farm gross margin provides a simple method for comparing the performance of enterprises that have similar input requirements for capital and labor (Forestry, 2009). Gross margins are usually computed per year or per cropping season. They are an indicator of farm profit and they provide a useful tool in terms of farm management, budgeting and estimating the likely returns or losses of a particular crop.

Gross margin analysis was used in this study not only because it is one of the easiest and common methods to determine profitability but because according to the literature reviewed in this study gross margin analysis is one of the best methods of estimating profits of an enterprise. For example in a study that was done on the profitability of carrot production it was found that gross margin was a more accurate estimate of profitability compared to other budgeting techniques such as total revenue or value of farm production measures (Ahmad, 2004). Similarly Erbaugh,2008 in studying profitability of sorghum in Tanzania used gross margin to estimate profits. In both of these studies the gross margin analysis was found to be the best method because it includes a determination of costs of each farmer on a per hectare basis on the specific enterprise as well as the revenue earned for each farmer considering the differences in prices. Whereas other methods such as total revenue or value of farm production include fixed costs of the whole farm, thus tend to underestimate the profit of each enterprise.

In this study the variable costs included all costs incurred in the production of cowpeas these costs were mainly labor and seed costs, as it was found that most farmers grew cowpeas on a small scale basis and thus did not use herbicides, fertilizer or machinery in the production of cowpeas. These expenses where calculated on a per hectare basis.

Total revenue in this study was considered to be all the revenue earned from production of cowpeas. It was calculated by multiplying the on farm price by the number of kilograms of cowpeas produced per hectare. Any other incomes earned as a result of cowpeas production was also included as part of the revenue that arose from the production of the crop. The prices that were used in calculating the revenue were on-farm prices for each farmer. However in cases were the farmer did not sell the cowpeas the price used was an estimation of the price for each district i.e. the mean price for each district was calculated and used to value the grain.

Algebraically gross margin can be expressed as

$$\text{I.} \quad GR = TR - TVC$$

Where GR is the gross margin, TR is total revenue and TVC is total variable costs.

The multiple regression was used to identify the influence of various factors on the value of cowpea production. More generally an unknown population model is expressed as as shown below (Dougherty, 2002).

$$\text{II.} \quad Y_{\ i} = \beta_1 + \beta_2 X_{2i} + \ldots\ldots + \beta_k X_{ki} + U_i$$

Where Y is the dependent variable, X's are K-1 explanatory variables and U_i is the error term.

Multiple regression analysis used in this study because it allows one to discriminate between the effects of the explanatory variables, making allowances for the fact that they may be correlated. The regression coefficient of each X variable provides an estimate of its influence on Y,

controlling for the effects of all the other X variables (Dougherty, 2002). The multiple regression was used in this study as was done in other studies to find out the influence of different factors on profitability. Bagamba,1998 in his study on the profitability of bananas regressed gross margin on different variables to estimate their influence on profitability. Similarly Ahmad, 2004 in his study on the profitability of carrots regressed yield on different factors to determine their influence on profitability. Thus in this study in order to identify the factors that affect profitability, gross margin was regressed on farm size, farm gate price, farm production costs, seed variety used, a set of dummy variables for tillage methods used, age of the farmer, education level of the farmer, gender of the farmer, a dummy variable for the type of power source, the land tenure i.e. whether the farmer owned the land or rented it and a set of dummy variables for extension services.

It was expected that farm size, production costs, farm location, interaction between production costs and farm gate price as well as the seed variety used would be significant. It was also expected that age, experience, level of education would have an insignificant effect on profitability. The farmers participating in conservation farming such as ridging and bunding were expected to be more profitable than those carrying out conventional farming such as hand-hoeing and ploughing.

3.3 Data Collection and Data Analysis

The data used in this study was secondary data that was collected from Food Security Research Programme (FSRP). This data was from the 2008 Supplemental Survey and it was collected by FSRP in conjunction with CSO.

All the analysis was done in Stata using data from the 2008 supplemental survey to the 1999/2000 post-harvest survey by the Central Statistical Office (CSO). Of the 8,094 households interviewed in that survey, only 187 had grown cowpeas in the 2006/07 production season. Thus, the analysis was based on those 187 households.

The regression model was subjected to a battery of specification tests, including heteroskedasticity, multicollinearity and the Ramsey's RESET test for functional form and ommitted-variable problems. None of these tests were significant. Thus, the ordinary least squares (OLS) estimator was used to fit equation.

CHAPTER 4

RESULTS AND INTERPRETATION

4.1 Introduction

This section consists of the findings of the study as well as their interpretation and discussion. It starts with a description of the demographic characteristics followed by the findings of the gross margin analysis and finally the regression findings.

4.2 Demographic Characteristics

The table below describes the demographic characteristics of the farmers who grew cowpeas and on who the gross margin analysis was carried out. It also includes the distribution of cowpeas production by province, which has an effect on gross margin and thus on profitability. Cowpeas were found to be grown in all provinces except Luapula province. Southern Province grew the most cowpeas, contributing 60 percent of total production. Figure 1 presents the contribution of each of Zambia's nine provinces to total cowpea production.

Table 1: Demographic Characteristics of Cowpea Producers

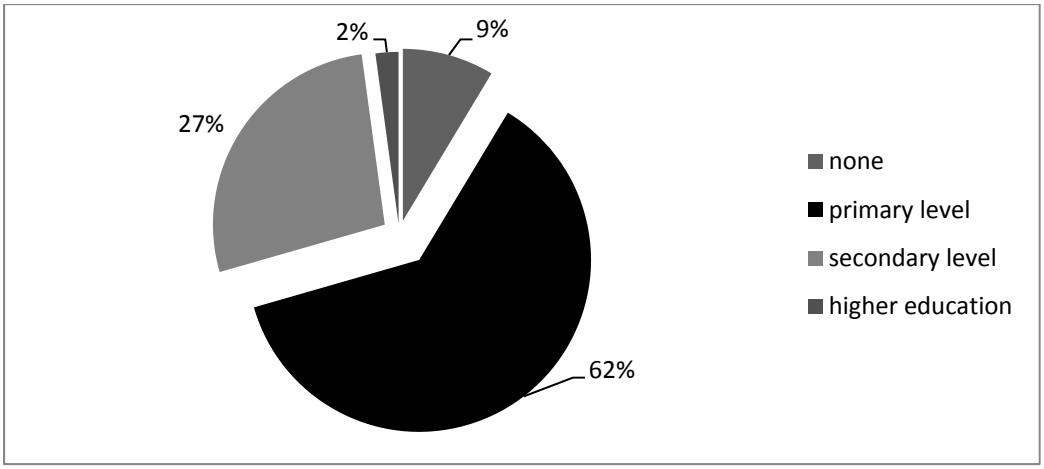
Characteristic	Category	Unit
Gender	Male	82.89%
	Female	17.11%
Age	Average	50.82yrs
Number of Household members	0-5	87.37%
	5 and above	12.63%

Source: supplemental survey, 2008.

The demographic characteristics show that on average most farmers who participated in cowpeas production were between the ages of 41-60, this may have a bearing on the gross margin and hence on profitability because the age of the farmer can translate into years of experience. Older famers have more experience and thus they may obtain higher yields compared to farmers with

fewer years of experience thus have higher gross margin and hence more profitable. The gender of the farmer was another demographic characteristic that was considered. According to the table the distribution was such that they were more male headed households compared to female headed households. Majority of the male headed households had positive gross margins where as majority of female headed households had negative gross margins. Among the demographic characteristics another factor that was considered to have an influence on profitability was the level of education of the famer. The distribution of the level of education of the farmers who grew cowpeas is shown in the figure below

Figure 1: Level of Education of Household Head

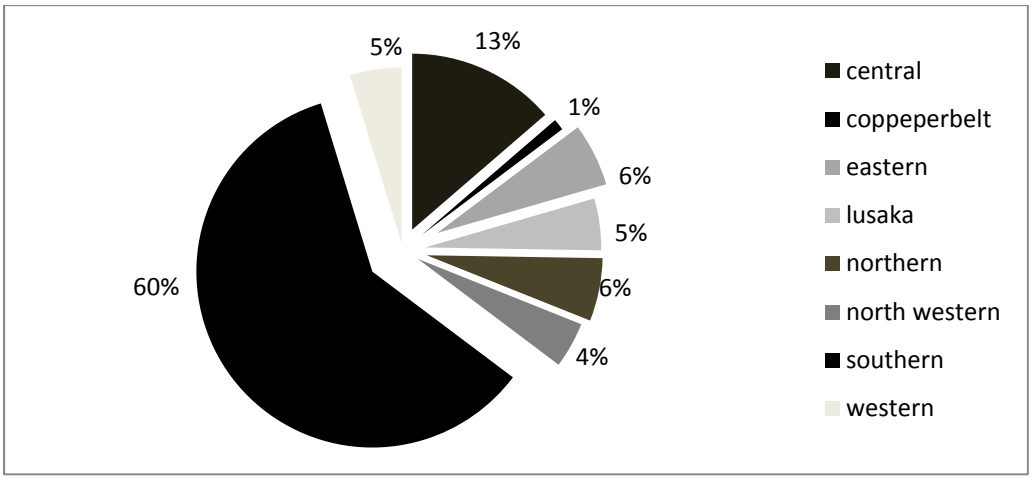


Source: Supplemental survey, 2008

Majority of the farmers who grew cowpeas only had primary level education as shown by the distribution in the figure above. According to the analysis results majority of the farmers who had primary and secondary level education had positive gross margins where as those who had tertiary level education all had positive gross margin and the majority of farmers who had no formal education had negative gross margins. Thus attainment of formal education may have a bearing on gross margin and thus on profitability.

Another interesting demographic characteristic that was considered was the distribution of cowpea production among provinces. The distribution of production is shown in the figure below.

Figure 2: Production Distribution by Province



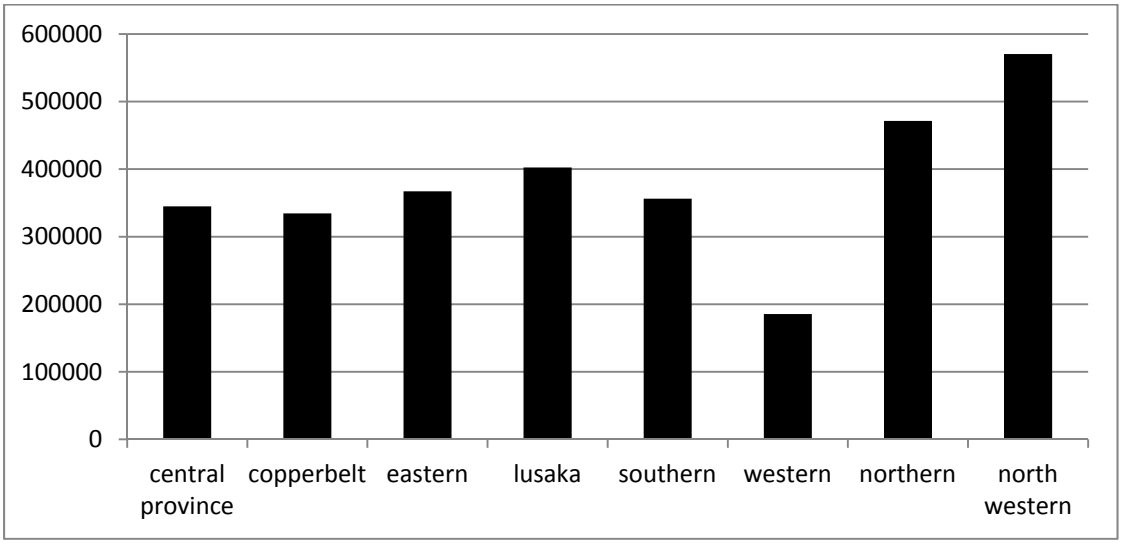
Source: supplemental survey 2008

According to the figure above Southern Province has the highest production of cowpeas which accounts for about 60%, where as Copperbelt had the least production accounting for about 1%.

Luapula province did not produce any cowpeas at all.
Perhaps Southern Province has the highest production of cowpeas due to the fact that in times of drought farmers in the province were encouraged to grow cowpeas because it is a drought resistant crop. Thus eventually cowpea was adopted as a traditional crop in the province.

The distribution of cowpeas among the provinces has an implication on the gross margin and hence on the profitability of production. This is because the quantity supplied affects the price of the cowpea grain. According to the laws of demand and supply, higher supply of a commodity leads to a lower price (Ahuja, 2006). Thus provinces that have a higher supply such as southern province are expected to have a lower price and this will greatly affect gross margin. According to Edward, undated commodities that have a higher price tend to have higher market value. Thus a higher price is expected to lead to a higher gross margin. Thus it is expected that the distribution of gross margins among the provinces will be different. The figure below shows the distribution of the mean gross margin by province.

Figure 3: Distribution of Mean Gross margin by Province



Source: analysis results 2011

According to the figure above, the highest average gross margin was found to be in north western followed by Northern Province. This could be explained by the fact that since production of cowpeas is low in these provinces supply tends to be lower; hence the price is higher thus raising the market value of cowpeas. Western province had the lowest average gross margin followed by Southern province which is to be expected because it has the highest production, thus the price in southern province is expected to be lower hence lower market value. Thus the low price means that the cowpeas are valued at a lower price compared to the other provinces. Central, Copperbelt, Eastern and Lusaka provinces had more or less the same average gross margin. This can be explained by the fact that these provinces had similar prices of cowpeas and thus the cowpea was valued using a similar range of prices in each province.

4.3 Gross Margin Analysis

Out of the 187 households on which the gross margin was done the minimum gross margin was found to be about -K1, 570,196, where as the maximum was about K5, 480,000. 81 households had negative gross margin were as 106 households had positive gross margin The average gross margin was found to be K1, 140,639. This information is shown in the table on the next page.

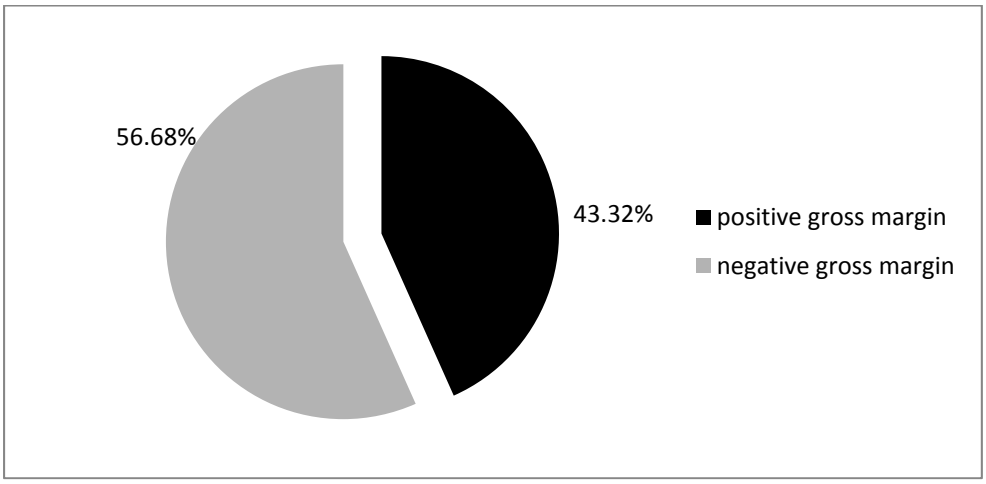
Table 2: Gross Margin Output

Variable	Obs	Mean	Std.Dev	Min	Max
Gross Margin	187	1140639	602934	-1570196	5480000

Source: analysis results 2011

The distribution of gross margin was such that 81 households had negative gross margin where as 106 households had positive gross margin. This is shown in the pie chart below.

Figure 4: Distribution of Gross Margin by Household



Source: analysis results 2011

On average the farmers who had positive gross margin tend to grow in regions that have low supply of cowpeas. This results in higher value of cowpeas because the low supply leads to a higher price. Majority of these farmers also tend to sell their cowpeas to the market outside the district these farmers sell at higher prices and thus tend to have positive gross margins compared to farmers who barter their cowpeas to neighbors or use all of it for consumption. The farmers with positive gross margin on average had some level of formal education were as most of the farmers with negative gross margin had no formal education at all.

4.4 Regression Analysis

The model was found to be significant at 5% this, means the model explained the variation in gross margin satisfactorily. The farm-gate price, quantity harvested, area planted, costs and land tenure were found to be significant at 95% confidence. This was consistent with literature that was reviewed in this study. A study that was done on profitability of sorghum in Tanzania showed similar results on the significant variables (Erbaugh, 2008)

The farm gate price had a positive relationship with gross margin i.e. increasing the price would increase the gross margin., This was expected because the price greatly affects the market value of any item thus a higher price is expected to lead to higher revenue and therefore a higher gross margin. Increasing the area of cowpeas planted would reduce gross margin with 95% confidence. This was not an expected result because according to literature that was reviewed in this study area had a positive relationship to the gross margin. For example a study that was done on the profitability of bananas, it was found that increasing area planted would increased the gross margin(Bagamba,1998). The price of a commodity is one of the most important influences on profitability (Ahuja, 2006). As discussed above provinces which had lower prices had lower gross margins and were less profitable compared to provinces that had higher prices.

Increasing the area planted is expected to increase yield which should lead to increased gross margin. However this negative relationship between area and gross margin maybe attributed to the fact that the area was not used efficiently thus increasing area of cowpeas planted would not actually lead to increased production. Quantity harvested also has a positive influence on gross margin at 95% confidence. An increase in yield has a positive relationship to gross margin because increasing the quantity harvested increases the number of kg's that can be valued. This result is similar to findings on a study on the market value of rice production that was done in Malaysia (Elm Farm Research Centre Bulletin, 1999)

Owning land had a positive relationship to gross margin. Owning land was found to increase gross margin compared to renting land. This is consistent with literature because according to

Boehlje in Farm Management, farmers who have high cash rent tend to have higher costs thus lower gross margins compared to those who own their own land. Thus explaining why owning land would increase gross margin compared to renting land. Costs as to be expected had a negative relationship to gross margin because as the costs of production increase more revenue is used to cover costs rather than to contribute to gross margin.

Table 3: Regression Output Significant Variables

Gross margin	**coeff**	**Std error**	**t**	**P> |t|**	**(95% conf.interval)**
Farm price	104.58	21.90	4.74	0.000	60.60 147.17
Qty harvested	17960.22	2118.82	9.59	0.000	16132.7 24505.43
Area	-81890	25087	-3.43	0.001	-1.36 -36514
Costs	-3270	1470	2.25	0.019	-2440 - 6227
Own-Land	20700	40434	6.31	0.000	10657 37423

Source: analysis results 2011

Table 4: Regression Output Insignificant Variables

Gross margin	coef	Std.error	t	P>|t|	[95% conf. interval]
Extension	-492,525	332197	-1.48	1.46	-1163921 178869
Ridging	118,6291	793481	1.50	0.143	-417394 2789977
Own anim	-458,762	399677	-1.15	0.258	-1266540 349015
Hired anim	-392119	446584	-0.88	0.385	-1294701 510461
hand hoeing	-65,106	401566	-0.16	0.872	-876703 556490
Primary	218,953	360276	0.61	0.547	-509193 947099

Regression Output Insignificant Variables (continued)

Gross margin	coef	Std.error	t	P>|t|	[95% conf. interval]
Secondary	218,953	357985	-0.24	0.813	-808743 638287
College	-85,227	714008	1.50	0.142	-373544 2512587
Male	1,069,521	345509	0.14	0.886	-648294 748305
-cons	-510,379	563966	-0.9	0.371	-1650199 629439
Age	1,732	1685	1.03	0.311	-1685 5151
Recycled	-139,161	576452.2	-2.41	0.197	-2556672 -226565
Opv	-574,519	160542.8	-3.58	0.231	-8989988 -750050
Hybrid	-783,747	217658.2	-3.60	0.510	-1223651 -843843
Ploughing	1,287,224	152511.2	8.44	0.345	1378987 1595460

Source: analysis results 2011

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter starts by concluding based on the findings, in order to answer the objectives of the study. This will then be followed by recommendations that can be drawn from the findings and conclusions of the study.

5.2 Conclusions

Cowpea production was expected to be profitable owing to the fact that it's low cost crop to produce and it has a conversion ratio i.e. high output can be expected from the input, this is also the case in literature. In this study most of the farmers that grew cowpeas were found to have positive gross margins and the average gross margin was also found to be positive. Gross margin in this study was used as a proxy for profitability, thus based on the findings it can be concluded that cowpea production in Zambia is profitable.

According to literature as well as theory there are many factors that influence or affect profitability of any enterprise. In this study the gross margin (proxy for profitability) was regressed on many variables in order to identify the factors that affect profitability of cowpea production and it was found that farm gate price, quantity harvested, area, costs of production and land tenure have a significant effect on gross margin. Farm gate price, quantity harvested and land tenure were found to positively influence gross margin were as area and production costs had a negative influence on the gross margin. Thus based on these findings, these are the factors that affect profitability of cowpea production.

5.3 Recommendations

Based on the results more farmers should be encouraged to grow cowpeas not just as a subsistence crop but as a cash crop. This would generally improve the living standards of the farmers because their incomes would be increased. Since Zambia has numerous small holder

farmers improvements in their living standards would increase the welfare of the country as whole. Increasing production of cowpeas would also improve nutritional status not only of the farmers who grow the cowpeas but also of the people who purchase and consume it.

In light of the above recommendation it would be beneficial to increase effort in the development of markets for cowpeas as well as other leguminous crops as well as development of a sustainable value chain. Value addition of cowpeas should also be considered as well as production of raw materials from cowpeas that could be used in industry. For instance, cowpeas are rich in proteins hence it can be used as a raw material for production of feed for animals. Cowpeas can also be processed into other forms that would make it more attractive and palatable to much of the population, however this would require more research.

Thus there is an urgent need for research on various aspects of cowpeas not just on agronomic properties but on aspects such as consumer preferences, market dynamics, production efficiency, e.t.c

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