

**SMALLHOLDER FARMERS' ACCESS TO CREDIT AND FARM LEVEL  
PRODUCTIOIN; A CASE STUDY OF MUMBWA COTTON OUTGROWERS**

**By**

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## **LIST OF ABBREVIATIONS**

CSO	Central Statistical Office
EU	European Union
EDF	European Development Fund
MACO	Ministry of Agriculture and Cooperatives
IDL	In Development Limited
SHCF	Small Holder Cotton Farmers
SPS	Statistical Package for Social Scientists
OLS	Ordinary Least Squares
NAP	National Agricultural Policy
FNDP	Fifth National Development Plan
HHD	Household Head
ZDA	Zambia Development Agency
ZMK	Zambian Kwacha

## **ABSTRACT**

### **SMALLHOLDER FARMERS ACCESS TO CREDIT AND FARM LEVEL PRODUCTION; A CASE STUDY OF MUMBWA COTTON OUT GROWERS**

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Liberalization of financial markets in the 1990's under the structural adjustment programme created problems among small-scale farmers particularly in rural areas, who up to now have limited access to credit and find it difficult to borrow from commercial financial institutions. The contract farming arrangement is one of the initiatives that have continued to provide agricultural credit to smallholder farmers. Regarding contract farming in Zambia, the cotton sector is ranked first in terms of the number of small holders involved and hectares cultivated. Smallholder cotton farmers are provided with inputs and an assured market for their produce. The time taken to produce the crops from planting through to harvesting implies a need for liquidity such that all production costs can be met. Farm household characteristics determine the liquidity position of a farm household and ultimately the production that results after accessing inputs on credit. However, there is lack of empirical evidence on whether access to credit through contract farming by smallholder cotton farmers successfully relaxes the liquidity constraints they may face and whether this credit significantly enhances level production.

This study was conducted in Mumbwa district of the Central Province of Zambia. It was aimed at assessing if access to credit by smallholder farmers through contract farming successfully relieves them of their liquidity constraints given the different household characteristics they possess and the terms and conditions of the credit. A probit model was used to determine the factors that affect the liquidity position of a farm household. Household characteristics that were found to be significant in influencing the liquidity position of farm households include; age of household head(p value=0.000), sex of household head(p value=0.023), number of household members between 31 and 40 years of age(p value=0.031), value of credit obtained(p value=0.002), number of household members providing family labour(p value=0.000), ability to produce grade A cotton(p value=0.000), conditions of the credit; prohibitive or non prohibitive to profit making(p value=0.000) and value of assets owned(p value=0.007) at 95 percent level of significance. The Heckman two stage model was used to determine the factors that significantly affect farm level production given the liquidity position of a farm household. The factors found significant include; the value of credit (p value=0.000) and units sold (p value=0.000) at 95 percent level of significance.

Only the public sector can go a step further to meet the liquidity constraints of SHCF. A government programme with social other than corporate goals would solve liquidity constraints and significantly increase farm level production. This form of credit provision at farm level should be formulated to address the issue of insufficient farm labour. The targeting criteria used by the out grower companies should consider the household characteristics. A public sector initiative that would be targeted at female headed households, younger farmers and vulnerable in rural cotton producing communities would address the situation

## **CHAPTER 1: INTRODUCTION**

### **1.1 Background**

Zambia's agricultural credit system after independence had been dominated by a number of government institutions. In the 1990's the Zambian economy underwent liberalization under the structural adjustment programme. Due to the liberalization of financial markets, state owned firms that provided credit to small holder farmers were liquidated. Consequently a vacuum was created in agricultural financing in the 1990's. This vacuum created problems among small-scale farmers particularly in rural areas, who up to now have limited access to credit and find it difficult to borrow from commercial financial institutions (National Agricultural Policy, 2004).

In order to address the problem of lack of access to credit, the Zambian government in the 1990's approached different foreign donor communities for funds to borrow so as to subsequently lend to the private sector. These included the Enterprise Development Fund (EDF), financed by the World Bank and the Export Development Programme funded by the European Union among others. In addition, there have also been other innovations both by the private and government sectors to provide agricultural credit to smallholder farmers (SHF) such as contract farming and different farmer input support programmes. Whereas Government policy encourages contract farming in an effort to alleviate poverty in rural areas where the majority rely on agriculture as their major source of income, there is lack of empirical evidence on whether access to credit through contract farming by SHF successfully relaxes the liquidity constraints they face and whether this credit significantly enhances farm level production.

Contract farming is an initiative aimed at providing farmers with agricultural credit and an assured market to sell their produce. Though a market is provided, the smallholder farmers are subject to conditions that the credit provider at the same time the buyer sets. For instance, the produce is valued based on the standards set by the contracting firm and the value of the credit offered is based on how much the lenders determine they should offer a particular farmer not based on how much one may want to borrow. However, in agriculture, farmers have to meet other operational costs in addition to the inputs acquired on credit. Besides, the biological lag between planting seeds and harvesting of crops implies a need for liquidity. Farmers who lack

sufficient liquidity are usually unable to manage farm resources in an optimal manner, tend to use fewer inputs, often achieve lower yields and net revenue (Winter-Nelson et al, 2005).

In Zambia cotton production by smallholder farmers can be ranked first in contract farming both in terms of the number of small-scale farmers involved, as well as the hectares cultivated (Likulunga,2005). The production areas are located in all the provinces of Zambia. There are about 280,000 smallholder cotton farmers cultivating cotton on contract arrangements with various out grower companies, cultivating more than 254,000 hectares. The majority of smallholder cotton farmers taking part in contract farming are located in the Eastern province, comprising about 65 percent of the total number of cotton farmers in Zambia, followed by the Central province (CSO, 2009). In the 1990's the yields of cotton averaged around 30,000 metric tonnes with a smallholder farmer participation of about 30,000 households. Following privatization of the sole parastatal Lintco in the mid 1990's, the yields increased to over 100,000 tonnes in 1998. However, fluctuations in world prices of cotton have led to cyclic production trends. An all time peak was reached in 2005, when more than 180,000 metric tonnes were produced. A significant drop was then recorded in 2008, when about 100,000 metric tonnes were produced (Kabwe, 2009). Privatization led to more private sector participation in cotton production with an increased number of smallholder farmers getting involved through contract arrangements.

In rural agricultural communities, liquidity is a major problem in commodity production particularly for smallholder farmers due to the fact that formal credit from lending institutions is not readily available (IDL Group, 2002). When credit is provided, it has terms attached to it. Hence the necessity to find out whether this credit favours the lenders or if at all there are benefits that accrue to the smallholder farmers at the end of an agricultural season. Access to both short term and long term credit is important if farm level production is to improve. However, access to credit alone may not be the solution to relieving the financial constraints, but credit should be affordable and provided for in sufficient amounts that can successfully relieve small holder farmers of the liquidity constraints they face in order to enhance growth in production at the farm level (IDL Group, 2002).

## **1.2 Problem statement**

Access to short-term and long-term capital has been cited as one of the major constraining factors affecting smallholder cotton production in Zambia. This is as result of limited financial resources for agricultural credit, high interest rates and transaction costs that make it difficult for smallholder farmers to access credit from local commercial banks (IDL, Group, 2002). Whereas institutions such as contract farming arrangements have developed that provide credit to small holder farmers with conditions not as prohibitive as commercial banks, it remains unclear whether the credit provided completely solves the liquidity constraints they face and if it enhances farm level production to a significant level.

Besides, the effects of access to credit on farm level production and the relationship between farm household characteristics and the liquidity position of a farm household also needed to be investigated for smallholder cotton farmers in such credit arrangements. Furthermore, there was need to determine whether the nature of the terms and conditions of the credit affect the liquidity position of a farm household and ultimately farm level production. Recent research in Tanzania done by Winter-Nelson et al in 2005 focused on how increased access to credit would affect the production and income of farm households that are liquidity constrained. Similar research by Oyedele et al in 2009 in Nigeria focused on how farm household characteristics act as determinants of a farm liquidity position. Both researches did not in any way try to establish whether the terms and conditions of the credit offered to farmers do in any way affect the liquidity position and ultimately farm level production. It was therefore necessary to find out whether the liquidity constraints faced smallholder cotton out growers are fully solved after accessing credit and how farm level production is affected taking into consideration the terms and conditions of the credit.

## **1.3 Objectives**

### **1.3.1 General objective**

This study aims at determining how farm household characteristics affect liquidity, effects of access to credit on liquidity and farm level production considering the terms and conditions of the credit.

### **1.3.2 Specific objectives**

- i) To find out if farm household characteristics affect the liquidity position of cotton farm households.
- ii) To establish whether the terms and conditions of the out grower schemes that small holder cotton farmers participate in affect liquidity
- iii) To determine whether access to credit successfully solves the liquidity constraints faced by smallholder cotton farmers.
- iv) Effects of access to credit on farm level production of the SHCF.

### **1.4 Study hypotheses**

- i) Farm household characteristics do not influence the liquidity position of a farm household.
- ii) The nature of the terms and conditions have no effect on SHCF liquidity
- iii) Having access to credit does effectively relieve smallholder cotton farmers of the liquidity constraints that they may face.
- iv) There is no significant effect of access to credit on farm level production of SHCF

### **1.5 Rationale**

Non-traditional cash crops have become an important source of income to Zambia in the recent past. The various governments that have existed since the collapse of copper prices in the 1970's have focused on agriculture diversification. This has been so due to the Governments' realization of the strong linkages that exist between agriculture and poor people's livelihoods. However, after economic liberalization in the 1990's, the void that was created in terms of provision of finance affects the ability of small-scale farmers to increase production and improve their livelihoods. The small-scale agriculture sector would potentially impact poverty reduction and national economic growth, only if sufficient numbers of the rural poor are actually able to access the benefits of agricultural commercialization (The IDL Group, 2002).

The government of the Republic of Zambia (GRZ) has put in place policies and strategies to promote the development of efficient and transparent public and private sector driven marketing

systems for agricultural commodities and inputs. One of the strategies includes encouraging the establishment of financial institutions in rural areas and promoting crops for both export and domestic markets (FNDP, 2004). The contract farming strategy is one of the programmes that have proved viable in the cotton sector in providing inputs and technical support to smallholder farmers. To successfully solve the liquidity constraints of SHCF, knowledge of the nature of financial constraints faced by smallholder farmers and their farm household characteristics is required. This study generated knowledge that can help policy makers in private and public institutions prepare programmes and policies that would be consistent with financial production constraints and household characteristics of SHCF. This knowledge further helps provide insight into the reasons why credit may fail to completely relieve farmers of the liquidity constraints that they may face.

Cotton plays a significant role in Zambian agriculture since it is one of the main cash crops grown by about 280,000 small holder farm households in Zambia. Currently, about one third of the 800,000 small holders participate in some kind of out grower scheme in Zambia. Most of these (about 85 percent) are engaged in cotton production with a dependant ratio of 1 to 8 such that about 2,200,000 people directly or indirectly depend on cotton production as a source of income. Small holder farmers produce the majority of cotton lint in Zambia about 98 percent of the total annual crop (Zambia Small Holder Commercialization Strategy Report, 2007). This underscores the importance of improving the productivity of the smallholder farmer, which currently stands at 650 to 700 kg per hectare, through provision of credit that would relieve them of the liquidity constraints they face and ultimately enhance farm level production.

The Zambian Government is party to the Millennium Development Goals (MDG's) agreement that acts as a coherent frame of action aimed at achieving global development. Policies have been put in place to meet the set goals. The contract farming arrangement is one initiative that contributes to meeting goal number one; to eradicate extreme hunger and poverty by 2015. This research aims at finding out how farm household characteristics, terms and conditions of the credit provided affect the liquidity position of a farm house hold and ultimately farm level production. Knowledge generated will provide reasons why output for SHCF are as they are and what can be done to improve their livelihoods as they participate in contract farming.

Most research has focused on how credit affects the liquidity position of a farm household to enhance production; however an important factor of the terms and conditions of the credit has often been over looked. This research included this variable to find out how liquidity and farm level production is affected.

## **1.6 Organization of the Report**

This report opens with Chapter1 that highlights the background information about access to credit for small holder farmers in Zambia. It covers the problem statement, objectives and rationale of the study. Chapter 2 gives an overview of the literature and conceptual framework used in this study. Chapter 3 looks at the methods and procedures employed in this study. Chapter 4 discusses the findings and Chapter 5 concludes and provides some recommendations on policy formulation and future research on related subjects.

## **CHAPTER 2: LITERATURE REVIEW**

### **2.1 Introduction**

This chapter discusses the characteristics of SHF, nature of liquidity constraints faced by SHF, liquidity position of farm households in relation to farm household characteristics, terms and conditions of out grower schemes and their effects on farm level production and access to credit and liquidity in relation to farm level production. This will be followed by a review of literature on access to credit in low income settings with weak institutions and incomplete markets.

### **2.2 Smallholder Farmer Characteristics**

Most of Zambia's small holder agricultural producers are poor smallholders who use simple technologies (hand hoes and oxen) and cultivation practices to produce rain-fed maize, groundnuts, roots and tubers, mostly for own consumption on five hectares or less. Zambian smallholder farmers are a heterogeneous group of farmers with various degrees of commercialization potential. There are unique features of smallholder farm household characteristics. Asset composition, human and social capital characteristics, farm household characteristics, spatial characteristics such as agro ecological zones, access to roads, infrastructure, market access and proximity to population centers. Given these characteristics, some smallholder farmers are better positioned to become commercialized than others given that their characteristics affect their liquidity position and ultimately the farm level production (Zambia Smallholder Commercialization Report, 2007).

Smallholder farmers that possess necessary inputs such as land, labour, physical and financial assets are more likely to efficiently utilize their resources in farm production such that any credit offered to them is more likely to solve their liquidity constraints and enhance their farm level production. However, for poorer farmers that lack the necessary resources to efficiently engage in production activities are less likely to have their liquidity constraints solved by credit obtained. Smallholder farmers that do not possess the necessary resources may not be fully commercialized since their production remains subsistent even though they may access credit. This is so because any income earned from production is mainly used for consumption purposes and little if any is used to improve productivity. For farmers to break out of this perpetual

subsistence cycle, it is required that credit fully relaxes their liquidity constraints and improves production. Therefore, production for such poorer farmers may not significantly be enhanced by participation in such credit schemes. This underscores the fact that SHF commercialization potential depends on physical and financial assets they possess.

Zambian smallholder farmers can be classified into three broad categories according to their commercialization potential. The first group is the very poorest and most vulnerable households who suffer chronic food insecurity and require long term social protection. The second group includes very poor households that have a potential to achieve sustainable livelihoods; these in seasons of good rainfall, market a small surplus of their produce. The third group of smallholder farmers includes poor households with potential to become, or which have already become commercially oriented through access to credit from donor projects, outgrower schemes, government input credit programmes and this is the group that this research focused on.

The traditional classification of Zambian agricultural producers estimates that there are about 800,000 smallholder households and about 50,000 emergent smallholder farmer households that are commercially oriented. The commercially oriented emergent farm households are poor but potentially, or already commercially viable small scale farmers. They often have assets that are used inefficiently because of conditions such as lack of access to markets, poor infrastructure and the inability to raise small loans for investment (Zambia Smallholder Commercialization Report, 2007). Production relies on own farm labour and in some instances hired labour. In cotton production a substantial amount of inputs are purchased. Inputs include things such as fertilizers and agricultural chemicals.

### **2.3 Nature of Liquidity Constraints Faced by Smallholder Farmers**

The Zambian smallholder cotton farmers experience a number of financial problems. Among other problems they face the problem of accessing medium and long-term funds required to increase the number of hectares they cultivate. To make production more profitable it is necessary that farmers increase the number of hectares so that economies of scale are achieved. When the smallholder farmers obtain assistance from lenders there is no provision for obtaining further financing to cater for other needs that may suffice after using the financial resources or

the inputs provided on credit. In the absence of liquidity, this leads to the farmers being financially constrained in terms of operating capital (Mbewe, 2002). Because of liquidity problems, many smallholder farmers may use insufficient amounts of inputs, such as chemicals and fertilizers. Fertilizers and chemicals are important in the maintenance of cotton and horticultural plants up to the time of harvest.

Most subsistence farmers depend on rain fed agriculture to sustain their lives. There is often a period for planting in which an optimum yield can be realized. Late planting can result in poor yields. Therefore, it is important for farmers to prepare land and to plant on time in order for them to have high yields and have the produce ready on time to fetch reasonable prices on the market. However, lenders may not be aware of the period of time it takes to prepare land and the appropriate time to plant and if funds or inputs are given out late, losses are incurred due to the fact that less than optimum income is generated to cover the costs borne for the season. Liquidity is necessary in order for smallholder farmers to meet their production needs after having used the financial resources or inputs provided on credit. Resources are required to purchase inputs required to maintain the crops after cultivation and subsequent planting.

#### **2.4 Liquidity Position of Farm Household and Farm Household Characteristics**

Credit is an important factor for improving the production and profitability of agricultural farm enterprises. The effect of credit on farm level production is influenced by social economic factors, farm assets held and household demographics. These factors are important variables that influence the liquidity position of a farm household and the production that results afterwards. A study done by Oyedele et al in 2009 looked at the effects of access to credit on profitability of Nigerian farm households. It focused on three main household characteristics. These were; age of the household head, household size and gender composition of farm households. These factors among others considered were found to be significant in influencing the liquidity position of a farm household. It was found that the older the house hold head was, the more likely that the household would be liquidity constrained. It was also found that female headed households were more likely to be non- liquidity constrained than male headed households and that the older the house hold head was, the more likely that a household would be liquidity constrained. This is because female headed households and households with elderly heads earned less off farm

income than male headed households and ones with younger household heads. Hence the effects of credit on liquidity, production and profitability of agricultural enterprises are affected by household characteristics, assets held and farm household expenditure (Oyedele et al, 2009). Therefore, it can be deduced that farm household characteristics influence the liquidity position of farm house holds and ultimately farm level production.

Eswarn and Kortwol in 1986 developed a model to show that when imperfect credit markets prevail and land is used as collateral the land rich farmer can easily acquire inputs and hence use their resources more efficiently. On the other hand the land-poor farmer would use their arm resources less efficiently. Having poor initial asset endowment would mean that the poor may not efficiently produce compared to those that have enough equity. Eswarn and Kortwols' work further showed that, being poor (resource constrained) contributes to deviations from the optimal production efficiency. All this shows that asset possession can affect the liquidity position of SHF and the production at farm level. The more assets a farm household has the more likely that they will have enough equity and produce more efficiently than poorer farmers.

## **2.5 Terms and Conditions of Outgrower Schemes and Their Effects on Farm Level**

### **Production**

Contract farming is an institutional arrangement widely used in agriculture. This is an agreement between farmers and contractors for production and supply of agricultural products (Junning et al 2008). In this arrangement farmers usually agree to deliver specific commodities of predetermined quality and quantity. Contractors agree to provide production support in form of inputs, technical support and to accept the products at a predetermined price (Singh, 2002).

Contract farmers are required to grow new crops or non food crops as in the case of cotton, using unfamiliar production techniques. This usually poses higher risks than farmers are usually exposed to in the production of their traditional food crops. Support from contractors reduces such risks, however, this support makes farmers become over dependant on the contractors, reducing the probability of them graduating from the contract to production without the contract (Mc Donald et al, 2004).

The terms of credit are mainly determined by the contractors. Although the farmers may breach the contract by diverting the inputs supplied on credit by selling at a higher price elsewhere, contractors may breach the contract by setting unfair quality standards, supply low quality inputs, delay in payments, and make incomplete purchases among other reasons (Junning et al, 2008).

### **2.5.1 Risks Associated With Acquisition of Credit for Smallholder Farmers**

The contract farming initiative is such that farmers are given inputs on credit and the farmer is required to produce a specific commodity which they are to sell to the lender at a specified price. The value of the inputs supplied on credit is deducted from the value of sales and the farmer takes home the remainder of the value of output. This poses a risk to farmers in the sense that they dedicate much effort to the production of the commodity that they are contracted to produce thus neglecting the production of staples. Since the price is dictated by the lender, the farmers have to produce high quantities to make substantial profit. Farmers are obliged to deliver the commodities at the quality determined by the lenders and in instances where these standards are not met the farmer suffers a loss and remains indebted to the lending institutions.

Lending institutions may break the commitment to buy the produce or simply arbitrarily raise the standards of the commodity and farmers may fail to sell the produce in addition, lending institutions may fail to deliver inputs to farmers on time. In instances where this happens, farmers are still subjected to pay back the credit, even though quality of the produce would have been compromised as a result of untimely delivery of inputs. Besides, there are production risks in agriculture such as agricultural produce being subject to the elements of the natural environment. To grow a product up to the time of harvest requires careful and consistent care of produce especially in horticulture and crops such as cotton. Any losses in product quality as a result of factors beyond the control of the farmer are borne by the farmer; however, the farmer is still bound fully by the debt despite the losses suffered on the farm.

### **2.5.2 Farm Households' Production Choices under Risks and Uncertainty**

This section focuses on the effects of risks and uncertainty on economic behavior of peasant farm households. Empirical findings in literature conclude that deviation from efficient economic

behavior is because of the presence of risks. Eswarn and Kortwal used the expected utility framework to prove that risk preferences are influenced by resource constraints and capital market imperfections. Thus it may be concluded that risks that farmers take result from prevailing institutional arrangements and access to such arrangements. Liquidity constrained households, may make production decisions based on access to credit institutional arrangements and the nature of such arrangements. When choices at the farm level involve the sustenance of one's family, trade-offs are distorted in ways unique to the individual because one is constrained by physiological or social norms (Duflo, 2003). Farm level production decisions, after considering the risks and family circumstances an individual faces are made in a manner unique to each individual. The nature of agricultural production typically implies a need for working capital to acquire necessary inputs.

## **2.6 Access to Credit, Liquidity Constraints and Farm Level Production**

Various studies have focused on access to credit and concentrated on access to credit and liquidity constraints in developing nations. In most developing nations, there exists imperfect credit markets and this has implications on production at the micro level and ultimately on economic growth (Briggerman et al, 2009). Liquidity constraints at the household level can affect resource allocation decisions and have an impact on production. A study by Briggerman et al in 2009 focused on US farm households and looked at how access to credit affects production at farm level and at an aggregate level. The study revealed that there were significant differences in the production levels for the liquidity constrained and those that were non liquidity constrained households for both crop and animal producers. It was revealed that access to credit in itself is important in enhancing production, however the credit provided has to be enough to relieve the farmer of the liquidity constraints that they may face, irrespective of the structure of the credit market.

A study in Malawi by Hazarika et al in 2002 looked at how access to credit may affect production at farm level (plot size) and efficiency among tobacco growers in Malawi. Efficiency was defined in terms of the producer's ability to obtain the highest possible output from a given set of inputs (capital and labour). Considering that tobacco cultivation requires substantial capital requirements, it discovered that access to credit was necessary to achieve more output (quantity

of tobacco). However, the study found no evidence of a positive correlation between access to credit and production efficiency. Thus improving farmers' access to credit in Malawi would likely promote tobacco production on along the extensive margin (Hazarika et al, 2002).

### **2.6.1 Access to Credit and Liquidity Constraints**

A smallholder farm household is liquidity constrained when it lacks financial resources from any source to undertake an investment that is profitable at the prevailing interest rates, factor and output prices (Winter-Nelson et al, 2005). Because of transaction costs, risks involved in lending to smallholder farmers and insufficient funds for lending, lending institutions usually are unwilling to lend out credit based on expected income only. Credit is then subject to what is known as credit rationing. This practice entails that lenders lend less than what the borrowers are willing to borrow subject to the conditions for borrowing. In such instances access to credit is not a guarantee to relaxing the liquidity constraints faced by the borrower. Farmers with access to credit may still be liquidity constrained. Therefore, farm households with access to credit may or may not be liquidity constrained. The same is true for household without access to credit.

Access to credit is generally measured in two ways in literature, namely, membership in credit programmes and actual loan uptake. However, these measures may be unsuitable for estimating the true impact of credit access on farm level production and income. Since participation in credit programmes and loan uptake are endogenous with outcomes such as productivity and income. It is likely that ambitious farmers may seek out credit to improve their productivity and livelihoods. However, it should be noted that a farmer who is already productive may get credit from a credit agency and therefore it cannot be concluded that access to credit leads to higher production (Hazarika et al, 2002). Unlike credit programme participation and loan uptake that are related to demand for credit, the credit limit, reflecting mainly supply-side factors such as availability of credit availability programmes and the financial resources of lenders are a truer measure of access to credit (Diagne et al, 2000).

## **2.7 Access to Credit in Low Income Settings with Weak Institutions and Incomplete Markets**

This section discusses theoretical and empirical literature about access to credit in low income settings with weak institutions and incomplete markets based on different analytical frameworks.

### **2.7.1 Farm Household Production Theories**

Schultz (1964) came up with the profit maximization peasant theory. In his theory he postulated that farm households in developing nations are poor but efficient. He described the peasant production techniques as profit maximizing. Efficiency is achieved in the perfectly competitive market where producers are price takers and workers are paid according to the value of marginal product. Empirical evidence suggests however, that profit maximization has a behavioral (motivation for a household) and a technical economic content (economic performance of farm). However, the profit maximization theory has been criticized because it is more concerned with the outcome of the economic decisions and overlooks the way a farm household reaches its decisions that affect the outcome of production (Mendola, 2007).

### **2.7.2 Utility Maximization Theories**

A number of utility maximization theories have been propounded and used to explain peasant farm level production. Utility maximization theories look at peasant households as families and enterprises and therefore take into account consumption at household level in making farm production decisions. The neoclassical farm household model postulated that households maximize utility through the consumption of all available commodities, subject to resource constraints. The model showed that if all markets existed and all goods were tradable then prices would be exogenous and production decisions would be made independently of consumption decisions. However, farm households in developing countries are likely to face more than one market imperfection. This shows that production decisions made by farm households in developing nations are not made independently of consumption decisions. Though utility maximization theories explain how production are arrived at considering consumption as factor in farm production decision making, they however ignore the effects of risk and uncertainty

involved in peasant farming. The theories assume that households are risk neutral (Mendola, 2007).

### **2.7.3 Rural Credit Markets and Liquidity Constraints**

Access to credit is commonly regarded as a key requirement for economic growth and raising the standards of living in less developed rural areas. Literature points to the fact that poor households in developing nations often with agriculture as the main source of income for the rural majority, cannot obtain as much credit as they demand (Petric, 2004). Jaffee et al (1990) stated that a potential borrower is considered to be liquidity constrained if after accessing credit still remains with excess demand for credit to fully relax the liquidity constraints they may face. A credit markets' outcome is termed underinvestment if the level of investment is (borrowed funds) below the socially desirable level. However it is argued by some that though banks may be interested in lending funds to farm households in under developed rural areas, but it is not easy to do so because of the difficulty of monitoring, enforcement, information barriers and the costs of such transactions are usually high for the lending institution.

### **2.8 Conceptual Framework**

This study used various theories on farm level production that are based on decisions farmers make as a result of their prevailing circumstances. The conceptual framework of this research was based on the fact that credit is a source of finance for liquidity constrained farm households. The credit acquired is used as a means of acquiring inputs for production purposes. Whether credit is offered in terms of inputs or cash it has an effect on farm level production. Rural farm households are generally poor and agriculture is the main source of income to sustain their livelihoods. Liquidity constrained households, may make production decisions based on access to credit, institutional arrangements and the nature of such arrangements (credit conditions).

Farm household characteristics (human, technical and capital aspects) in theory are regarded as the factors that determine the liquidity position of a farm household. Access to credit in literature is generally measured in terms of participation in credit programmes and loan uptake. However, Diagne in 2002 regarded the amount of credit gotten against that which a borrower would prefer

as truer measure of access to credit. Therefore, excess demand for credit would imply credit does not fully relieve a borrower of the liquidity constraints they may face.

This study considered credit as an important aspect in farm level production. The total value of output at farm level determined the total farm level production. Farm households borrow because of being liquidity constrained. Access to credit and the state of being liquidity constrained are what determine whether a farmer will borrow or not. Therefore, a farmer should have access to credit before making the decision of borrowing or not. The lender also makes a decision of whether to give the actual value of credit asked for by the borrower or less than the amount asked for. In some instances the lender may even totally reject the request for credit. Whether the offered credit is sufficient or not, has an impact on farm level production.

In this study a probit model was used to explain which households are constrained by liquidity and those that are not liquidity constrained in their farm level production.

### **2.8.1 Switching Regressions**

Switching regression exists in two situations. Whenever the dependent variable of a model is a function of a binary regime switch or when sample selection bias exists. Sample selection bias exists when the response variable can only be observed if a selection condition is met (Miranda and Rabe-Hesketh, 2005). In either case, problems arise because standard regression techniques result in biased and inconsistent estimators if unobserved factors affecting the response variable are correlated with unobserved factors affecting the switch or selection process. Simple two-stage regression strategies have been developed to address these problems if the outcome variable is strictly continuous (Heckman, 1979, 1978).

When estimating the effects of credit and liquidity constraints, one must deal with the potential selectivity bias. Selection bias arises because respondents are not randomly assigned treatment (liquidity constrained) and control (non liquidity constrained) groups. Rather the classification in either group is dependent on the characteristics of each respondent (Briggerman et al, 2009). Also the value of output produced on the farm is affected by a binary regime switch in the model that determines the liquidity position of a farm household. The Heckman two stage procedure

using maximum likelihood procedures was employed to estimate the effects of credit on farm level production of SHCF.

Farmers who due to lack of adequate resources were restricted in purchasing of inputs or hiring labour were considered liquidity constrained. Output from the marginal probit model was used to explain marginal effects. The regression for non- liquidity constrained households was estimated the Heckman model to give an indication of how complete relaxation of the liquidity constraints would impact on farm output (winter-Nelson et al, 2005).

Farmers who are liquidity-constrained were estimated using the proxy of excess demand for finance. This excess demand was described by the function given below.

$$D^* = BZ + E$$

Where:-

- Z is a vector of exogenous variables that determine the liquidity constrained condition of farm households. These included household characteristics, human capital, financial and physical factors.
- B is a vector of parameters.
- E is a random disturbance term with mean zero and a constant variance of value one.

Although  $D^*$  was not be observed, farmers self-identification of being liquidity-constrained was used to indicate whether  $D^*$  is greater than zero for each particular farmer. D a binary dummy variable was created where  $D=1$  if  $D^*>0$  and  $D=0$  if  $D^*=0$ . Probit maximum likelihood methods were then used to estimate the following probit model.

$$Prob(D=1) = 1 - f(-BZ) + E$$

The vector Z is represented by the following function.

$$Z = f(H, P, F, M)$$

**H: Household characteristics (B)**

$H_1$ : Age of household head in years.

H<sub>2</sub>: Sex of household head: male=1 female=0 (Dichotomous variable)

H<sub>3</sub>: House hold size in number.

**P: Physical assets owned (B).**

P<sub>1</sub>: Value of physical assets owned.

**F: Financial Capital Variables (B).**

F<sub>1</sub>: Amount of credit obtained or value of inputs gotten on credit

F<sub>2</sub>: Number of credit initiatives farm is participating in.

F<sub>3</sub>: House hold expenditure per month

F<sub>4</sub>: Expenditure on inputs used in production

F<sub>5</sub>: Non Farm income: earned=1 otherwise=0

F<sub>6</sub>: Terms of credit: prohibitive=1 otherwise=0.

**M: Human capital variables (B).**

M<sub>1</sub>: Number of years of formal schooling for household head.

The production functions of smallholder farmers were represented in the following way:

Given (1), the production functions of constrained and non-constrained farmers were

Modeled in this way:

$$Y_1 = bX_1 + u_1 \text{ if } D = 0$$

$$Y_2 = bX_2 + u_2 \text{ if } D = 1;$$

Where Y<sub>1</sub> and Y<sub>2</sub> represented output from non constrained and constrained farmers respectively, X<sub>1</sub> and X<sub>2</sub> are vectors of explanatory variables and b<sub>1</sub> and b<sub>2</sub> represented coefficients that were estimated.

$$Y_1 = B_0 + B_1X_1 + B_2X_2 + B_3D_3 + B_4X_4 + B_5X_5 + B_6X_6 + B_7X_7 + B_8X_8 + B_9X_9 + B_{10}X_{10} + B_{11}D_{11} + E$$

$$Y_2 = B_0 + B_1X_1 + B_2X_2 + B_3D_3 + B_4X_4 + B_5X_5 + B_6X_6 + B_7X_7 + B_8X_8 + B_{10}X_{10} + B_{11}D_{11} + E$$

Where:

$X_1$ = Number household members.

$X_2$ = age of the household head;

$X_3$ : Sex of households' head

$X_4$ =Education level of household head in years

$X_5$ =Household expenditure per month (ZMK)

$X_6$ = value of physical assets owned.

$X_7$ = Earned Non farm income or not (1= earned, 0= otherwise).

$X_8$ = Number of credit initiatives farm is participating in.

$X_9$ = Value of credit obtained

$X_{10}$ =Value of inputs used to produce output.

$X_{11}$ =Terms of credit prohibitive=1 non prohibitive=2

E = error term

Where  $Y_1$  represented output from non liquidity constrained households,  $Y_2$  output from liquidity constrained farmers and  $B_i$  represented coefficients that were estimated. While  $u_1$  and  $u_2$  may not be equal to zero and the variance may not equal to zero, making direct OLS inappropriate. If completely identified, the model can be solved using OLS, as long as the usual conditions for OLS hold and at least one variable from  $Y_1$  is excluded from  $Y_2$ . To ensure identification, the excluded variable should be continuous and statistically significant in the probit model (Deaton, 1997).

The output of households that are not liquidity constrained ( $Y_1$ ) is expected to be lower than those that are liquidity constrained ( $Y_2$ ). The output is determined by the liquidity position of a household. Liquid households are expected to be those that own a high value of physical assets, have more income to spend on household items, receive more off- farm income, have a household head with higher education status, comprise more family members that contribute family labour and obtain a higher value of credit. These variables are expected to be statistically significant in explaining the output of the liquid households. When the liquidity constraints of constrained households are completely relaxed then it is expected that their output could be enhanced to the level of those that are not constrained.

## **CHAPTER 3: RESEARCH METHODS AND PROCEDURES**

### **3.1 Introduction**

This chapter outlines the study area, research design, sampling procedures, data collection techniques and data analysis tools that were used in this research.

### **3.2 Area of Study**

The study was conducted in Mumbwa district which is located in the Central province of Zambia. Mumbwa district was chosen because of the large number of smallholder farmers that access credit in form of inputs from Dunavant. The farmers sampled comprised of smallholder cotton farmers from Mumbwa from five camps. Farming areas targeted included: Kaindu, Kamilambo, Mphusu, Kabwanga and Sichimbizi.

### **3.3 Sampling Procedures**

Convenient sampling was used. A sample of 117 households was selected from households that grow cotton under contract arrangements in the five mentioned camps. Input distributors in each camp provided names of households to whom they supply inputs. The number selected in each area was determined by the number of smallholder farmers taking part in contract farming in that particular area to get a representative sample in each camp. A farm household was treated as sampling unit.

### **3.4 Research Design**

The research design that was used is a case study under the experimental research design. An experimental research design was used because farmers in the target area were divided into two groups based on their being liquidity constrained or non-liquidity constrained. A case study was used so as to have a deeper understanding of the factors affecting the liquidity constrained position of cotton farm households in Mumbwa district and how this affects farm level production.

### **3.5 Data Collection Procedures**

In this study, both primary and secondary data were collected. Primary data was collected from small-scale farmers using structured questionnaires. After collection of data, the questionnaires were coded. The data was then entered and cleaned in SPSS. Secondary data was collected from various organizations (e.g. Ministry of Agriculture, Zambia Development Agency and CSO among others), the Internet and relevant publications.

### **3.6 Data Analysis**

The field data collected was analyzed in SPSS to produce descriptive statistics and the output was organized using EXCEL. Heteroskedasticity may be present across households due to the use of cross sectional data. The data was tested for potential Heteroskedasticity using the Breusch-Pagan Godfrey test. Heteroskedasticity was significant at 95 percent level of significance. This was corrected for by running the probit model using robust standard errors. The presence of multicollinearity was also investigated by checking the values of the variance inflation factors (VIF) of all the variables in the model. None of the variables was found to have a VIF value greater than ten. Therefore, multicollinearity was not present. STATA was used to estimate the probit model and the Heckman model. The probit model was used to estimate the probabilities of being either liquidity constrained or non liquidity constrained while the Heckman model was used to estimate the selection equation (liquidity constrained or non liquidity constrained) and the farm level production equation.

### **3.7 Limitation of the study**

In this study problems of data collection among others were encountered. The small holder farmers interviewed were mostly subsistence farmers that do not keep records in their farm production and home management activities. Data collected on expenditures, input purchases and sell of produce was mostly based on recall memory of the farmers interviewed. The various camps are located many kilometers away from each other, reaching them proved quite costly; because of this, only 117 farmers were interviewed as opposed to the proposed 150.

## **CHAPTER 4: STUDY FINDINGS AND DISCUSSION**

### **4.1 Introduction**

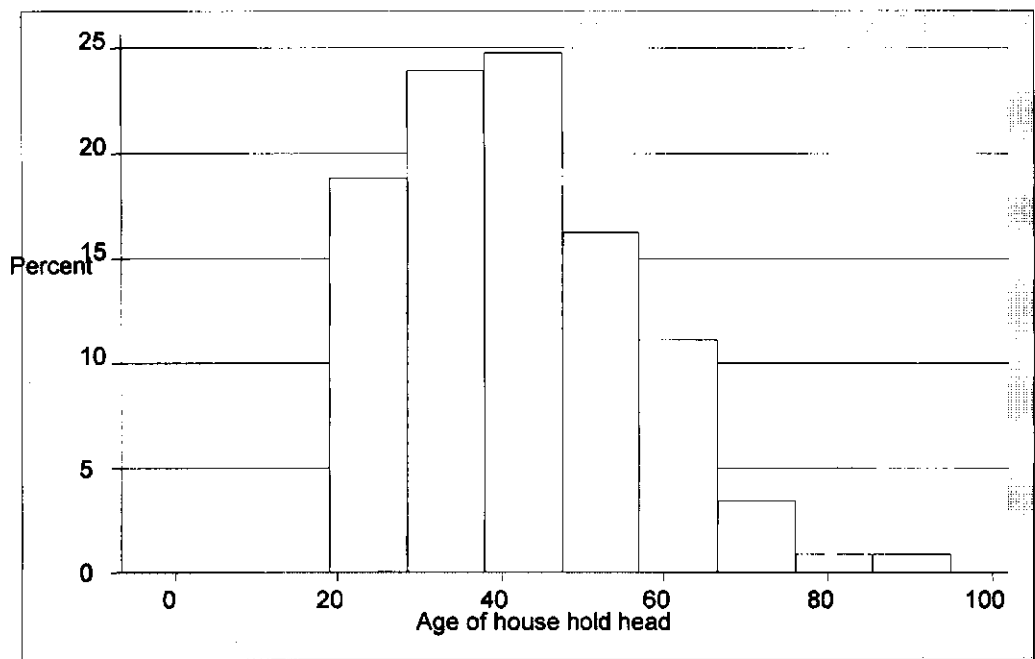
This chapter presents and discusses the study findings. It begins with a presentation and discussion of farm household characteristics of the SHCF. Thereafter, the effects of farm household characteristics on liquidity position of a farm household are discussed, followed by the effects of the terms and conditions on liquidity and farm level production and lastly, the effects of access to credit on liquidity and farm level production for smallholder cotton farmers.

### **4.2 Farm household characteristics**

This research focused on the following household characteristics; age of household in years, sex of the household head, marital status of the household head, level of education of household head, number of females and males in the household, number of household members that provide family labour, household expenditure per month (ZMK), non farm income earned, the number of credit initiatives the farm household is participating in, value of credit obtained, value of inputs used to produce output and the terms of credit prohibitive or not.

The mean age of the SHCF farm household heads participating in contract farming was found to be 42 years. The minimum age was 22 while the maximum age was found to be 95 years. The mean age of household heads that are liquidity constrained was found to be 40years. The maximum age of liquidity constrained households was found to be 74years, whereas the minimum was found to be 22 years. The maximum age of non liquidity constrained households was found to be 95years while the minimum age was found to be 25years and the mean was found to be 24 years. Younger farm household heads have fewer production assets and a smaller number of household members to provide farm labour than relatively older farm household heads. This gives an indication that age of the household head has an effect on the liquidity position of the farm household. The graph below (Figure 1) shows the distribution of the age of household heads.

**Figure 1: Graph Showing Distribution of the Age of Household Heads**



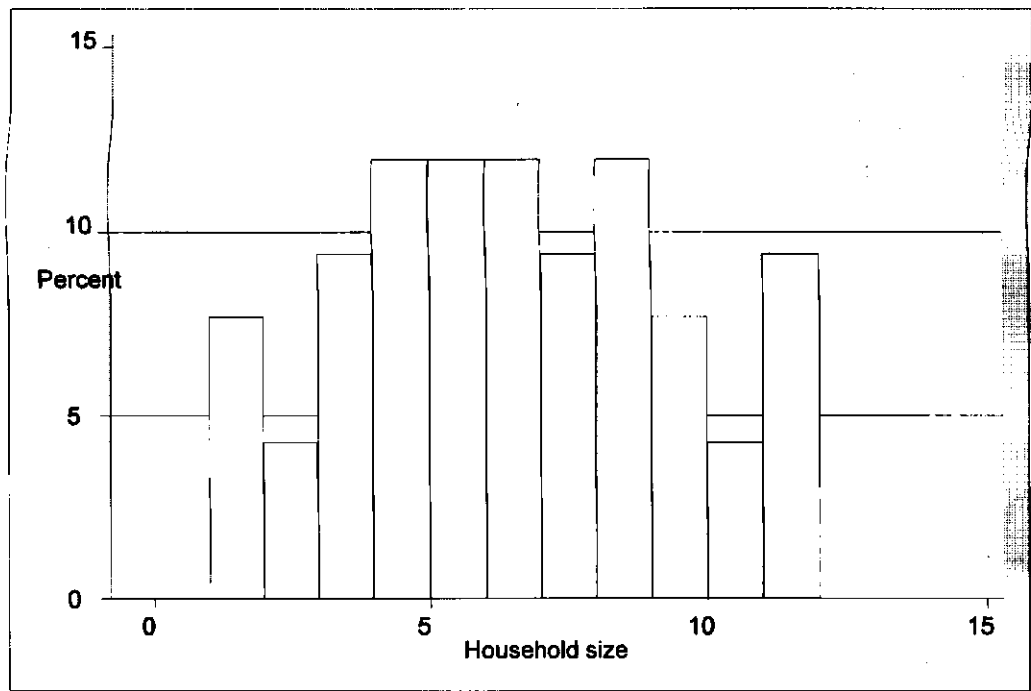
Source: Own survey data (2010)

It was observed that the majority of household heads were between 25 and 60 years of age, while few household heads are aged above sixty years. The average age for the household heads was found to be about 42 years.

**4.2.1 Household Size**

The average household size was found to be six. The maximum household size was found to be 12 members while the minimum was 1 household member. The mean household size of liquidity constrained farmers was found to be 6 members while for non liquidity constrained households the mean family size was found to be 5.9. The minimum and maximum household size for the liquidity constrained and non constrained households were found to be one and twelve respectively. The mean household size for the liquidity constrained and non liquidity constrained households are not very different from each other. Therefore, the household size may not be a reason why households belong to either group of farmers.

**Figure 2: Distribution of Household Size for SHCF.**



Source: Own survey data (2010)

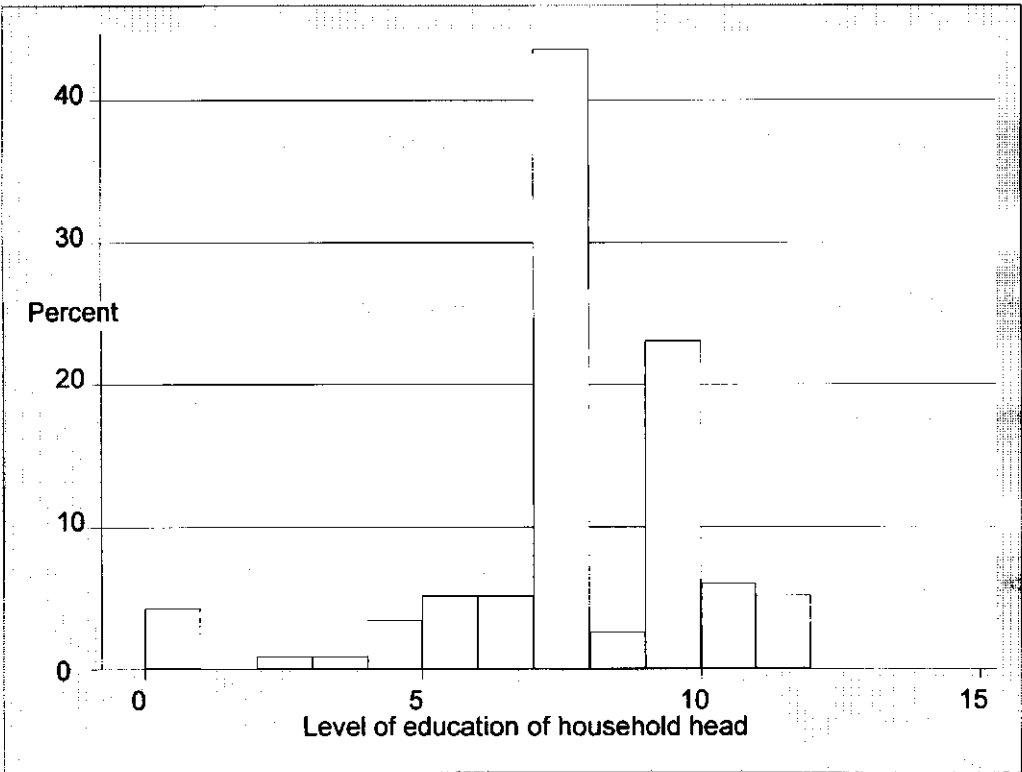
**4.2.1 Sex of Household Head**

The majority of household heads in the survey were male while the female headed households were in the minority; about 94 percent were male and only about 6 percent were female. About 62 percent of the respondents were liquidity constrained and 38 percent were not liquidity constrained. Amongst the female headed households that were interviewed, about 75 percent were found to be liquidity constrained while only 62 percent of the male headed households were liquidity constrained. More of the households that were headed by females were liquidity constrained. This could be attributed to the fact that female household heads are not in a position to earn as much farm income as their male counterparts. This was shown by the fact that about 43.5 percent of the female head households had not earned any off farm income in the previous month, while only 13.7 percent of the male household heads had not earned off farm income in the previous month. Female household heads also have to perform household chores therefore, reducing the amount of time they spend looking for alternative sources of income.

4.2.3 Distribution of Farmers by Level of Education

The farmers in the liquidity constrained group as well as the non liquidity constrained group had all on average reached grade seven (about 45 percent). However, it was noted that about 5 percent of the respondents had reached grade twelve, about 5 percent too had reached grade eight and about 24 percent had reached grade nine, almost thirty percent had been to school but never finished the primary school. It was discovered that about 5 percent had never gone school. The majority of farmers had reached at least grade seven level of education (about 65percent) irrespective their liquidity position. Level of education of household heads was found not significant in explaining liquidity and farm level production. This is because there were no differences in the level of education for either group of farmers. Farmers generally had gone through primary school. Liquidity cannot be explained based on level of education, unless significant differences can be found among the two groups of farmers to explain their liquidity position.

Figure 3: Level of Education of Household Heads



Source: Own survey data, 2010

**4.2.4 Number of family members providing farm labour**

The number of family members providing family labour ranged from one to nine. It was discovered that in about 43 percent of the farm households only two members provided farm labour. These included the household head and spouse. It was found that about 73 percent of the respondents had at most three household members providing farm labour, while only less than one percent of the respondents had at least nine household members providing farm labour.

**Table 1: Number of Household Members Providing Family Labour**

Household Labour	Frequency	Percent
1	16	13.7
2	50	42.7
3	19	16.2
4	18	15.4
5	4	3.4
6	6	5.1
7	3	2.6
9	1	0.9
Total	117	100

Source: own survey data (2010)

About thirteen percent of Liquidity constrained households had only one family household member providing farm labour, while fourteen percent of the non-liquidity constrained households had one household member providing family labour. It was discovered that about fifteen percent of the liquidity constrained and non constrained households had four household members providing farm labour. No household for the liquidity constrained households had at most nine household members providing farm labour whereas about 1.39 percent of the non liquidity constrained households had at least nine members of the household providing family labour.

Provision of farm labour is very critical in determining liquidity. A household can be big but the number of active members that provide labour is important. Also, a household may be small but if it can afford to hire farm labour and buy all the required inputs, it may be non liquidity constrained despite the fact that few household members provide farm labour. Therefore, the

number of household members providing farm labour though important in explaining liquidity was considered together with other factors in explaining liquidity at farm level.

**Table 2 Number of Household members providing farm labour**

Household labour	Non- liquidity constrained		liquidity constrained	
	Frequency	Percentage	Frequency	Percentage
1	10	13.89	6	13.33
2	32	44.44	18	40
3	10	13.39	9	20
4	11	15.28	7	15.56
5	2	2.78	2	4.44
6	4	5.56	2	4.44
7	2	2.78	1	2.22
9	1	1.39	0	0
Total	72	100	45	100

Source: Own survey data (2010)

#### 4.2.5 Household Expenditure

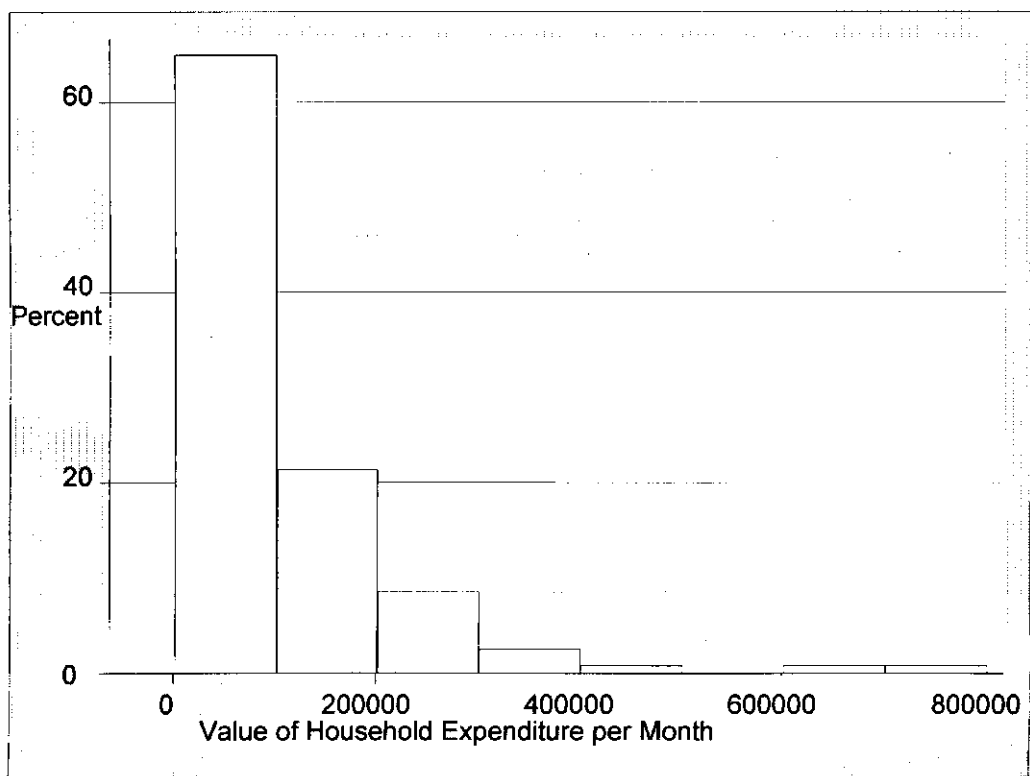
It was discovered that 20 percent of the respondents spent at least k30, 000 as household expenditure. About 50 percent of the respondents had spent at least hundred and fifteen thousand Kwacha on household consumption in the previous month. Less than 10 percent of the households had spent amounts greater than K300, 000 the previous month on household consumption. The mean household expenditure for liquidity constrained households was about K96, 000 while for the non liquidity constrained households was about K113, 000.

The higher the household expenditure, the more likely that such a household has more money to spare such that the likelihood of being liquidity constrained is less than those households that have less to spend on household necessities. Farmers who spend more income at household level have more resources than those that spend less. This explains why on average non liquidity constrained households spent more on household expenditure than the non- liquidity constrained households. The higher the household expenditure, the more likely that particular household is non liquidity constrained.

Farmers depend on cotton production as their most important source of agricultural income. The majority had spent most of their income from cotton sales on household consumption. The value of income from cotton sales determines how much is spent on consumption and on

investment in agricultural production. It was also discovered that the majority of liquidity constrained households (87.5 percent) had spent most of their income on household expenditure while 77.8 percent of the non liquidity constrained households had spent most of their income on home consumption. About 80 percent of the households had spent most of their income on home consumption. Home consumption can explain liquidity because the higher the income from cotton sales the more that would be available for household consumption and investment in farm production activities.

**Figure 4: Distribution of Value of Household Expenditure per Month**



Source: Own survey data (2010)

**4.2.6 Number of Credit Initiatives**

The majority of farmers were participating in only one credit initiative (78.6 percent), while about 20 percent were participating in two credit initiatives. Less than one percent of farmers interviewed were participating in three credit initiatives. Liquidity constrained households had about 86 percent (62) of the households participating in one credit initiative, about 12 percent (9)

participating in two and only one was participating in three credit initiatives. Non- liquidity constrained households had about 67 percent (30) of households participating in one credit initiative, about 33 percent (15) were participating in two and none at all were participating in three or more credit initiatives. Among the credit initiatives farmers participate in included the Farmer Input Support Programme (FISP) and credit offered by co-operatives. Farmers who were participating in only one credit initiative were those that were solely engaged in the out grower scheme. Those that were participating in more than one initiative included those that were taking part in the out grower scheme and also in credit arrangements of their various cooperatives.

**Table 3: Number of initiatives and liquidity position**

Credit sources	Liquidity constrained		Non liquidity constrained		Total
	Frequency	Percentage	Frequency	Percentage	
1	62	86.11	30	66.67	92
2	9	12.5	15	33.33	24
3	1	1.39	0	0	1
Total	72	100	45	100	117

Source: Own survey data (2010)

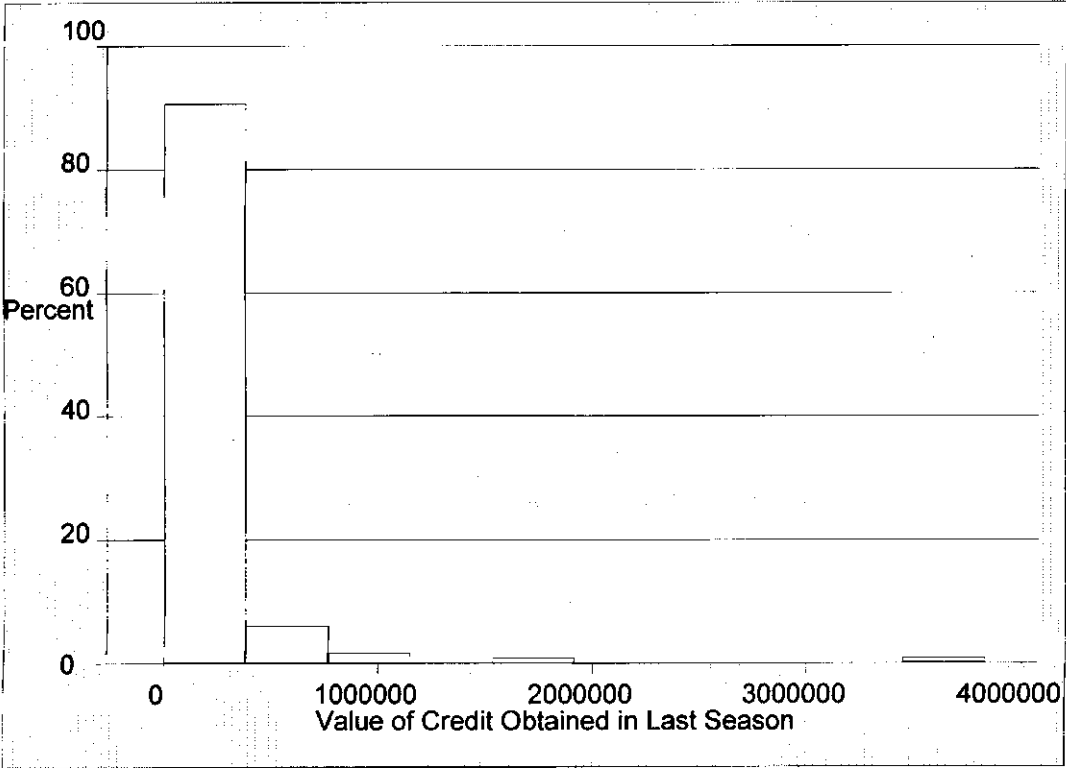
#### 4.2.7 Value of Credit Obtained

About 30 percent of the farmers had obtained credit valued at most K 125, 000, while about 54 percent of farmers had obtained credit valued at most K 154,000 and about 10% of farmers had obtained credit worth at least K375, 000. About 19 percent of liquidity constrained households had obtained credit valued at 125,000, while 5 percent of the non-liquidity constrained households had obtained the same value of credit but had their liquidity constraints relaxed. About 19 percent of non-liquidity constrained households obtained credit valued at 142,000 and had their liquidity constraints solved, however, about 15 percent of liquidity constrained households obtained the same value of credit and still remained liquidity constrained.

Almost 16 percent of non-liquidity constrained households obtained credit above K 500, 000 and had their constraints fully relaxed. It was discovered that only two people among the

liquidity constrained households had obtained credit valued above K 500, 000 but less than One million. Farmers, who obtained credit worth more than one million Kwacha, had borrowed inputs such as Cattle and other more valuable inputs. As can be seen in the graph below (figure 6) the majority of the farmers (about 90 percent) had borrowed inputs less than 500, 000 Kwacha.

**Figure 5: Distribution of Value of Credit Obtained in Previous Season**



Source: Own survey data (2010)

**4.3 Determining Factors Affecting Liquidity of Cotton Farm Households**

The probit regression model was used to assess the household characteristics that determine the liquidity position of a farm household. The output from the probit model is shown in the table 4 below. The probability of being either liquidity constrained or not is shown by the maximum likelihood estimation of the probit model. A probit model that shows marginal effects was also run to show the marginal effects that household characteristics have on liquidity. The

significance of the probability chi-square 42.53 shows that the probit model was appropriate for the determination of the probability of being liquidity constrained or not for SHCF.

**Table 4: Determining Farm Household Liquidity**

Credit sufficiency	Coefficients	Robust std errors	P<[z]	Marginal effects
Age of household head**	0.54352	0.0144	0.000	0.0093
Sex of household head**	-1.14125	0.5021	0.023	-0.3251
Household size	2.31e-6	0.0863	0.728	-0.0052
Hhd members aged 31 to 40yrs**	0.5853	0.2719	0.031	0.1006
Level of education HHD	1.1632	0.0852	0.055	-0.0281
Value of credit**	2.31e-6	7.4e-7	0.002	3.97e-7
Number of credit initiatives	0.3073	0.4568	0.501	0.0528
Housing expenditure	8.67e-7	6.14e-7	0.160	1.48e-7
Standard meet**	4.0456	0.8131	0.000	0.6668
Credit conditions**	1.1146	0.4646	0.016	0.1709
Assets owned**	4.12e-6	1.54e-8	0.007	7.06e-9
Clothing and footwear**	-0.6816	0.1689	0.000	-0.117
Family labour**	0.6816	0.1690	0.000	0.1172

Source: own survey data (2010)

Household characteristics that were found to be significant in influencing the liquidity position of farm households include; age of household head, sex of household head, number of household members between 31 and 40 years of age, value of credit obtained, housing expenditure, number of household members providing family labour, ability to produce grade A cotton, conditions of the credit (prohibitive or non prohibitive to profit making) and value of assets owned at 5 percent level of significance.

Age of the household head significantly affects the liquidity position of a farm household in a positive direction of SHCF households at 5 percent level of significance. The results show that older farmers are more likely to be non liquidity constrained than younger farmers. Probably due to the longer time they have been engaged in farming that makes them have more resources for use in production. Also younger farmers are more likely to spend more of their farm income on luxurious things and consumption items and leave little for purchasing inputs and hiring labour. This finding is in line with what was found by Oyedele et al in 2005 for Nigerian farm households were the age of the household head was found to significantly affect the credit constrained position of agricultural households in Nigeria. However, the direction of effect

differs in that their findings indicated that the older a farmer is the more likely that they would be credit constrained (have excess demand for credit). The marginal effects in this study indicate that an additional year of life raises the probability of being non liquidity constrained by about 0.93 percent for SHCF.

The sex of the household head was found to be significant in affecting the liquidity condition of a farm household. It was found that female headed households were more likely to be liquidity constrained than male headed households. The marginal effects indicate that female headed households are about 32 percent more likely to be liquidity constrained than male headed households. The ability to earn off farm income has a bearing on the liquidity position of a farm household. Though women manage credit obtained more prudently than men, they were generally found to earn less off farm income as their male counterparts. A comparison of how many female household heads had not earned off farm income revealed that more female household heads (about 43.7 percent) had not off farm income in the previous month compared to the male household heads (about 13.7 percent).

Number of family members providing farm labour was found significant but negatively affecting the liquidity constrained status. This is because an additional household member providing farm labour increased the probability of the household being non liquidity constrained by about 11.7 percent as shown by the marginal effects. These findings are in line with Oyedele et al in 2009 and Winter-Nelson et al in 2005 regarding their effects on household liquidity positions. Only household size seemingly does not have an effect on liquidity due to the fact the more household members available the more likely that enough labour will be available for performing farm duties bearing in mind that cotton is a labour intensive crop. Size of the household does not really have a bearing on liquidity but the number of household members that are active and provide farm labour is significant in explaining liquidity. A household can be large and be liquidity constrained if most members are school going children and elderly. A household can be small but be non liquidity constrained if most members are active, provide farm labour and possibly earn off farm income.

Housing expenditure, assets owned and household members between 31 and 40 years of age were found to be positively significant in explaining the liquidity position of a farm household ( $p < 0.05$ ). The marginal effects were 0.0000634 percent 0.0000078 percent and ten percent respectively. It was surprising to find out that the household size was not significant in explaining the liquidity position of a farm household. However, the number of family members providing farm labour was found significant but negatively affecting the liquidity constrained status. In that an additional household member providing farm labour increased the probability of the household being non liquidity constrained by about 11.7 percent as shown by the marginal effects.

Access to credit was initially defined as not just participating in a credit scheme but also the value of credit obtained being a truer measure of credit access. Therefore, value of credit obtained was treated as a variable to measure credit access. The value of credit obtained was found to significantly influence the liquidity position of farm households at 95 percent level of significance. The value of credit obtained was found to positively affect the liquidity position of a farm household such that the greater the value of credit obtained the more likely that a farm household would be non liquidity constrained. The marginal effects show that an additional Kwacha worth of credit would increase the probability of being non liquidity constrained by about 0.000039 percent. This finding is in agreement with Briggermans' findings for Tobacco growers in Malawi. He found that increased access to credit works at relieving farmers of liquidity constraints. However, it does not guarantee increased productivity at farm level. Increased productivity can result from other factors such as improved agronomic practices and favourable weather.

The findings show that liquidity of a farm household is determined by age of the household head, sex of the household head, assets owned, value of credit obtained (access to credit), housing expenditure, number of household members providing farm labour not just the farm size which may comprise inactive household members that do not contribute to labour provision. The number of household members between 31 to 41 comprised the majority of active family members therefore it was not surprising that these were found significant in determining liquidity of a farm household with a marginal effect of about 10 percent.

#### **4.4 Effects of Terms and Conditions of Credit on Liquidity**

The terms and conditions of the credit at the ( $p < 0.05$ ) were found to be significant in influencing the liquidity position of a farm household. The marginal effects show that SHCF that feel that the terms and conditions enhance profit making ability are about 17 percent more likely to be non liquidity constrained. It can be deduced from this that the terms and conditions of credit do have a bearing on the liquidity position of a farm household and hence an effect on farm level production. The terms and conditions of the credit affect the liquidity position of the farm households and ultimately on farm level production.

The value of credit obtained is mainly determined by the out grower company. The out grower company considers the repayment capacity of the farm household before deciding how much credit can safely be offered. About 91 percent of the non liquidity constrained households had obtained as much credit as they wanted to borrow. Whereas, only 56 percent of the liquidity constrained households had borrowed as much credit as they had required. It can be deduced from the above findings that obtaining credit to the tune of the value required by the farm household has a significant bearing on the liquidity position of the farm household. This is one important condition that affects liquidity in out grower schemes.

The liquidity position of a household is explained by the ability to produce first grade cotton and value of credit obtained among other factors. The produce is graded by the out grower company at the time of sell. Also, the quality and quantity of inputs is determined by the out grower company. Almost 96 percent of the non liquidity constrained households had the ability to produce first grade cotton (grade A), but only 33.3 percent of the liquidity constrained households were able to produce first grade cotton. The main constraint faced by the farm households is the ability to hire labour in instances where family labour cannot meet all the farm labour requirements. Therefore, most farmers failed to produce first grade cotton (A) due to their failure to provide sufficient farm labour. The terms and conditions of the out grower schemes are such that all labour is provided by the farmer. Cotton is a labour intensive crop, however, in cases where labour is insufficient there is no provision to supplement labour.

About 61 percent of the respondents felt the terms and conditions of the out growers schemes inhibited their ability to make profit while 39 percent felt the conditions were good. About 57 percent of the liquidity constrained households felt the conditions were prohibitive towards profit making and only 43 percent felt the conditions were not prohibitive. Almost 89 percent of the non liquidity constrained households felt the terms and conditions of the credit were good while only about 11 percent felt the conditions were prohibitive in profit making. The conditions affect farmers differently. Others feel that the conditions are good while others feel the conditions inhibit profit making depending on characteristics unique to each farm household.

**4.4 Effects of Access to Credit on Farm Level Production**

The farm level output is determined by independent factors that affect the output and also by factors endogenous to SHCF. The endogenous factors are the ones that determine whether a farmer is liquidity constrained or not. Therefore, it can be deduced that value of output at farm level is determined not only by independent factors that affect output(value of credit obtained, hectares cultivated, number of household members providing farm labour and units sold among others) but also on endogenous factors to the SHCF that affect the liquidity position of a farm household.

The Heckman two stage procedure using maximum likelihood methods was employed to predict the factors that affect liquidity and farm level production simultaneously. Household characteristics affect liquidity and liquidity has an effect on the resulting farm level production. The value of output produced when the household was non liquidity constrained was represented by  $Y_1$  that was observed only if  $D^*$  demand for credit is zero (not observed) i.e. credit was sufficient. The model tries to explain what the effect of credit obtained would be on farm level production given that credit obtained is sufficient to solve liquidity constraints faced by SHCF. Effects of access to credit are more appropriately measured not by value of credit obtained but by the credit limit; the extent to which a farmer accessing credit remains liquidity constrained or not. The output is given the Tables (5 and 6) below: the output in Table 6 is the selection model that explains factors affecting the liquidity position of a farm household. The output in Table 5 estimates the effects of independent variables on the value of output sold given the liquidity position of a farm household.

**Table 5: Credit and Farm level Production**

	Coefficient	Std. Err	z	P value	[95% Conf. Interval]	
<b>Value of farm product</b>						
Value of credit**	0.9114704	0.1362697	6.69	0.000	1.17856	0.64439
Number family labour	28491.26	39930.68	0.71	0.476	-49771.45	106754
Units of product sold**	1338.714	94.36774	14.19	0.000	1153.757	1523.671
Expenditure on inputs	-0.08795	0.3354	-0.26	0.793	-0.7454	0.5694
Cons	147903.1	162654.8	0.91	0.363	-170894.5	466700.8

Source: own survey data (2010)

**Table 6 Selection Model**

	Coefficients	Std error	z	p> z	95% conf interval	
<b>Credit Sufficiency</b>						
Age of HHD**	-0.0329848	0.01401	2.35	0.019	0.00551	0.0604
Sex HHD	-0.7725654	1.20508	-0.64	0.521	-3.134479	1.5893
Education of HHD	-0.1951819	0.09703	-2.01	0.144	-0.38536	-0.005
Household Size	0.542525	0.32048	1.69	0.090	-0.08562	1.1706
Housing Expenditure	1.26e-06	1.34e-06	0.94	0.348	-1.37e-06	3.88e-06
Clothing & footwear	6.97e-07	6.36e-07	1.09	0.274	-5.51e-07	1.94e-06
Number of credit initiatives	0.3441644	0.41456	0.83	0.406	-0.46842	1.1568
Household members aged 31 to 40**	0.6422	0.23862	2.69	0.007	0.17449	1.1099
Standard meeting**	2.626544	0.69428	3.78	0.000	1.265783	3.9873
females in HD**	-0.9642856	0.35609	-2.71	0.007	-1.662214	-0.266
males in household	-0.3799593	0.27586	-1.38	0.168	-0.9206	0.1607
Credit conditions**	1.324416	0.4725	2.80	0.005	0.3983	2.2506
Assets owned**	3.95e-08	1.72e-08	-2.30	0.022	-7.32e-08	-5.78e-09
Rho	-0.4610899	0.43809			-0.9200214	0.5312
Sigma	369343	48010.62			286274.6	476515.4
Lambda	-170300.4	175708.6			-514682.9	174082.2

Source: Own survey data (2010)

In the selection model the following variables were found to be significant in influencing the liquidity position of the SHCF. The assets owned, if farmer felt the credit conditions are prohibitive in profit making or not, number of females in household, ability to produce first grade cotton, number of household members between 31 and forty years of age and the age of household head.

The value of assets owned was found to be significant in influencing the value of what is produced at farm level (p value=0.022). This finding highlights the fact that assets owned affect how much one can produce and sell. Farmers that have more assets are likely to possess more

resource that can be used in production than farmers that are relatively poor. The number of females in the household was found significant in explaining the liquidity condition of the farm household (p value=0.007). Looking at the coefficient -0.9643 it affects liquidity in the negative direction. The more females a household has the more likely that that household would be liquidity constrained. This is because the females do not provide as much farm labour for cash crop production as they do on food crops. Females cannot earn as much off farm income as the male household members since most off farm income involves working away from the farm for long hours. Women do not usually engage themselves in such activities, but stay home to take care of household chores.

The age of the household head was found significant in explaining liquidity at 95 percent level of significance. The p value was found to be 0.019. The older the household head the more likely that they would be non liquidity constrained and hence more productive. The number of household members between 31 and 40 years of age was found to be significant in explaining liquidity with p value 0.007. This age group is most active in terms of earning off farm income and providing farm labour. This significance can be attributed to this fact.

In the Farm level production model the (value of product sold) the value of credit and units sold were significant in explaining the value of product sold since all their p values were found to be less than 0.05. These variables are the ones that directly affect the value of what is produced at farm level given the liquidity position of that household.

The model reflects what production is for the non liquidity constrained farmers and what it would be for the liquidity constrained farmers if credit obtained completely relaxes their liquidity constraints. Access to credits' effect on farm level production is more efficiently measured using the credit limit; the extent to which credit obtained relieves liquidity constraints since the effects of access to credit are different on a farm household depending on the liquidity position. Therefore, the effects of access to credit on non liquidity constrained households was taken in this study as a means of measuring the effects of access to credit on farm level production of SHCF.

The model is good enough to explain the relationship between household characteristics and liquidity and the relationship between farm level production and the independent factors since the value of Rho is negative. The factors affecting liquidity do not directly affect the value of output produced but affected by the status of being liquidity constrained or not. Hence the model successfully corrected for selectivity bias. Value of credit obtained was significant in explaining farm level production for SHCF. The positive coefficient on the value of credit obtained (0.9114) tells us that there is a positive relationship between the values of credit obtained and farm level production. This is the situation that would prevail if all SHCF obtained credit sufficient to relieve them of their liquidity constraints.

Access to credit alone may not be the solution to relieving the financial constraints, but credit should be affordable and provided for in sufficient amounts that can successfully relieve small holder farmers of the liquidity constraints they face. This would enhance growth in production at the farm level and improve income for smallholder farmers. The value of credit obtained has been seen to positively affect the farm level production for SHCF.

## **CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS**

### **5.1 Introduction**

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

### **5.2 Conclusions**

Access to credit in out grower schemes does not guarantee relaxation of liquidity constraints. The majority of SHCF that are engaged in contract farming in Mumbwa are still liquidity constrained (62 percent) even after accessing credit from the out grower company. Liquidity constraints were defined as the failure to purchase sufficient inputs or to hire adequate labour to efficiently produce at farm level throughout the production season. The inputs (seeds and pesticides) may provide the basics required to produce cotton. However, liquidity constrained farmers still lack the ability to purchase additional inputs required in the instances that what is provided is insufficient. Cotton production is quite labour intensive. Farmers also lack the ability to hire or provide labour sufficient labour.

Household characteristics are important factors that affect the liquidity position of a farm household. The age and sex of the household head, housing expenditure per month, ability to meet grade A, assets owned among others are significant in explaining the liquidity position. These are some of the factors that are behind the failure of credit to relax liquidity constraints of farm households. Each individual household has unique household characteristics and therefore the effects of credit on liquidity and farm level production of each household is different. The resulting output cannot be the same for each household even when the credit provided is of the same value.

It is interesting to notice that household size does not significantly explain the liquidity position of a household but family members providing labour is significant in explaining the liquidity position. This underscores the fact that the number of active family members is what affects the liquidity position not the total household size. A small family can be non liquidity constrained if

they can hire sufficient labour while a large family can be liquidity constrained if they cannot hire sufficient labour or the majority of family members are not able to provide farm labour.

Female headed households are more likely to be liquidity constrained than male headed households. Value of credit obtained and the ability of the household to earn off farm income were significant in explaining the liquidity position. Female household heads do not naturally possess the ability to earn as much off farm income as male household heads and this could be a reason why female headed households are 32 percent more likely to be liquidity constrained than the their male counterparts.

The mean age of the household heads was about 42 years, the minimum 22 years while the oldest was 95 years old. The findings indicate that the older the household heads is the more likely that they would be non liquidity constrained among SHCF in Mumbwa. An additional year of life in other words an additional year in cotton production raises the probability of being non liquidity constrained by about 0.9 percent. Farmers that have more experience in cotton production have accumulated more equity than those that are just starting out. Older farmers usually own more assets used in production. This validates the findings that value of assets owned significantly affects the liquidity position of a farm household.

The terms and conditions of the credit affect the liquidity position of the farm households and ultimately on farm level production. Farmers who felt that the terms and conditions of the credit inhibit the ability to make profit in the study were 16 percent more likely to be liquidity constrained. The terms and conditions of out grower schemes affect the liquidity position of farm households. The liquidity position of a household is affected by the ability to meet grade A and value of credit obtained among other factors. The value of credit given is determined by the out grower company and the produce is graded by the out grower company at the time of sell. The quality and quantity of inputs is determined by the out grower. Labour is provided by the farmers. These conditions in out grower affect farmers' liquidity and farm level production. They affect farmers differently. Others feel the conditions are good while others feel the conditions inhibit profit making.

The effects of credit on farm level are properly measured using the credit limit in literature. This refers to the ability of credit to successfully solve liquidity constraints faced by the credit beneficiaries. The effects of value of credit obtained on farm level production in this study were measured with reference to the non liquidity constrained group. The effects of access to credit on liquidity constrained households would equal those that are non liquidity constrained in the instances that credit provided is able to fully solve the liquidity constraints that they may face. Value of credit obtained was significant in explaining household liquidity position (in probit model) and also in explaining the value of output produced at farm level (in Heckman model).

Credit provided to have a significant effect on farm level production it should fully solve the liquidity constraints that small holder farmers face. To significantly raise farm level production and increase income of small holder cotton farmers it is important to recognize that it is not only provision of credit in form of inputs that is important but also the ability of farmers to buy additional inputs where inputs are insufficient and to hire labour where family labour is insufficient.

### **5.3 Recommendations**

Most SHCF remain liquidity constrained even after accessing. Private out growers are a business and therefore cannot meet the needs of every particular farmer. A gap has been identified in that out growers have no social goals but corporate goals aimed at profit maximization. Only the public sector through government programmes can go a step further to meet the liquidity constraints of SHCF. If production of cotton in rural communities such as Mumbwa is going to increase at farm level and significant benefits accrue to small holder farmers their liquidity constraints have to be fully relaxed. However the extent to which out growers are willing to go is mainly determined by their corporate goals.

Out grower companies do provide the basic production inputs. However, most farmers cannot hire sufficient labour the out grower companies should look in the matter of how to solve the insufficient labour for farm families that cannot afford to hire labour to help out in production. In sufficient labour is one of the most limiting factors in cotton production for smallholder farmers. A form of assistance at farm level should be formulated to address the issue of insufficient farm

labour. It is true that farm household characteristics affect the liquidity position. Credit provided by out grower companies may fail to solve liquidity constraints if farm household characteristics are overlooked in targeting the farmers. The targeting criteria used by the out grower companies should consider the household characteristics. Small families, inexperienced farmers, farmers asset base should be considered in the credit provision especially on the issue of insufficient labour.

Older, more experienced and relatively resource endowed farmers are more likely to do well in out grower schemes. A public sector initiative that would be targeted at female headed households, younger farmers and vulnerable in rural cotton producing communities would address the situation. Whereas resource endowed rural communities take advantage of the out grower arrangement, poorer resource poor cannot and in the cases that they do participate the benefits accrued are not as significant as the relatively well off famers.

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# APPENDICIES

## Appendix 1: Questionnaire

**QUESTIONNAIRE** #.....

**SMALLHOLDER FARMERS ACCESS TO CREDIT AND FARM LEVEL PRODUCTION; A CASE STUDY OF MUMBWA COTTON OUTGROWERS**

AGE 500: Research Project (Matthews Mwape)  
Department of Agricultural Economics and Extension Education  
University of Zambia

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

Instructions: Please write some answers in the tables, boxes & blank spaces provided

### HOUSEHOLD IDENTIFICATION

1.1 District.....	District Code [    ]
1.2 Block Name.....	Block Code [    ]
1.3 Camp Name.....	Camp Code [    ]
1.5 Farm Name.....	Farm code [    ]
1.4 Name of Household Head (Farmer).....	
1.5a Year the house hold head was born	[    ]
1.5b Sex of household head (2= female 1= male)	[    ]
1.6 Is the household had the main respondent? (2= No 1= yes )	[    ]
1.7 Name of the main respondent.....	
1.8 How many hectares of land do you own	.....
1.9 How many hectares of cotton did you cultivate last season	.....
Relationship of the respondent to house hold head [    ]	
(see codes on DM Table)	
Date of Enumeration.....	
1.10 Name of Enumerator.....	
1.11 Date checked.....	

### 2.0 DEMOGRAPHICS

Now would like to ask you a few questions about each of the members of your household/farm family. I will also ask about the farm manager if there is one.

n you please give the names of the members of the household? Start with the farm manager/head.		What is ...'s sex? 0=Female 1=Male	When was ... born?		What is ...'s marital status? 1=Single or under-age 2=Married 3=Divorced or separated 4=Widowed	What is the highest level of <u>education</u> attained by ...  See code below	What is ...'s <u>relationship</u> to the head?  See code below	Did ... provide farm labour the past 12 months?  0=No 1=Yes	Did ... earn any income during the past 12 months (farm or off-farm)?  0=No 1=Yes	Source income .  0=informal employment 1=formal employment
Member	Member name		Month Codes below	Year (e.g. 1967)						
ID	NAME	DM01	DM02	DM03	DM04	DM05	DM06	DM07	DM08	DM09

11=Form 4; Grade 11  
12=Form 5; Grade 12  
13=Form 6  
14=College Student  
15=Tertiary Certificate  
16=Bachelors degree

1=Head  
2=Spouse  
3=Own child  
4=Step child  
5= Parent  
6= Brother/Sister

7	Government								
8	Intermediaries (buyers)								
9	Fellow farmers or informal lenders								
10	Others (specify)								

3.2 Is the household participating in any credit initiatives either a government or private arrangements? Eg out grower schemes( contract farming or any credit arrangements)

A. Yes [ ]

B NO [ ]

3.21 If yes how many? [ ]

3.22 If you participate in more than one credit initiative please list them here

1..... 4.....  
2..... 5.....  
3..... 6.....

3.23 What is the value of credit/ inputs you obtained on credit this season? .....

3.24 Was the amount/value of credit you obtained equivalent to what you would have desired to borrow?

A. Yes [ ]

B. No [ ]

3.25 Was the credit/ inputs you obtained sufficient to meet all the production needs eg. To buy all the inputs or hire labour throughout the season as need arose?

A. Yes [ ]

B No [ ]

3.26 After accessing credit who determines the standards that the crops have to meet?

A. Lenders [ ]

B Other buyers [ ]

3.27 Do you easily meet the standards set by the credit providers?

A yes [ ]

B No [ ]

#### 4.0 FARMHOUSEHOLD EXPENDITURE AND CONSUMPTION

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

ITEM		AMOUNT (ZMK)		
School fees		1 <sup>st</sup> Term	2 <sup>nd</sup> Term	3 <sup>rd</sup> 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	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		
2	Rice		
3	Sweet potatoes		
4	Ground nuts		
5	Kapenta		
6	Fish (fresh/dried)		
7	Meat (goat ,pig, game, cattle)		
8	Chicken		
9	Beans		
10	Tomato, Onion & vegetables		

#### 4.1 EXPENDITURE ON INPUTS

VARIABLE COSTS	Unit	Amount	Cost	Source
Seed/ seedlings	Kilograms			
Basal Dressing fertilizer	Packets			
Top Dressing fertilizer	Packets			
Herbicides	Litres			
Insecticides	Litres			
Fungicides	Litres			
Labour	Man days			
Insurance				
Tractor hire	ZMK/Day			
Own Tractor	Hours			
Combine hire	ZMK/Day			

Transport packing	Kilograms			
Irrigation water	Cubic Metres			
Total Variable Costs	<b>ZMK</b>			

4.1a The resources used to finance the purchase of the inputs mainly came from

- A. Farm income from sale of farm produce [       ]  
 B. Borrowed funds [       ]  
 C. Off farm income [       ]

## 5.0 PHYSICAL CAPITAL/ASSETS OWNED

Fill in the following table about the farm's ownership of livestock and non-livestock 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. 1999)	What is the current value of all ...? (ZMK)	How many did the household have in September 2003?
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	Wheel barrow					
9	Other tractor-drawn implements					
10	Grinding mill					
11	Refrigerator					
12	Milking parlor with cement floor					
14	Residential building					
15	Milking cans					
16	Television					
18	Computer					
24	Land telephone line					
25	Mobile phone					
26	Bank account					
27	Artificial insemination equipment					
31	Lounge suit/Sofa					
32	Bed					

35	Water pumps					
38	Crop/animal Sprayer					
39	Electric stove					
40	Radio					
41	Non-residential building					
42	Kraals					
43	Scale					
44	Feed storage tank					

5.0 INCOME FROM FARM PRODUCTION

Codes	Products	Did you sale any cotton products in the last 12 months? Yes=1 No=2	Unit of products sold	Amount of product sold	Amount earned from products sold in ZMK	Who is the main buyer of the produce?	On wh are the earning mainly spent on
		PS01	PS02	PS03		PS04	PS05
1	Cotton lint						
2	seeds						
3	Others please specify						

Ps 01  
Yes=1  
No=2

Ps02  
Tonnes=1  
Others (specify)

Ps04  
Cooperative=1  
Contract farming firm=2  
Other buyers(specify)

Ps05  
Home management=1  
Crop inputs= 2  
Loan repayments=3

.....THANK YOU FOR YOUR COOPERATION.....