

**FARMERS' PERCEPTION ON COTTON PRODUCTION UNDER
LIBERALIZED MARKET ECONOMY: A CASE STUDY OF EASTERN
COTTON GROWING AREA**

BY

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**A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE
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ABSTRACT

The objective of this study was to analyze farmers' perception on cotton production in the Eastern Cotton Growing Area. Specifically, the study aimed to (i) study the status of cotton production, (ii) establish farmers' perception on cotton production, (iii) establish the relationship between farmers' perception on cotton production, farm resources and household characteristics and (iv) determine the needed changes in institutional support to revive cotton production in ECGA. A cross section survey of 160 farmers from Morogoro Rural and Kilosa districts using structured questionnaire was done. Secondary data were collected from various sources. Descriptive analyses were used to describe the respondents' characteristics. Principal Component Analysis (PCA) was used to establish perception index. Then, perception index was used in probit regression as dependent variable to determine the intensity of relationship between farmers' perception, farm resources, and household characteristics. Results show that cotton production decreased from 15 734kg in 2007 to 13 156kg in 2009 in Morogoro district and 21 895 kg to 6 650 kg in Kilosa district in the same years. Furthermore, 92.5% and 93.8% of respondents in Morogoro and Kilosa districts respectively perceived that cotton production has decreased. Also, 10.3% of land was allocated for cotton, 25.2% for maize, and 17.4% was allocated for paddy. On establishing farmers' perception on causes of low cotton production; low selling price, unreliable market, lack of credit, lack of proper private sector setup and little government involvement were found to be significant at 0.00 level. In addition, accessibility to extension services, insecticides use and gender were found to have significant influence on perception of farmers in both districts at $P < 0.01$ and $P < 0.05$ levels. Moreover, it has been found that there are significant differences in perception between the two settings. The study found that there were problems hindering cotton production in the study area. This included lack of reliable market, lack of processing machines, lack of credit and inadequate extension services. This can be solved by improving institutional support in the cotton sub-sector.

DECLARATION

I, REMIJO JOHN MPAGAMA do hereby declare to the Senate of Sokoine University of Agriculture that this dissertation is the result of my own original work and that it has neither been submitted nor being concurrently submitted for degree award in any other institution.

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The above declaration is confirmed by;

Prof. Joseph P. Hella
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Date

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DEDICATION

I dedicate this work to my beloved parents; John Galamwenda Mpagama and Spelancia Mnyalwiha Sekimbe who laid down the foundation for my education.

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LIST OF ABBREVIATION

| | |
|--------|---|
| CSRT | Cotton Sub-sector Reform in Tanzania |
| ECGA | Eastern Cotton Growing Area |
| FAO | Food and Agriculture Organization |
| FSDT | Financial Sector Deepening Trust |
| KCU | Kilosa Cooperative Unio |
| ML | Maximum Likelihood estimation |
| MOFACO | Morogoro Farmers Cooperative |
| NGOs | Non- Governmental Organization |
| OLS | Ordinary Least Square |
| PCA | Principal Component Analysis |
| RCU | Regional Cooperative Union |
| SACCOS | Savings And Credit Cooperatives Society |
| SNAL | Sokoine National Agricultural Library |
| SPSS | Statistical Package for Social Sciences |
| SSA | Sub- Saharan Africa |
| TCA | Tanzania Cotton Authority |
| TCB | Tanzania Cotton Board |
| TCMB | Tanzania Cotton Marketing Board |
| TLSB | Tanzania Lint and Seed Board |
| URT | United Republic of Tanzania |
| WCGA | Western Cotton Growing Area |
| WRS | Warehouse Receipt System |

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background Information

Cotton is a lifeline of about 40% of Tanzania's population because of its contribution to the income of producers of the crop and the country's income at large. In the 2005/06 financial year, cotton was the first forex earner among agricultural commodities followed by tobacco, coffee and sisal (Gatsby Tanzania, 2007)). Sustainable cotton farming therefore has the potential to significantly contribute to poverty alleviation as well as to socio- economic development in the country. In Tanzania cotton is grown under rain fed condition. The number of farmers growing cotton fluctuates between 350 000 and 500 000 depending on producer price paid in the preceding season, weather patterns and competitiveness of cotton against other crops (Gabagambi, 1998). Therefore, a further increase in seed cotton production is central to the development of the sector (Gabagambi, 1998).

Although cotton has dominated the cash crops landscape in cotton growing regions, production has been declining due to non-availability of assured buyers, low accessibility to credit facilities, delayed payment, non- availability of tractors leading to high cost of hiring, lack of political insistence towards cotton growing, breakdown of ginneries, low use of purchased inputs and hence most farmers have shifted to other crops which are also considered as cash crops and hence declining trend has been observed in recent years (TCB, 2008).

According to Stephen (2007) cotton production is dependent upon external inputs such as fertilizers, and is relatively capital intensive. It therefore requires a high degree of support in the form of credit facilities, efficient distribution of inputs, timely payment to farmers

and all of which have been lacking significantly. Despite of the importance of the crop in an economy, the overall production of the crop have continued to show declining trend overtime especially in Eastern Cotton Growing Area. In Tanzania cotton is grown in two zones which are the Western Cotton Growing Area (WCGA) which comprises Mwanza, Shinyanga, Mara, Tabora, Singida, Kagera and Kigoma regions which produces about 95% of the crop, while the remaining is produced from the Eastern Cotton Growing Area (ECGA) which includes Morogoro, Pwani, Mbeya, Iringa, Arusha, Kilimanjaro and Tanga regions (Gabagambi,1998).

As it is observed in Fig.1, there was high production of seed cotton in 1991/92 in both WCGA and ECGA. This increase in production was caused by well distributed rainfall and favorable seed cotton prices, which led the farmers to plant more cotton and pay more attention to crop husbandry where as low cotton production in 2006/2007 in the ECGA was caused by lack of assurance of price of the crop and inputs such as insecticide and the buyer of the crop. It is perceived that lack of assured prices, cotton buyers and inputs as one of the constraints in cotton production. However, the ECGA has fertile soils and large arable land which are currently not fully used. As observed by Tanzania Gatsby Trust (2007), major market failure due to reform which occurred in 1980s, made cotton production in ECGA to drop significantly. For example, in 2006/07 the ECGA produced 1 317 t of seed cotton as compared to 26 554 t of seed cotton that were produced in the period 1992/ 93. Therefore, this study will strive to find out the perception of farmers on cotton production and the institutional support needed to revive cotton production.

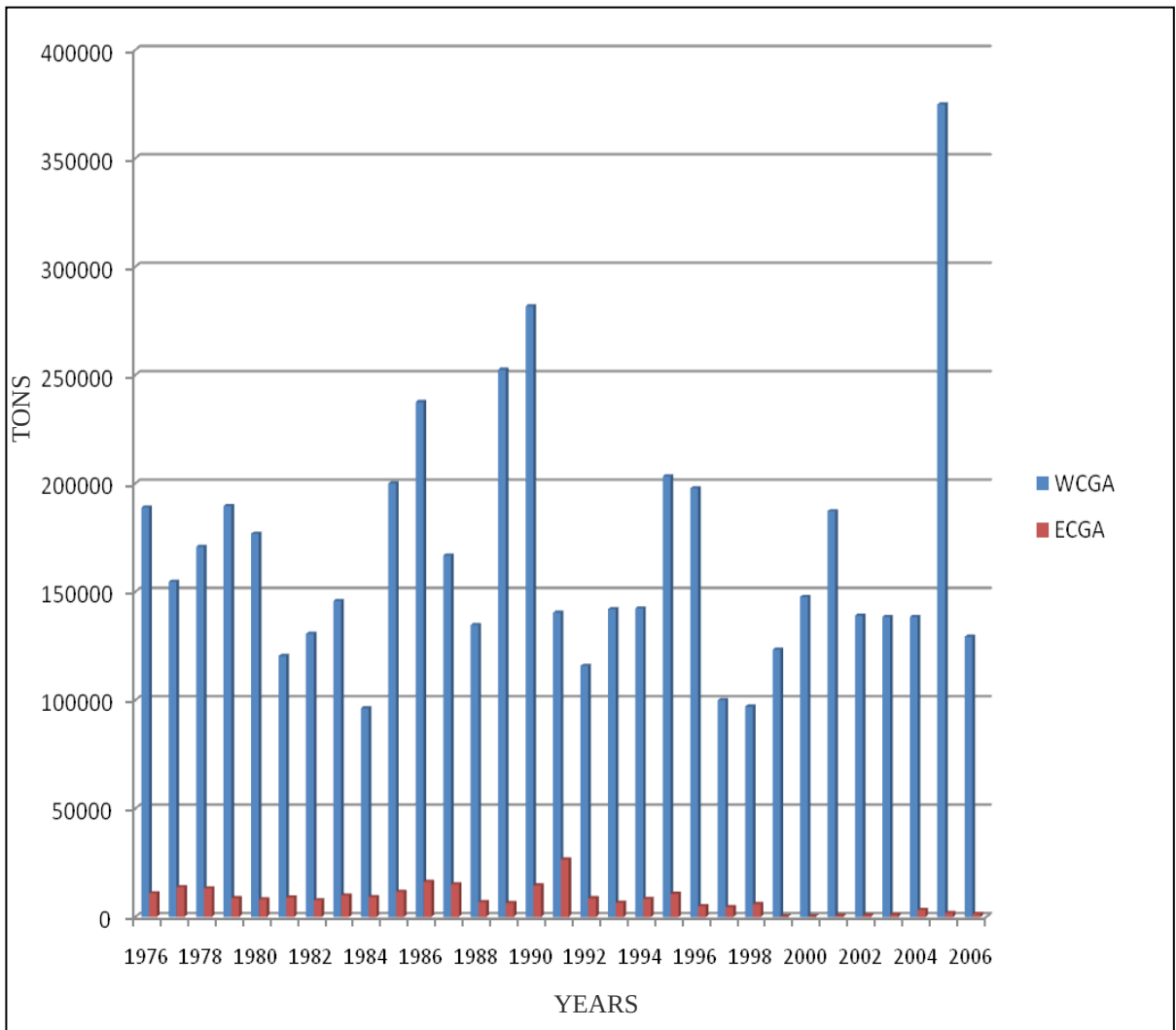


Figure 1: Seed cotton production in WCGA and ECGA (Tons)

Source: Gatsby Tanzania Trust (2007)

1.2 Problem Statement and Justification

Cotton production and marketing have gone through phases from the era when Cooperatives were dominant to Tanzania Cotton Authority (TCA), Regional Cooperatives and eventually reforms which lead into private buyers (Tanzania Gatsby Trust, 2007). In 1952, Tanganyika Lint and Seed Board were formed by the British Colonial Administration with the aim of marketing the cotton from Tanganyika (Tanzania). In 1973, Tanzania Cotton Authority (TCA) was formed with the function of promoting the development of the cotton sector. In 1976, Co-operative Unions were dissolved by the

government and TCA took over control of the cotton sector from production, buying seed cotton from farmers, ginning to the export of cotton lint (Nindi, 1992). However, in 1984 the government reinstated the Regional Co-operative Unions (RCU) through the Tanzania Cotton Marketing Act No 19 of 1984, which repealed the TCA and established the Tanzania Cotton Marketing Board (TCMB). The functions of TCMB, included exporting of cotton lint on behalf of the RCUs (Nindi, 1992).

In 1993, the government liberalized the entire cotton industry as part of the economic recovery and structural adjustment programmes. This was followed by increased private sector involvement in seed cotton buying, ginning and lint exporting (TCB, 2008). In the same year, the government promoted the Tanzania Cotton Lint and Seed Board (TCLSB) by an Act of Parliament (Miscellaneous Amendment Act No.11 of 1993). The TCLSB became the exclusive overseer of regulation of the cotton sector on behalf of the government of the United Republic of Tanzania. In 1999/2000 marketing season, the Cotton Development Fund (CDF) was established by TCLSB. A three percent levy on cotton export was paid into a trust fund and used to finance purchases of cotton seed, chemicals and research and development. In 2001, the government formed the Tanzania Cotton Board (TCB) through the cotton industries Act No 2 of 2001. The TCB replaced the TCLSB with increased functions such as promotion of cotton production, stimulation of cotton research and extension, and the collection and dissemination of information on the cotton sub- sector.

While production continued to expand, in response to these major changes, in WCGA with record increase in quantity produce from 281 711 t in 1991/92 to 374 819 t in 2005/06, it was not the case in ECGA where production declined from 26 467 t in 1991/92 to 1 317 t in 2006/07. According to Mkapa (2005), many farmers dropped

cotton and opted for other crops such as sunflower, sesame and vegetables as income generating crops. Many years have passed since farmers stopped producing cotton in ECGA. The reasons which have been mentioned are non-availability of assured buyers of the crop, low accessibility to credit facilities, delayed payment and low use of purchased inputs (TCB, 2008). However, no substantial study has been conducted to analyze farmers' perception regarding cotton production in the ECGA. Hence, there is little information on farmers' perception and its significance regarding cotton production. This study aims to examine the perception of farmers on cotton production under liberalized market economy in the ECGA. The information will help the agricultural sector to find alternative approaches needed to revive and increase cotton production which in turn will increase farmers' income and reduce their income poverty and the national income as well.

1.3 Objective of The Study

1.3.1 General objective

The general objective of this study is to analyze the farmers' perception on cotton production in the Eastern Cotton Growing Area.

1.3.2 Specific objectives

Specifically the study is thought to:

- (i) Assess the status of cotton production in Eastern Cotton Growing Area
- (ii) Establish perception of farmers on cotton production.
- (iii) Establish relationship between farmers' perception on cotton production, farm resources and household characteristics
- (iv) Determine the needed changes in institutional support to revive cotton production in ECGA

1.4 Hypothesis

Farmers' perception and decision to produce cotton is significantly independent from household farm resources and characteristics.

1.5 Organization of the Dissertation

This dissertation is organized in 5 chapters. After this first chapter, the second chapter presents the literature review. The methodology is presented in chapter three. Chapter four presents the results and discussion of the study. The last chapter (chapter 5) presents the conclusions and policy recommendations

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Conceptual Framework

Farmers are decision makers that must continuously assume the role of problem solvers in a complex production sector that has always been dependent upon many factors that are often difficult to predict or control. Furthermore, farmers are under increasing pressure of some challenges like market problems, climate change, under production, competition, quality of produce and challenges caused by the environment under which farmers operate (Baffes, 2002)

Despite of most studies on cotton production emphasizing more on the prices, price policy and market opportunity factors as the main reasons in the decline in the production trends in Tanzania, the theory suggests that, there is no single factor, which determines the farmers' decision in the production and resource allocation process (Jones and Mutuura, 1989). This is mainly because the aim of most farmers like any other entrepreneurs is to maximize profit/utility subject to the available resources and the cost of production.

The conceptual framework (Fig. 2) illustrates the relationship between household farm resources, household characteristics, farmers' perception on cotton production and the decision environment under which cotton farmers operate. It shows a way in which farmers' perception link up with decision making, choice of cotton growing basing on the available household resources, household characteristics, and the environment under which cotton farmers makes decisions.

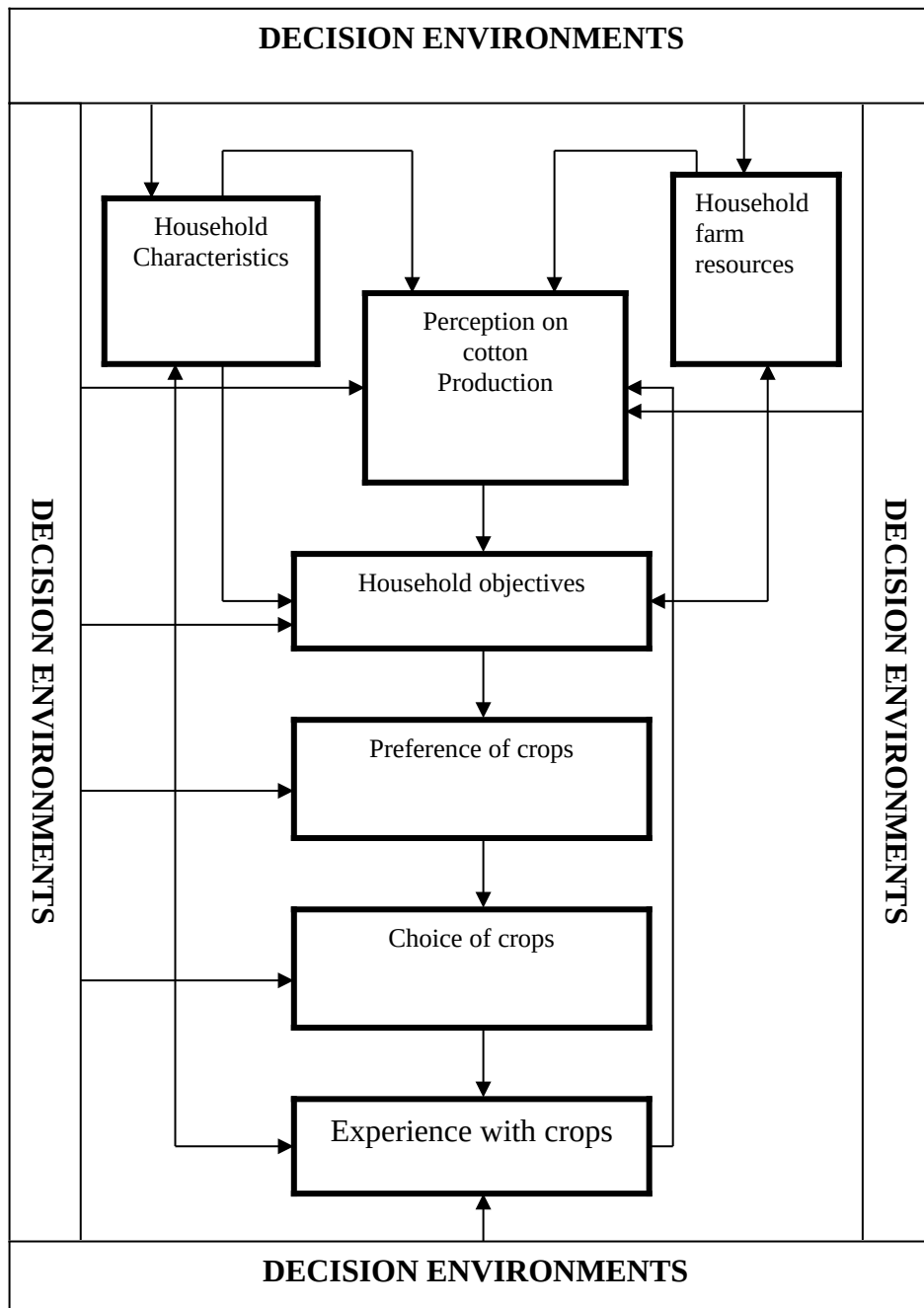


Figure 2: Conceptual framework showing different decision environments

Source: Modified from Senkondo (2000)

The elements of the decision environment which are different from one household to another influence the household farm resources and household characteristics, which in turn influence the farmers' perception on cotton production. In addition, farmers' perception influences the household objectives and ultimately the preference ranking and

choice of crop (s) to be grown which also depend on farmers' experience with that crop (s) which in most cases is associated with the age of the farmer. For instance, Schmitkey *et al.* (1992) showed that experience in crop production is mostly associated with age and play an important role in determining perception of an individual farmer.

Generally, farmers have multiple objectives ranging from livestock keeping to crop production but all these objectives are subject to the decision environment. Mainly these objectives aim at attaining utility or profit. According to Senkondo (2000) the household's objectives which play an important role in smallholder land allocation in production include productivity, profitability, security/stability, continuity/sustainability, identity, diversity, time dispersion and compatibility which again are influenced by the perception of a particular household.

2.2 Theoretical Framework

Perception is defined as how you look at others and the world around you. Being able to select, organize and interpret information starts the conceptual process. Perception affects the way people communicate with others. An individual pattern of thinking can affect the perception of others. Most people communicate best with people of similar culture (Donald, 2006). Furthermore, perception is defined as a process by which organisms interpret and organize sensation to produce a meaningful experience of the world. Sensation usually refers to the immediate, relatively unprocessed result of stimulation of sensory receptors in the eyes, ears, nose, tongue, or skin. Perception, on the other hand, better describes one's ultimate experience of the world and typically involves further processing of sensory input.

In practice, sensation and perception are virtually impossible to separate, because they are part of one continuous process. Our sense organs translate physical energy from the environment into electrical impulses processed by brain. For example, light, in the form of electromagnetic radiation, causes receptor cells in our eyes to activate and send signals to the brain. But we do not understand these signals as pure energy. The process of perception allows us to interpret them as objects, events, people and situation. Thus, perception of an individual determines the way of making decisions. Thus why decisions making of individuals on a particular aspect differs because individuals have different perceptions. Therefore, these differences in perception affect the decision in the allocation of farm resources from one individual to another. However, these differences during crop production are based on the utility and risk aspects accompanied in the production system (Donald, 2006).

As noted earlier, what farmers are doing as decision-makers is a function of their mental processes entailing perceptions. Perceptions of farmers towards utility or profit and risk aspects of an innovation affect adoption of new technologies which eventually affect production and productivity. Normally, farmers will adopt an innovation with an intention to maximize utility or profit while at the same time considering the risk attributes of that innovation (Mutabazi, 2007). Thus, in decision theory and practice, perceptions are human elements keep on changing in response to changing contexts of utility or profitability of a particular crop, risks associated with that crop and decision-makers' circumstances or environment (Mutabazi, 2007). Thus, perception is not a permanent aspect it keeps on changing depending on the prevailing situation. This scenario has been observed in cotton production where farmers stopped dealing with cotton production due to the fact that the utility accrued from this crop has decreased relative to other crops which compete for the same resources.

This is supported by Baffes (2002) despite of government considering cotton as profitable crop; farmers perceive cotton production as a risky and not profitable crop because of being not well explained in terms of the selling price, quality and timely availability of seeds and assurance of cotton buyers. Once input supply mainly chemicals, seeds and support such as credit for purchasing inputs were no longer integrated into a single cotton marketing channel, use of inputs declined sharply, loss of the single marketing channel pushed up the cost of marketing chemicals and led to a collapse in supply distribution (Baffes, 2002). According to Scott (2007) most farmers did not have access to credit and so could not afford to purchase chemicals at market prices. Therefore, due to high prices of inputs and unreliable market for the crop, most cotton farmers perceived cotton production as being associated with risk and uncertainty situation relative to other crops such as maize, paddy, sunflower, sesame and vegetables.

Considering any production process, profit maximization is very important aspect. Thus, to be rational farmers allocate their scarce resources to the profitable and less risky crops. This is because resource allocation involves the distribution of the available resources among the competing alternatives. Although usually thought of only in the context of declining resources, resource allocation occurs when total resources are declining, stable or increasing. Resource allocation is used to assign the available resources in an economic way for utility maximization/profit maximization. Resource allocation is the scheduling of activities and the resources required by those activities while taking into consideration both the resource availability and the activity time frame. According to the economic efficiency principle, the resource should be allowed to flow to the sector generating the highest marginal value (Kadigi, 2006). Resource allocation by household is very much dependent on whether a particular household is a risk seeker or risk averter. In most cases households would prefer to allocate their resources to the most utility maximizing farm

enterprise because the aim of the producer is to maximize profit/utility. However, household's decisions in resource allocation differ depending on the decision environment and the socio-characteristics of a particular household which in turn influence the perception of a particular household. This is because households are very different both in composition and socio-economic status. They vary greatly both from one culture to another, and within a community (Senkondo, 2000).

Clay *et al.* (2002) used production theory where a farmer has an objective to maximize profit and or utility. Thus, a farmer should be regarded as both a producer and a consumer. This implies that a farmer takes into consideration “current consumption and production ends” (Clay *et al.*, 2002). In this regard, the consumption needs are satisfied through own production though at times they are met through food purchases. Farmers make purchase using cash from crop sales or off-farm earnings. The need for cash is not only for food but also for other household requirements such as health and education and therefore, it has been noticed that farmers may react in a number of ways towards declining production or variability in production that undermine consumption needs. Thus, before investing in whatever practice brought to a farmer's attention, he/she looks at the utility/profit, whether the capacity is there to implement the practice, and what constraints she/he is facing (Clay *et al.*, 2002). Therefore, farmers in such a situation may feel more comfortable to continue with current practices despite noticing its shortcoming. They perceive such behavior as risk reduction strategies and efficient use of their available resources.

This has been indicated by Baffes (2002) that cotton farmers perceive that available resources such as land and labour have not been used efficiently because of lack of proper

policy on the cotton sector especially after the introduction of market economy because of the underlying uncertainties and risky situation.

2.3 Status of Cotton Production in ECGA

Almost all cotton farmers in Tanzania are smallholders with the majority growing less than one hectare, while very few grow more than five hectares. Their objective is to achieve a cash income from cotton. In the Western Cotton Growing Area, farmers perceive cotton as the first choice cash crop and profitable crop, although in some districts rice, maize, tobacco (Kahama and Bukombe districts) and sunflower in Nzega district are also important for cash income of farmers (TCB, 2008)

Cotton is grown in many parts of Tanzania mainland, but more than 95% of the crop comes from Western Cotton Growing Area (WCGA). Western Cotton Growing Area covers about 300 kilometers around Lake Victoria and comprises of Mwanza, Shinyanga, Tabora, Kigoma, Singida and Kagera regions. The rest 5% of the crop is grown in Eastern Cotton Growing Area which includes Morogoro, Pwani, Tanga, Manyara, Kilimanjaro, Mbeya and Iringa regions. In both areas, cotton is grown by smallholder farmers in an estimated area of about 300 000 to 400 000 hectares (TCB, 2008). Though the area under production is big but production continues to decline mainly because cotton production depends on weather condition and limited supply of inputs mainly insecticides. In spite of increased private sector participation in the cotton industry, growth of the sector is still low as exemplified by production not living up as perceived during the structural adjustment programme (TCB, 2008).

After introduction of competitive market in the cotton sub-sector, cotton farmers perceived that under competitive market, seed cotton could improve their income as compared to the previous single marketing chain where there were a number of problems

most of them being institutional. According to TCB (2008) transition from the system where by cotton was being bought, processed, and exported under a single marketing chain to the one where multiple buyers are involved under a competitive market environment has been associated with several constraints which are perceived to have contributed to declined seed cotton production. The constraints are:

Collapse of seed multiplying industry and increased spread of diseases due to increased unregulated movement of seed cotton between previous breeding and variety zones. Lack of input and output markets in marginal cotton producing areas particularly in Eastern Cotton Growing Area and some parts of Western Cotton Growing Area of Singida and Kigoma regions. Increased price risk and price volatility to farmers following the withdraw of the state in price fixing which often cushioned farmers from adverse price movements. Unfair competition arising from existing mismatch between the number of active cotton buyers vis- a- vis the amount of cotton available to be bought. Demise of regional Co-operative Unions, which served as smallholder plat form against some exploitative private buyers. These constraints perceived to have significantly contributed to the decline in cotton production and as well as reduction in cotton quality (CSRT, 2008).

This is linked to the Tanzania Cotton Board (2008) which pointed out that cotton production has declined and hence affecting farmer's income in recent years due to low prices for the sale of seed cotton, some seed cotton buyers buy on credit and delay final payments, the costs of essential inputs such as fertilizers and insecticides have risen more rapidly than the seed cotton producer prices. Also few cotton buyers are willing to stock pesticides and fertilizer inputs, some cotton buyers do not use proper weighing scales and the farmers feel that they are being cheated.

Furthermore, farmers perceive that their interests are not well protected by the government because they have conflicting interests. The government looks primarily after their interests of buyers of seed cotton and owners of cotton ginneries. Also too many and too high taxes and levies have been perceived by cotton farmers as one of the causes of their cotton to be sold in low prices for the benefits of the cotton buyers and owners of cotton ginneries. In addition, on the production and growing side of cotton most of the farmers perceive that there are some constraints which are outside their control and which hamper their production. Such constraints are: cotton seeds are of low quality and are not readily available when needed, rural roads are in poor condition making deliveries of inputs and collection of seed cotton expensive and hence affecting the price of the crop (TCB, 2008). Also, legislation banning intercropping prevents food crops to be grown with cotton. This has been perceived by cotton farmers as one of the constraints towards intensive utilization of land, and risk management in situation when cotton fails to bring about the pre determined objective (TCB, 2008).

As pointed out by Gatsby Tanzania (2007) cotton farmers require reliable access to purchased production inputs and credit to take advantage of export opportunities from production of cotton. However unregulated and poorly coordinated markets for cotton, production inputs, and credit have too often perceived to have failed to deliver sustainable cotton production resulting in a variety of different approaches to these problems (Kabwe, 2007). Another relevant cotton production constraint has been perceived to be linked to institutional problems. This is inline with Kabwe (2007) who argues that cotton production is dependent upon external inputs and is relatively capital intensive. It therefore, requires a high degree of support in form of credit facilities, efficient distribution of inputs and timely payment to farmers all of which have been absent to

some extent. Because of these constraints, cotton shows low results with low returns to farmers.

2.3.1 Farmers' perception

Perception is defined as how you look at others and the world around you. Being able to select, organize and interpret information starts the conceptual process. Perception affects the way people communicate with others. An individual pattern of thinking can affect the perception of others. Most people communicate best with people of similar culture (Donald, 2006). Furthermore, perception is defined as a process by which organisms interpret and organize sensation to produce a meaningful experience of the world. Perception, on the other hand, better describes one's ultimate experience of the world and typically involves further processing of sensory input (Donald, 2006).

The word 'perception' comes from the Latin words perceptio, percepio and means receiving, collecting, action of taking possession apprehension with the mind or senses (Gilovich, 2006). Thus, in decision theory and practice, perceptions are human elements keep on changing in response to changing contexts of risks and decision-makers' circumstances and therefore perception is not permanent it changes with time depending on the environment (Mtabazi, 2007). Thus, Farmers' perception can have a huge impact on decision-making and on an organization's behavior in whole because what one perceives is a result of interplays between past experience, including one's culture, and the interpretation of the perceived. For example the perception of farmers in cotton production in the Western Cotton Growing Area is different from that of the Eastern Cotton Growing Area.

Cotton farmers in the WCGA have positive perception on cotton production, such that even after market reform in the cotton sub-sector, the production trend of the crop has been somehow stable as compared to the ECGA where the production dropped drastically (TCB, 2008). According to TCB (2008) in the WCGA there are many ginneries which are in good working condition. Again, these gins have high processing capacity such that it takes short time to process a good number of bales per hour and hence reducing the processing cost. Thus, this situation motivates the investors to invest more in cotton because it takes short time from buying cotton, processing until they realize profit and hence reducing the cost. Therefore, due to low cost involved, many cotton buyers prefer to invest in cotton production in the WCGA than in the ECGA where these facilities are lacking.

As supported by Technoserve (2010) due to many cotton traders, they do tend to compete from the stage of supplying inputs to the stage of buying cotton, and in the course of competition some of them tend to raise the price of buying the crop above the set/agreed price in an attempt to attract more cotton farmers to bring their cotton for selling. Thirdly, in the WCGA farmers have few alternative crops which could compete with cotton thus they perceive that cotton is the only profitable cash crop as opposed to the ECGA where there are many alternative crops which are competing with cotton for the same resources such as land and labour. Thus, at times where they find that cotton is not profitable they do opt to go for other crops. In addition, in the WCGA most farmers use Ox-ploughs in cultivation. These farming implements enable farmers to have timely cultivation of relatively large areas for cotton (Technoserve, 2010). Therefore, farmers in the WCGA are perceiving cotton production as one of the profitable ventures.

2.3.2 Farmers' perception, production and productivity

As explained before, the environment under which farmers operate influences very much the household farm resources, household characteristics and hence the farmers' perception. In the ECGA, cotton production declined drastically, despite the efforts by the government to sensitize farmers to cultivate the same. This has been the result of poor policies set by the government in relation to cotton prices, market for the crop, and absence of credit facilities to facilitate farmers in the process of production (TCB, 2008). For instance, there were no cotton production in 2008/09 season in Morogoro Rural district and only 72 tons were produced in Kilosa district due to the mentioned reasons (TCB, 2008). In addition, this situation was attributed to the farmers' perception that there are no proper arrangements regarding cotton production and hence they perceived it as being not profitable crop as compared to other crops which compete for the same resources.

This is supported by Scott (2007) who asserts that farmers perceive cotton production as a risky crop because of being not well explained in terms of the selling price, quality and timely availability of seeds and assurance of cotton buyers. Once input supply mainly chemicals and seeds and credit for purchasing inputs were no longer integrated into a single cotton marketing channel, use of inputs declined sharply, loss of the single marketing channel pushed up the cost of marketing chemicals and led to a collapse in supply distribution.

According to Baffes (2002) most farmers did not have access to credit to be used in cotton production and so could not afford to purchase chemicals at market prices and therefore cotton farmers perceived cotton production as being associated with risk and uncertainty situation as compared to alternative crops and therefore farmers allocate their

scarce resources to the profitable and less risky crops. Basing on the economic efficiency principle, resources should be allowed to flow to the sector generating the highest marginal value (Kadigi, 2006). Thus, resource allocation by household is very much dependent on whether a particular household is a risk seeker or risk averter. However, households' decisions in resource allocation differ depending on the decision environments and the socio-characteristics of a particular household. This is because households are very different both in composition and socio-economic status. They vary greatly both from one culture to another, and within a community (FAO, 2004).

According to Scott (2007) the uncertainty in cotton production is not just the matter of loss in the area cultivated; so much uncertainty is in the air that the limited credit that was available to producers is drying up. Therefore, without credit cotton farmers will face a struggle for survival. However, some studies such as Senkondo (2000) attempted to highlight the economic theory underlying farmer perceptions in decision-making before entering into production. He used production theory to explain the central objective of farmers. He asserts that the central objective of farmers in producing a particular crop is to maximize profit and or utility and thus a farmer should be regarded as both a producer and a consumer. This implies that a farmer takes into consideration "current consumption and production ends" (Clay *et al.*, 2002).

Therefore, it has been noticed that farmers may react in a number of ways towards declining production or variability in production that they perceive undermine consumption needs. The same fact was pointed out by Tanzania Cotton Board (2008) farmers perceive that cotton production has declined and hence affecting their income in recent years due to low prices for the sale of seed cotton, some seed cotton buyers buy on credit and delay final payments, the costs of essential inputs such as fertilizers and

insecticides have risen more rapidly than the seed cotton producer prices. Also few cotton buyers are willing to stock pesticides and fertilizer inputs, some cotton buyers do not use proper weighing scales and the farmers feel that they are being cheated.

Furthermore, cotton farmers feel that their interests are not well protected by the government because they have conflicting interests because the government looks primarily after the interests of buyers of seed cotton and owners of cotton ginneries and not the cotton farmers. Also too many and too high taxes and levies have been perceived as being one of the causes of their cotton to be sold in low prices for the benefits of the cotton buyers and owners of cotton ginneries. In addition, on the production and growing side of cotton most of the farmers perceive that there are some constraints which are outside their control and which hamper their production. Such constraints are: cotton seeds are of low quality and are not readily available when needed, rural roads are in poor condition making deliveries of inputs and collection of seed cotton expensive and hence affecting the price of the crop (TCB, 2008).

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inline with Kabwe (2007) who argues that cotton production is dependent upon external inputs and is relatively capital intensive. It therefore requires a high degree of support in form of credit facilities, efficient distribution of inputs and timely payment to farmers all of which have been absent to some extent. Because of these constraints, cotton shows low results with low returns to farmers.

2.4 Institutional Change to Restore Farmers' Perception

Institutions are structures and mechanisms of social order and cooperation governing the behavior of a set of individuals within a given human collectivity. Institutions are identified with a social purpose and performance, transcending individual human lives and intentions and with the making and enforcing of rules governing cooperative human behavior. "The term institution" is commonly applied to customs and behavior patterns important to a society, as well as to particular formal organizations of government and public services (John, 2005).

As structures and mechanisms of social order among humans, institutions are one of the principal objects of study in the social sciences such as political science, anthropology, economics and sociology. Social and political scientists often speak of the state as embodying all institutions such as school, prisons, Religions, Legal system and so on. Thus, the state in this case is a linkage institution, which is a structure within a society that connects people to the government or other centralized authority. Financial institution is one of the institutions embodied by the state which deals with providing financial support to people as facilitation in income generation (John, 2005).

The financial system include all savings and financial opportunities and the financial institutions that provides savings and financing opportunities as well as the valid norms

and modes of behavior related to these institutions and their modes of operations (Ledgerwood, 2000). Financial system can generally be divided into the formal, semiformal and informal sectors. The distinction between formal and informal is based primarily on whether there is a legal infrastructure that provides resource to lenders and protection to depositors (Kashuliza *et al.*, 1998). However, access to finance is currently perceived as a huge challenge for the cotton farmers. This has been supported by the Tanzania Cotton Board (2008) which is currently piloting a passbook system to enforce savings by the farmer to secure inputs for the next season.

Tanzania Cotton Board (2008) argue that high interest rates set by financial institutions is one of setbacks towards accessing loans as the profit margins of the farmers limits their ability to carry the additional financing costs. The inherent risky nature of farming also results in the interest rate for farmers being high due to their high risk profile. Furthermore, not many formal banks which operate in rural areas to assist farmers increase production since they find it unprofitable to operate in these areas. It is for example not beneficial for a bank to run a credit analysis with its administrative costs, for one single small loan application in the rural areas (Tanzania Gatsby Trust, 2007).

Again, accessing a loan is subject to the farmer being able to provide security and a title/lease deed on his/her land. This situation is currently problematic and has been impeding cotton farmers from accessing loan. On the contrally, finance is more readily accessible to the gins than to the farmers. This is as a result of the gins having more assets to assign as security and collateral. Gins can use tools such as the Warehouse Receipt System (WRS) to secure loan financing. Because of the tangible nature of the assets associated with gins, investors are more likely to invest in such a venture, allowing capital to be raised for refurbishment.

Thus, institutional change is highly needed and this should be by providing subsidies to cotton farmers, establish special organ for providing loans to cotton farmers, improve the private sector dealing with cotton for the purpose of improving competition in the market, improve infrastructures such as roads for cotton and inputs transportation, storage facilities and ginneries for cotton processing. As pointed out by Stephen (2007) cotton is capital intensive so it needs reliable investment hence the institution has to effectively play its roles to ensure that these setbacks are tackled. Moreover, as a long strategy, it is prudent to work towards the establishment of an autonomous sustainable revolving fund that would support the activities of cotton farmers for increased cotton production (Paulo, 2010)

2.4.1 Semi formal credit institutions

Semi formal credit institutions are not regulated by banking authorities but are usually licensed and supervised by other government agencies. Examples are Credit Unions and Cooperative banks, which are often supervised by a bureau in a charge of Cooperatives. They include Cooperatives and Unions, Savings and Credit Societies, Community Based Projects, credit programmes of Non-Governmental Organizations (NGOs), venture capital firms and many others (Ledgerwood, 2000).

In Tanzania, Semi formal financial institutions include OXFARM, PRIDE Tanzania and many others (Sumay, 1999). The Semi formal institutions mainly focus on income generating activities for youth and women who are the most disadvantaged groups in poor societies. As a result of the implementation of structural adjustment and financial sector liberalization policies in the majority of the Sub-Saharan Africa (SSA) countries in the last ten years, institutions and organizations participating in the semi formal credit system

have increased substantially and expanded their operations in both rural and urban areas (Kashuliza *et al.*,1998). The operation of the informal sources, are frequently more cost effective and useful for poor than those of formal credit sources. In most cases, collateral and repayment conditions are flexible which an advantage is for those without collateral (Kimei, 1999). However, repayment remains high because of the personal nature of the finance and credit transactions which are largely conducted on the basis of the trust and intimate knowledge of customers. Hence, the impact of semi- formal financial institutions is perceived as not enough to bring about substantial results and increased productivity of various crops (Kashuliza, 1993; Bagachwa, 2005).

This is in line with Tanzania Cotton Board (2008) who asserts that these institutions have done little in cotton sub-sector because of the perceived inherent problems in the cotton sub-sector and therefore, cotton farmers perceive that, for revival of the crop to be successful, cotton traders should be responsible to extent financial support in collaboration with the government instead of depending on financial institutions which have difficult borrowing conditions which most farmers and cotton farmers in particular fail to meet.

2.4.2 Access to credit

According to the World Bank (2005) credit assumes a special importance as it provides a means to smooth consumption protects against shocks and in some cases makes productive investments that lead to high future income. Credit offers the means to make temporal financial decisions. For example, spending money productively now in order to be able to get better earning later. In addition to loans, credit facilities such as overdrafts or lines of credit are increasing in importance. According to URT (2000) credit services can perform some of the services as savings and can allow enterprises and families to

make some important investments. It is generally acknowledged that, credit to farmers is very important instrument in bringing about agricultural improvement. This applies especially to small scale farmers whose lack of capital seems to be a major limiting factor to farm development. Credit is necessary for inputs, land improvement and other forms of investment on the farm (Sumay, 1999).

Access to financial services has received more attention lately and has become the most important part of the overall development agenda. This is likely for a number of reasons: for one, evidence that “finance” as in financial development, matters for growth has been accumulating over the last decade. Second, based on changes in economies and economic production, finance may have moved up in the ranking of barriers to economic growth. Third, there is an increasing perception that access to financial services has been skewed for household and enterprises (Demirguc and Vojislav, 2005). Therefore, finance help growth through raising and pooling funds, thereby allowing more and more risky investments to be undertaken by allocating resources to their most productive use, by monitoring the raising of funds, and providing instruments for risk mitigation.

Financial access also helps with improving income distribution and poverty reduction through several channels. Foremost, financial access helps through economic growth, thus raising overall income levels. Finance can more specifically help by distributing opportunities fairly. There is evidence that financial access matters especially for poor smallholder farmers who deal with crop production to increase productivity (Levine, 2000). The improvement of access to financial services should help consumers and producers raise their welfare and productivity. Over the last decade, finance has been recognized as an important driver of economic growth.

Ngasongwa (1978) found that agricultural credit removes financial constraints faced by farmers. It provides incentives for farmers to adopt new technologies, which accelerate agricultural development. Also It have been reported by Anne *et al.* (2005) that of recent, access to financial services has been recognized as an important aspect of development and more emphasis is being given to extending financial services to low income individuals and households. However, as pointed out by Elizabeth *et al.* (2003) access to finance is limited in many developing countries like Tanzania and it reaches only few individuals and firms. Generally, the reforms of financial institution have changed the direction and manner in which financial institutions in Tanzania used to operate and deliver services to their customers.

However, despite the reforms, most of the services are largely confined to few people (FSDT, 2006). Thus, getting a loan is cumbersome and too costly for many farmers due to the high fixed costs of applying and collaterals. In the past, in regard to credit accessibility, Regional Cooperative Unions (RCUs) made always use of overdraft facilities of the National Bank of Commerce to purchase the seed cotton from the farmers. Those credits were secured by lint sell contracts and the assets. Until 1994, farmers got inputs (mainly pesticides) on credit from the RCUs, which got it on credit from the Tanzania Cotton Marketing Board (TCMB) then payments were settled with the sales of seed cotton from the cotton farmers to the RCU and lint from the RCU to the TCMB (TCB, 2008).

However, access to finance for cotton production is currently a huge challenge for the farmers. This is because an interest rate of between 20% and 30% does not allow farmers to access these loans, as the profit margins of the farmers limits their ability to carry the

additional financing costs. In addition, the inherent risky nature of farming also results in the interest rate for farmers being high due to their high risk profile (TCB, 2008).

Tanzania Cotton Board (2008) observed that TCMB stopped importing pesticide in 1994. Since then, the RCUs and private ginners bought pesticides from the agents of International Agro- chemical Companies based in Mwanza, Dar-es-salaam and Kenya. Initially they sold the pesticides on credit to farmers, but most of them have reduced drastically or have entirely stopped selling on credit because of very low repayment rate. Currently, cotton farmers have no access to bank credits, because the commercial banks have no branches outside the major cities and also are not interested in lending to small scale farmers because of high cost of such a credit line.

Therefore, the absence of credit facilities for inputs has been perceived by farmers as a major bottleneck for cotton production and solutions to this problem are not easy to find because it is not realistic to assume that either commercial banks will soon become interested in giving credits to cotton farmers, or SACCOS will become numerous and big enough to solve the problem. Hence, credit from input suppliers and seed cotton purchasers seem to be perceived as the least cost solution of giving credit to the cotton farmers (TCB, 2008).

However, the development of such credit relations is presently blocked by the lack of proper arrangements by the government and hence it is perceived that, cotton production improvement will take long time unless there are strong government interventions to reshape the private sector in the cotton sector (TCB, 2008).

2.5 Approach in Measuring Farmers' Perception

Basically, farmers' perception in decision-making is influenced by the environment in which a farmer makes decision and therefore perception differs from one location to another location. Further, perception differs from one individual to another and is not permanent. It can change depending on the prevailing environment. Thus, decision-making is a subjective process, as the perception regarding a problem can diverge from person to person (Mutabazi, 2007). Farmers are influenced by many natural factors and processes that are difficult to measure and model precisely. Therefore, different approaches have been used to measure perception in decision-making process. These approaches include (a) direct elicitation of utility function, (b) experimental procedures in which individuals are presented with hypothetical questions regarding perception and (c) inference from observation of economic behavior using non-parametric and parametric (econometric) models. These approaches are found extensively in various literature some of which include Anderson and Hardaker (2003), Senkondo (2000) and Mutabazi (2007). The third approach (c) might be extended to include the latent variable approach. In this study the Latent Variable approach (LVA) is employed to study farmers' perception on cotton production. A similar approach in analyzing farmers' perception, attitude and adaptation to rainfall variability risks using factor analysis was used by Mutabazi (2007). Also Senkondo (2000) used similar approach to measure risk attitude and risk perception in agro forest decisions.

In LV approach, the socio-economic or psychological variables are linked to economic analysis by working with 'soft' or 'latent' variables that can not directly be observed by researchers and other change agencies. LV approach is synonymous to Likert scale framework widely used in attitudinal social studies. The strength or usefulness of LV approach is well documented in a number of literature including Mutabazi (2007), Manski

(2004) and Senkondo (2000). Social researchers rarely ask respondents openly about their views or opinions in preference to structured interviews. Furthermore, econometric specification for farmers' perception was employed.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Description of the Study Area

The study was conducted in the Eastern Cotton Growing Area (ECGA) particularly in Morogoro region. Morogoro region was selected because in the past it had an impressive trend of cotton production. Morogoro district is among the five districts of Morogoro region. Other districts are Kilosa, Kilombero Ulanga and Mvomero (Fig. 3). Morogoro district has a total area of 11 925 square kilometers out of which 8 805 square kilometers is potential arable land, 2 000 square kilometers is game reserve, and 1 120 square kilometers is waste land and water bodies. The district boundaries are: to the north is Mvomero district, to the south are Kilombero and Liwale districts, to the east lie Bagamoyo and Kisarawe districts.

The temperature ranges from 18 to 30 centigrade and rainfall ranges from 600 to 2000 mm per annum. The district has bimodal pattern of rainfall namely short rains and long rains. Normally the short rains start on early October to late January. The long rains start on late February to late may. The total population in Morogoro district is 263 920 of which males are 129 285 and females are 134 635. There are 56 723 households and an average family size of 4.6 persons per household. The average growth rate is 2.6 percent per annum. The economically working group is 136 533. Crops grown are maize, sorghum, legumes, fruits and vegetables. Cash crops are Cotton, oilseeds and coffee. Administratively, the district is divided into six division, 29 wards, and 142 villages. The divisions are Mikese, Ngerengere, Mkuyuni, Matombo, Bwakira and Kisaki.

cotton in 2007/08. The volume of seed cotton in 1980s was averaged to 41 026 tons as compared to 328 tons of seed cotton obtained in 2007/08. There were 13 small gins in the ECGA all of which were owned by the TCLSB. Most of these ginneries are not operating any more due to several factors, others being lack of seed cotton supply and breakdown of the gins themselves due to lack of routine maintenance. In Morogoro rural there was one gin in Dutumi village owned by Morogoro Farmers Cooperative Union (MOFACU). This gin was installed in 1928. However, it is no longer operating due to breakdown. There is only one ginnery which is still operating. This is in Morogoro municipality near Railways Station.

Likewise, Kilosa district is also located in Morogoro region (Fig. 4) where the climate is tropical rainy. Its altitude ranges from 300 to 600 meters above sea level. The average rainfall is between 700 to 1200 mm per annum and temperature averages 25 centigrade. The total area is estimated at around 14 245 square kilometers and no significant water areas in the district. The population is estimated to be 489 513. Kilosa district is densely populated and suitable for livestock keeping. Crops grown are maize, paddy, sorghum, and legumes where major cash crops are sisal, cotton and oilseeds.

In regard to cotton production, which used to be important cash crop in the past, farmers stopped cultivating it and shifted to other crops such as sesame, sunflower, maize, onions and paddy which are also considered as income generating crops. In 1980s the district allocated an average of 56 038 hectares for cotton production and the production averaged to 47 632 t, where as the area allocated for cotton production in 2007/08 was 402 hectares, and the volume of cotton produced in the same season was 351 t. Processing of cotton was done by a ginnery within the district. There was one gin which was installed in

1950. This gin is owned by the Kilosa Cooperative Union (KCU). Currently, one gin is still operating, however, with frequent breakdowns.

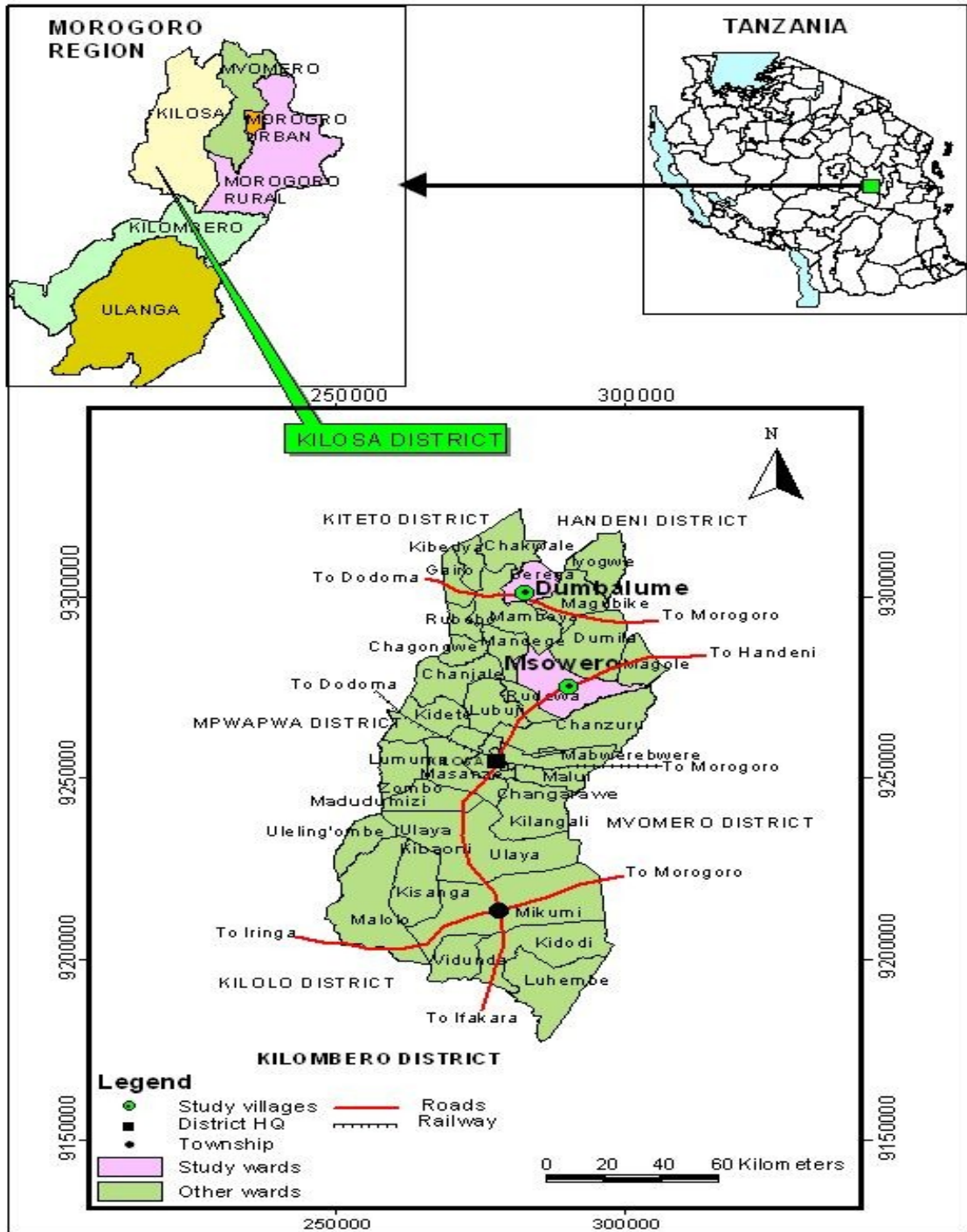


Figure 4: Map of Kilosa district showing study villages

3.2 Research Design

The study used cross section design and employed a survey method. Through cross sectional survey, data were collected by asking questions to a representative sample of the population at a single point in time. This design was chosen because it is suitable for description purposes as well as the determination of relationships between variables (Bailey, 1998).

3.3 Sampling Procedure

The target population for the study was current cotton producers and former cotton producers residing in the study area. A combination of multi-stage random sampling and purposive sampling techniques were employed to sample respondents from the study areas. Multi-stage sampling technique starting at the zone level and ending at the district level. This technique reduces the amount of traveling for interview and hence the corresponding cost (Casley and Kumar, 1998). One region Morogoro from the ECGA was purposively selected based on its potentiality in cotton production in the past (Tanzania Gatsby Trust, 2007). The second stage was purposive selection of two districts which used to be potential in cotton production in the region. Then two divisions from each district were purposively selected and then randomized to get one division from each district. The fourth stage was random selection of two wards from each division and hence making a total of four wards. Then random selection of one village from each ward was done making a total of four villages.

A sample comprised of 160 farmers was used in an interview. Random sampling was used in selecting cotton farmers and former cotton farmers from each village. The villages involved were Msowero and Dumbalume in Msowero and Belega wards in Kilosa district. In Morogoro district, the villages which were involved are Mbwade and Bonye

in Bwakirachini and Dutumi wards respectively. Table 1 shows the distribution of respondents in the study area.

Table 1: Distribution of population and respondents in the study villages

| District | Village | Population | | | Sample | | |
|----------|-----------|------------|--------|--------|--------|--------|-------|
| | | Male | Female | Total | Male | Female | Total |
| Kilosa | Msowero | 7 210 | 8 290 | 15 500 | 30 | 18 | 48 |
| | Dumbalume | 1 542 | 1 797 | 3 339 | 24 | 8 | 32 |
| Morogoro | Mbwade | 1 602 | 1 678 | 3 280 | 36 | 4 | 40 |
| | Bonye | 1 844 | 1 968 | 3 812 | 28 | 12 | 40 |
| Total | | | | 25 931 | | | 160 |

3.3 Data Collection

Both primary and secondary data were used. Primary data was collected through informal and formal surveys. Informal survey involved discussions with key informants in the study area. The discussions were meant to get in depth understanding of issues related to cotton production. The formal survey involved personal interviews using pre- tested structured questionnaires. Also other data were obtained using field observation. Secondary data were extracted from various reports and other documents from District Agriculture and Livestock Development Offices in Kilosa and Morogoro districts, Morogoro Farmers Cooperative Union (MOFACU), Sokoine National Agricultural Library (SNAL) and internet. The secondary data aimed at forming an overview on what has been done in relation to the interest of the study and identify gaps in information. Prior to actual survey, pre- testing of the questionnaires was done under field condition.

Questionnaire pre-testing involved ten respondents. This activity was undertaken in order to determine if there were questions that would not yield responses from farmers as well as checking if the questionnaire was comprehensive enough in terms of validity and reliability to collect the information required. Questionnaire pre-testing was conducted in

Ngerengere village in Morogoro Rural district. After per-testing, some of the questions were restructured and a final version was therefore developed.

3.4 Data Processing and Analysis

3.5.1 Data processing

Data collected by structured questionnaires were coded, summarized and entered in Statistical Package for Social Science (SPSS) computer programme. Descriptive statistics such as frequency distribution, means and percentage were used to answer the first and fourth objectives where by the status of cotton production in Eastern Cotton Growing Area and the needed changes in institutional support to revive cotton production in Eastern Cotton Growing Area were measured. Factor analysis as a factor reduction method was used to identify reliable factors so as to establish farmers' perception on cotton production. Respondents were presented with various statements aimed at measuring a given concept and they were asked to state whether it is not a problem, a minor problem, a big problem and a biggest problem.

Then, in the analysis, responses in not a problem and a minor problem were recorded into 0 showing that there is no problem with that concept and responses in big and biggest problem were recorded into 1 showing that there is a problem in that concept. The combination of responses was done to simplify the process of data analysis. The aim of factor analysis was to identify a relatively small number of factors that can be used to represent relationship among sets of many interrelated variables. In this case, Principle Component Analysis (PCA) as a form of factor analysis was used to reduce a large number of variables into few variables. Hence, PCA method for factor extraction was therefore used to construct indices.

The use of PCA made it possible to identify the best factors in terms of explaining the variance in the sample. The total variance explained by each factor is indicated by the factor's Eigen value: a high Eigen value for a factor indicates that the factor accounts for high total variance in the sample (Filmer and Pritchett, 1998). As pointed out by Mutabazi (2007) PCA is effective and widely used as a means of exploring the interdependence among the variables. It gives uncorrelated linear combination of the observed variables in a rank order. Ranking is based on the amount of variance in the sample accounted for by the linear combinations. The first linear combinations of the observed variables (Principal Components) accounts for the largest amount of variance in the sample followed by the second and so on. Hence, perception indices were developed based on the perceptual statements to serve as a measure of farmers' perception variability. This was done mainly to measure objective two; that is to establish perception of farmers on cotton production. Objective three was measured using choice probit model. The choice of the model was based on the assumption that the dependent variable is binary.

3.5.2 Descriptive statistics

Analysis of farmers' perception involved capturing responses on a number of perception measuring statements addressed through structured questionnaire. These perceptual statements were addressed to capture different aspects related to cotton production such as fertilizer use, insecticide use, financial capital, soil fertility, accessibility to extension services, hired labour, credit accessibility, cotton market and rainfall pattern. Then convention factor analysis was used to give descriptive insights into intrinsic perception towards cotton production. Comprehensive details on factor analysis are found in Papanastasion (2005), Senkondo (2000) and Mutabazi (2007). The scoring factor can have negative or positive value. Positive value indicates the variables associated with households having high perception on cotton production while the negative factors

indicate the variables associated with household of low perception towards cotton production.

In this case, the positive scores increase the index while the negative scores decrease the index (Regnard, 2006). This was meant to measure objective two; that is to establish perception of farmers on cotton production. Cross tabulation involving Chi-square test was used to test association between perceptions of cotton production among people in different location. Cross tabulation is the commonest and reliable form of data presentation (Casley and Kumar, 1998). Choice probit model was estimated to identify critical factors influencing perception of farmers in cotton production. The general formula for the index value is shown hereunder:

$$A_{ij} = f_i(a_{ij} - a_i) / s_i + \dots + f_N(a_{jN} - a_N) / s_N \dots \dots \dots (1)$$

- Where: Index value
- Factor scoring weight for each variable
- Number of specific variable
- Mean for each variable
- Standard deviation of each variable

3.5.3 Probit regression model

To identify critical factors which account for farmers’ perception on cotton production, a quantitative analysis was done by using a probit regression model. The model was used because of the fact that, the dependent variable was binary. The model explains whether the farmer has positive perception on cotton production or otherwise. This is a choice model which takes only two values ranging from 0 to 1. The model has a non-linear probability distribution. Thus, the model was used to estimate the relationship between

farmers’ perception, farm resources and household characteristics which is objective three. This was very important in determining which of the variables have influence on the farmers’ perception on cotton production and in which direction.

The dependent variable “Y” is the perception of farmers. It is a probability with values between 0 and 1. It explains how farmers perceive cotton farming. Independent Variables are factors which influence farmers to have different perception on cotton production. The coefficients on their own do not tell much but the coefficients can be used to compute the marginal effects, which are useful in interpreting the effects of predictors on the change of probability. Also the signs of the coefficients can be used to indicate the direction of the change of the predicted probability arising from a change in the predictor. The effect of a dummy variable has to be analyzed by comparing the effect of the variable when the value is one to when the value is zero. The difference of the effects on the probabilities between the two values, holding other variables constant, is the incremental effect for a dummy variable. As much as the marginal effect can be computed on an individual case, the general practice is to compare the marginal effects at the sample’s value (Mukherjee *et al.*, 1998). In this case, we assume there is a latent or unobserved variable which is generalized from a familiar looking model below.

$$y^* = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \beta_{11} X_{11} + \mu \dots \dots \dots (2)$$

Where β is a K- vector of parameters, X is a vector of explanatory variables and $\mu \sim N(0, 1)$ is random shock. We observe $y = 1$ if $y^* > 0$ and $y = 0$ otherwise. Note that in the model, the standard error of e is 1. The estimated probit regression model is specified as:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \beta_{11} X_{11} + \mu \dots \dots \dots$$

Where: = Positive perception, = Otherwise
 = Constant (intercept)
 = Coefficient or the parameter being estimated
 = Education (years)
 = Age (years)
 3 = Gender (dummy) (male= 1, female= otherwise)
 4 = Marital status
 5 = Household size (number)
 6 = Accessibility to extension services
 = Access to credit facility (dummy), (yes = 1, 0= otherwise)
 = Use of insecticides (dummy), (yes = 1, 0 = otherwise)
 = Other sources of income
 = Land resources ownership
 = Hired labour for cotton
 = Error term

3.5.4 Principle component analysis

Principle Component Analysis (PCA) is a form of factor analysis used to reduce a large number of variables into few ones and detect structure in the relationships between variables. Therefore, PCA as method for factor extraction was used in this study to establish farmers' perception on cotton production indices. The use of PCA made it possible to identify the best factors in terms of maximizing the variance/variability that is not captured by the preceding factor in the sample. The variances extracted by the factors are called the Eigen values. The sum of Eigen value is equal to the number of variables. Thus, the total variance explained by each factor is indicated by factors' Eigen value. A high Eigen value for a factor indicates that the factor accounts for a high total variance in the sample (Darlington, 1983). Therefore, in this study for each factor analysis, items in the factors with the highest Eigen value of greater than one were taken and those with Eigen value less than one were generally considered not substantial (Filmer and Pritchett, 1998).

Rotation is the step in factor analysis that allows to identify meaningful factor description. There are several rotation methods such as Varimax, Equamax and Quartmax. But for the

purpose of this study Varimax method of rotation was employed. The method minimizes the number of variables that have high loadings on a factor and hence enhancing the interpretability of the factors. In addition, the scoring factor can have negative or positive value. Positive values indicate the variables associated with positive perception while the negative factors denote the variables associated with negative perception. Basically, the positive score increases the index while the negative score decreases it (Darlington, 1983).

3.6 Limitation of The Study Methodology

In conducting this study, several limitations were faced. Listed below are some of the constraints which were faced during the study;

- (i) Research regarding farmers' perception on cotton production has almost not been done in the Eastern Cotton Growing Area. It was therefore very difficult to access recent and relevant materials concerning this study. However, to solve this problem various information from secondary data, various literature and internet were used to ensure reliable research results.
- (ii) Availability of funds and time limit was a big problem. This problem was settled using cross sectional study design to collect data only once at a time, however this design limited the collection of much information as it would have been with longitudinal study. Because, use of cross sectional data limits observation overtime. This makes it difficult for the study to account for changes due to time difference. However, to do away with this problem large sample was used. Large sample size enabled the study to capture the required information and allow for statistical analysis.

Basically, case studies could generate more accurate and reliable results especially under a situation where only limited resources are available. Because such studies entails few resources such as money, time, labour and still bring about implementable area specific policy recommendations as opposed to blanket recommendations from country wide study.

- (iii) Another limitation is that most farmers do not keep records regarding production, selling prices, and inputs hence the data provided are based on farmer memory and some respondents didn't remember the actual quantities they had produced or the actual price they sold their produce. So sometimes respondents used estimation. However, figures are proximate indication of the actual situation in the study area. To overcome the problem, information regarding production, marketing and prices were supplemented from other cotton stakeholders such DALDO's Office and MOFACO

- (iv) During data collection there was a problem of floods in some villages of Kilosa district. So most of the leaders in the district, division, and wards at times were not available because they were responsible in handling the floods victims. Also some of the farmers were having relatives who were victims of floods thus, they had to spend some time in supporting them. Therefore, data collection took quite sometime than it was planned. However, the problem was mitigated by having appointments with village leaders on dates and time to conduct interviews with farmers and the procedure was fruitful.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 Demographic Characteristics

The demographic characteristics examined included age, marital status, level of education, family size, and gender of respondent (Table 2). Socio-characteristics of respondents have important implications on the farming practice. They have important attributes to any society as they reflect its behavior in decision making and its probable expected responses to stimuli exposed to it.

4.1.1 Age of respondents

The result shows that the minimum age of the respondents in Morogoro district was 30 years and the maximum age was 65 years while the mean age was 47 years. In Kilosa district, the minimum age of respondents was 29 years and the maximum age was 65 with a mean of 45 years (Table 3). Also, result shows that the majorities (58.8%) of the respondents in the study villages of Morogoro district and 50.0% of the respondents of the study villages in Kilosa district were aged between 35 and 50 years. On the other hand 13.8% of respondents in Morogoro district and 15.0% in Kilosa district were aged between 19 and 35 years where as 22.5% and 33.8% of the respondents in Morogoro and Kilosa districts respectively were aged between 51 and 60 years. Also the study result shows that respondents who were above 60 years were 5.0% and 1.2% in Morogoro and Kilosa district (Table 2). Basically, the results show that there was no significant difference in terms of age of the respondents in the two settings. In general, the results show that the majority of the respondents were in their prime productive ages and could therefore be expected to contribute to the development of their respective villages, particularly in cotton farming.

Furthermore, age of the farmer is one of the factors that can explain the level of labour force that could be employed by the household. Age is thought to influence attitudes and perception towards technologies as it is associated with experience, and decision-making. In the Tanzania case where institutions that offer information for price and other agricultural information have never been operating, farmers rely heavily on personal experience for their farm work. This implies that they rely very much on their previous knowledge of agricultural practice for their cultivation of crops and cotton in particular. A study by Schnitkey *et al.* (1992) reported that age is related to farming experience that farmers with more experience have less demand for external information for both production and marketing. However, the difference in the mean age was found to be not significant to cause significant difference in farmers' perception on cotton production.

Table 2: Distribution of respondents' demographic characteristics

| Variable | Morogoro | | Kilosa | | χ^2 | df | Significant |
|----------------|----------|-------|--------|-------|----------|----|-------------|
| | N | % | N | % | | | |
| Age group | | | | | | | |
| 19 - 35 | 11 | 13.8 | 12 | 15.0 | | | |
| 36 -50 | 47 | 58.8 | 40 | 50.0 | | | |
| 51- 60 | 18 | 22.5 | 27 | 33.8 | | | |
| Above 60 | 4 | 5.0 | 1 | 1.2 | | | |
| Total | 80 | 100.0 | 80 | 100.0 | 4.20 | 3 | 0.240 |
| Marital status | | | | | | | |
| Married | 70 | 87.5 | 65 | 81.2 | | | |
| Single | 7 | 8.8 | 10 | 12.5 | | | |
| Divorced | 2 | 2.5 | 3 | 3.8 | | | |
| Widow | 1 | 1.2 | 2 | 2.5 | | | |
| Total | 80 | 100.0 | 80 | 100.0 | 1.25 | 3 | 0.742 |
| Gender | | | | | | | |
| Male | 70 | 87.5 | 55 | 68.8 | | | |
| Female | 10 | 12.5 | 25 | 31.2 | | | |
| Total | 80 | 100.0 | 80 | 100.0 | 8.23 | 1 | 0.004* |
| Education | | | | | | | |
| None | 4 | 5.0 | 18 | 22.5 | | | |
| Adult | 26 | 32.5 | 15 | 18.8 | | | |
| Primary | 50 | 62.5 | 47 | 58.8 | | | |
| Total | 80 | 100.0 | 80 | 100.0 | 11.95 | 2 | 0.030** |

Note: * Significant at $p < 0.01$, **significant at $p < 0.05$

4.1.2 Household size

During the study it was important to determine the household size because it has implication in the agricultural production and consumption after production. Results from survey revealed that there was no significant difference in terms of household size with Morogoro district having a maximum number of 8 household members and mean of 4.7 and Kilosa district which has maximum of 8 members and a mean of 4.2 household members per household (Table 3). This slight difference may be attributed to by the education being given to farmers on family planning. Also the hardship of life which is currently observed in many parts of the country could be compelled some farmers to plan their families. Household sizes have impact on production because household with fewer members tend to be relative productive as compared to the one with many members this is because in bigger households there are more consumption than the one with few members.

Table 3: Distribution of respondents by age and household size

| District | Variable | Minimum | Maximum | Mean | Std Deviation |
|----------|----------------|---------|---------|------|---------------|
| Morogoro | Age | 30 | 65 | 47.0 | 8.8 |
| | Household size | 1 | 8 | 4.7 | 1.7 |
| Kilosa | Age | 29 | 65 | 45.0 | 8.7 |
| | Household size | 1 | 8 | 4.2 | 1.4 |

4.1.3 Marital status

About 87.5% of the respondents in Morogoro district were married where as married respondents in Kilosa district accounted to 81.2%. This shows that the society in both settings is stable; the divorce rate was low at only 2.5% in Morogoro district and only 3.8% in Kilosa district (Table 2). A stable family is more productive in that they

concentrate more on production than an unstable one and thus may influence efficiency in production (Msuya, 2003). It can also be seen from the table that 8.8% of the respondents in Morogoro district were single where as in Kilosa district single respondents accounted to 12.5%. Widow respondents were 1.2% and 2.5% in Morogoro and Kilosa districts respectively. This is an implication of low death rate of the household heads hence agricultural production and other agricultural decisions in the household are well managed. However, it was observed that there was no significant difference in the two settings in terms of marital status.

4.1.4 Gender of household

The result summarized in Table 2 shows that male dominates cotton production. The result indicates that in Morogoro district male accounted to 87.5 % of the households headed by men where as 68.8% of households are headed by male in Kilosa district. Hence, this reveals that men dominate the cotton sector. However, it was observed that in Kilosa district female (31.2%) were head of household as compared to 12.5% observed in Morogoro district. This could be attributed to the economic power which they have some of the females. However, it was observed that there was significant difference ($p < 0.004$) between the two districts in terms of gender as head of household.

4.1.5 Respondent's education level

Education is one of the long-term strategies that may be used to improve agriculture in the developing countries like Tanzania. Saito (1994) reported that education in agriculture contributes 50% of the variation in total agriculture output. Education especially literacy level is expected to increase farmers' ability to obtain, understand, analyze and perceive different issues in a positive way. During the survey, the information on education attainment was collected from every respondent. Table 2 shows that the majority (62.5%)

of the respondents in Morogoro district reported to have attained primary school education while in Kilosa district 58.8% of respondents reported to have attained primary school education. About 32.5% of respondent in Morogoro district indicated that they have attained adult education and in Kilosa district adult education attainment accounted to 18.8%. This implies that bigger percent of the respondents are relative literate therefore; they can understand and digest the profitability of various innovations related to crops and cotton production in particular. Furthermore, it was observed that there was significant difference ($p < 0.03$) between the two settings in terms of education (Table 2).

4.1.6 Household resources

During the survey household resources owned by household were determined. These resources were thought to be important in agricultural production as assets and tools (Table 4). Others were considered to be important in providing agricultural information such as information in markets for agricultural produce, agricultural inputs prices. Thus, respondents' perception on ownership of resources was considered. The resources which were considered are chickens, radios, bicycles, iron sheet houses and grass thatched houses preference, farming tools and land. Thus, respondents were asked on their perception on the importance of these resources.

The result in Table 4 indicates that ownership of chicken, radio and type of house preference was significant at $p < 0.030$, $p < 0.010$ and $p < 0.048$ levels respectively. However, other resources such as land resource, bicycles and farming tools were found to be important but not significant. Furthermore, the survey results show that most respondents in Morogoro district (76.2%) perceived chicken ownership as important source of income and meat. On the other hand, about 82.5% of respondents in Kilosa district perceived the same on ownership of chicken. In addition, ownership of radio as an

information media accounted for 63.8% and 78.8% of the respondents in Morogoro and Kilosa district respectively. Furthermore, perception on the importance of the type of house ownership accounted to 78.8% in Morogoro district and 62.5% in Kilosa district.

Table 4: Distribution of respondents by perception on the importance of resources

| Resource | Morogoro | | Kilosa | | χ^2 | df | Significant |
|----------------------|----------|------|--------|------|----------|----|-------------|
| | N | % | N | % | | | |
| Chickens | | | | | | | |
| Always important | 61 | 76.2 | 66 | 82.5 | 6.990 | 2 | 0.030** |
| Sometimes important | 19 | 23.8 | 10 | 12.5 | | | |
| Not important | 0 | 0.0 | 4 | 5.0 | | | |
| Radio | | | | | | | |
| Always important | 51 | 63.8 | 63 | 78.8 | 8.318 | 2 | 0.010* |
| Sometimes important | 27 | 33.8 | 12 | 15.0 | | | |
| Not important | 2 | 2.5 | 5 | 6.2 | | | |
| Land resource | | | | | | | |
| Always important | 62 | 77.5 | 60 | 75.0 | 0.138 | 1 | 0.710 |
| Not important | 18 | 22.5 | 20 | 25.0 | | | |
| I don't know | 0 | 0.0 | 0 | 0.0 | | | |
| Bicycles | | | | | | | |
| Always important | 65 | 81.2 | 59 | 73.8 | 4.173 | 2 | 0.124 |
| Sometimes important | 13 | 16.2 | 21 | 26.2 | | | |
| Not important | 2 | 2.5 | 0 | 0.0 | | | |
| Farming tools | | | | | | | |
| Always important | 70 | 87.5 | 61 | 76.2 | 5.190 | 2 | 0.075 |
| Sometimes important | 9 | 11.2 | 19 | 23.8 | | | |
| Not important | 1 | 1.2 | 0 | 0.0 | | | |
| Type of house | | | | | | | |
| Always important | 63 | 78.8 | 50 | 62.5 | 6.063 | 2 | 0.048** |
| Sometimes important | 12 | 15.0 | 25 | 31.2 | | | |
| Not important | 5 | 6.2 | 5 | 6.2 | | | |

Note: *Significant at $P < 0.01$, **Significant at $P < 0.05$, ***Significant at $p < 0.1$

4.2 Cotton Production Status

Status is defined as the state of affairs or a situation concerning a particular event. Thus, in undertaking this study it was important to understand the state of affairs/ condition or situation regarding past and current cotton production in the ECGA. Current production

status is important in justifying whether cotton production has declined or increased by comparing with the past situation. Thus, respondents in the study area were asked about the status of cotton production in their respective location. About 92.5% of the respondents in Morogoro district perceived that cotton production has decreased and 93.8% of the respondents in Kilosa district perceived that there is decrease in cotton production whereas 3.8% of the respondents in Morogoro district perceived that cotton production has increased.

About 1.2% of respondents in Kilosa district perceived that cotton production has increased. About 3.8% and 5.0% of the respondent in Morogoro and Kilosa districts respectively perceived that cotton production remained the same. The high percentage (92.5% and 93.8%) of respondents in Morogoro and Kilosa respectively indicates that in most areas especially in the ECGA cotton production has decreased due to various reasons as indicated in Table 6. However, the result regarding farmers' perception on cotton production status indicated that there was no significant difference in regard to location (Table 5).

Table 5: Distribution of farmers by perception on cotton production status

| Production | Morogoro | | Kilosa | | χ^2 | df | Significant |
|-------------------|----------|------|--------|------|----------|----|-------------|
| | N | % | N | % | | | |
| Decreased | 74 | 92.5 | 75 | 93.8 | 1.150 | 2 | 0.563 |
| Increased | 3 | 3.8 | 1 | 1.2 | | | |
| Remained the same | 3 | 3.8 | 4 | 5.0 | | | |

In addition, Fig. 5 indicates cotton production status in three consecutive years. The result shows that cotton production has been showing a declining trend especially in the ECGA.

This has been observed in Morogoro and Kilosa districts where cotton production has shown tremendous fall in the recent years. The figure indicates that there was tremendous fall in cotton production in both districts. However, it was observed that there was more fall in cotton production in Kilosa district in 2008/09 season.

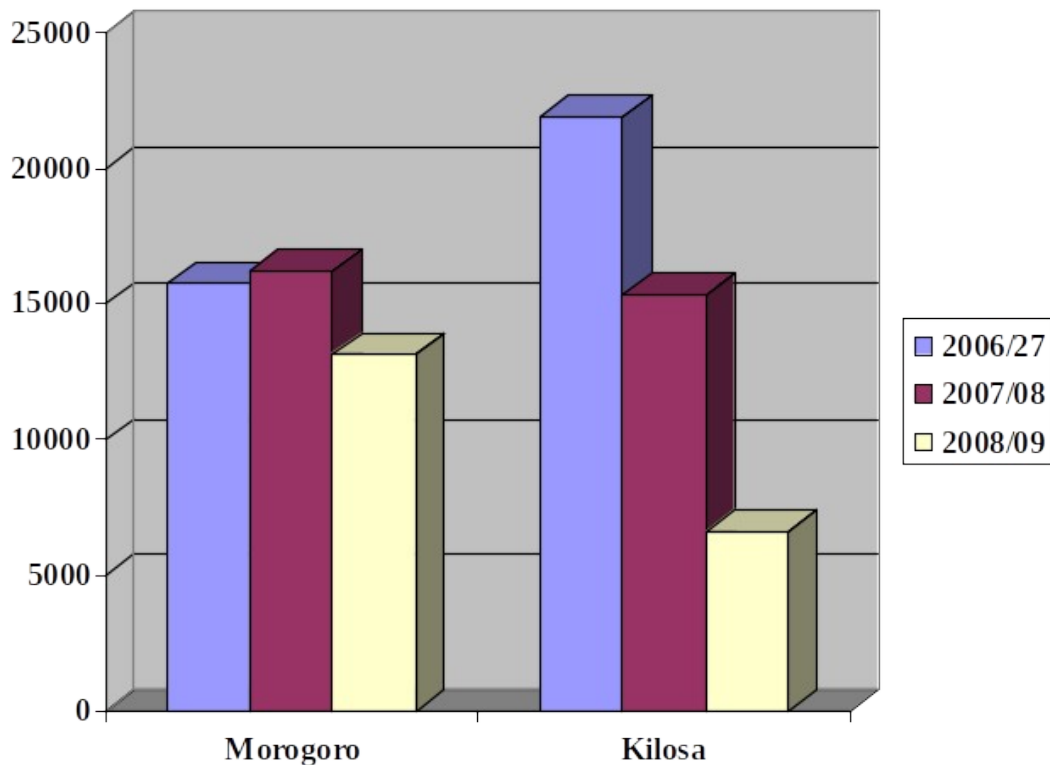


Figure 5: Cotton production in Morogoro and Kilosa districts (Kg)

Furthermore, respondents were asked on their perception on the causes of declined cotton production. The reasons which were perceived included low price of the crop, unreliable market, lack of credit, poor private sector setup and unreliable agriculture policy. Majority of the respondents in Morogoro district (56.2%) perceived that the decline in cotton production was due to unreliable market where as in Kilosa district unreliable market perceived to account to 42.5%. Low price of the crop perceived to account to 31.2% and 6.2% in Morogoro and Kilosa district respectively. These reasons were found to be significant ($p < 0.00$) in both locations (Table 6).

Table 6: Farmers' perception on causes of low cotton production

| Description | Morogoro | | Kilosa | | χ^2 | df | Significance |
|---------------------|----------|------|--------|------|----------|----|--------------|
| | N | % | N | % | | | |
| Low price | 25 | 31.2 | 5 | 6.2 | | | |
| Unreliable Market | 45 | 56.2 | 34 | 42.5 | | | |
| Lack of credit | 7 | 8.8 | 34 | 42.5 | | | |
| Poor private sector | 1 | 1.2 | 3 | 3.8 | | | |
| Unreliable Policy | 2 | 2.5 | 4 | 5.0 | 34.312 | 4 | 0.000 |

Furthermore, cotton production status was determined using the amount of hectares which were allocated for cotton production as compared to the area allocated for other crops including maize, paddy, sunflower and sesame (Table 7). This criterion was used because farmers do allocate their resources basing on the profitability, sustainability and the risks associated with that crop regarding their respective decisions environments. Thus, it was observed that, these crops were competing with cotton for the same resources such as land and labour. The survey result shows that 10.3% of the area was allocated for cotton production and 25.2% of the area was allocated for maize production. About 17.4% of the area was allocated for paddy production and sunflower production covered only 3.0% of the area. In addition, 12.1% of the area was allocated for sesame production and 32.0% was fallow land (Table 7).

Table 7: Farmers' perception according to land allocation to various crops (Ha)

| Description | District (Ha) | | District (%) | | Total percent |
|-------------|---------------|--------|--------------|--------|---------------|
| | Morogoro | Kilosa | Morogoro | Kilosa | |
| Fallow | 205.0 | 188.0 | 16.7 | 15.3 | 32.0 |
| Maize | 145.0 | 165.0 | 11.8 | 13.4 | 25.2 |
| Paddy | 128.5 | 85.0 | 10.5 | 6.9 | 17.4 |
| Sesame | 80.0 | 68.5 | 6.5 | 5.6 | 12.1 |
| Cotton | 69.0 | 58.0 | 5.6 | 4.7 | 10.3 |
| Sunflower | 2.0 | 34.5 | 0.2 | 2.8 | 3.0 |

Basically, it was observed that availability of arable land was not a problem in both districts of Kilosa and Morogoro since 32% of the total arable land was under fallow as this area could be used in cotton production if at all the venture was lucrative. Nevertheless, the area allocated for cotton production was the least as compared to the area which was allocated for other crops such as maize, paddy, and sesame. This might be due to the farmers' preference to food security and profitability considerations taking into account that these crops compete for the same productive resources such as land, labour, financial resources, and time which again link with the perception of farmers that cotton as a cash crop is no longer a profitable crop relative to other crops competing for the same resources because of inherent problems of the cotton sub-sector some of them being lack of assured buyers and selling prices. Therefore, it is apparent that farmers can not invest in cotton production in such a situation. Kadigi (2006) asserts that basing on the economic efficiency principle; resources should be allowed to flow to the sector generating the highest marginal value.

In addition, during the survey it was observed that, despite the fact that some crops are highly specialized as cash crops, it was observed that maize and rice in the surveyed area are considered as both food and cash crops. Thus, it was observed that the first priority to most farmers is food production to ensure food security. In addition, Tanzania Cotton Board (2008) reported similar findings that cotton production has declined and hence affecting the income of farmers in recent years as compared to the time when cotton production was under single market chain. Figure 6 indicates land allocation in hectares for various crops.

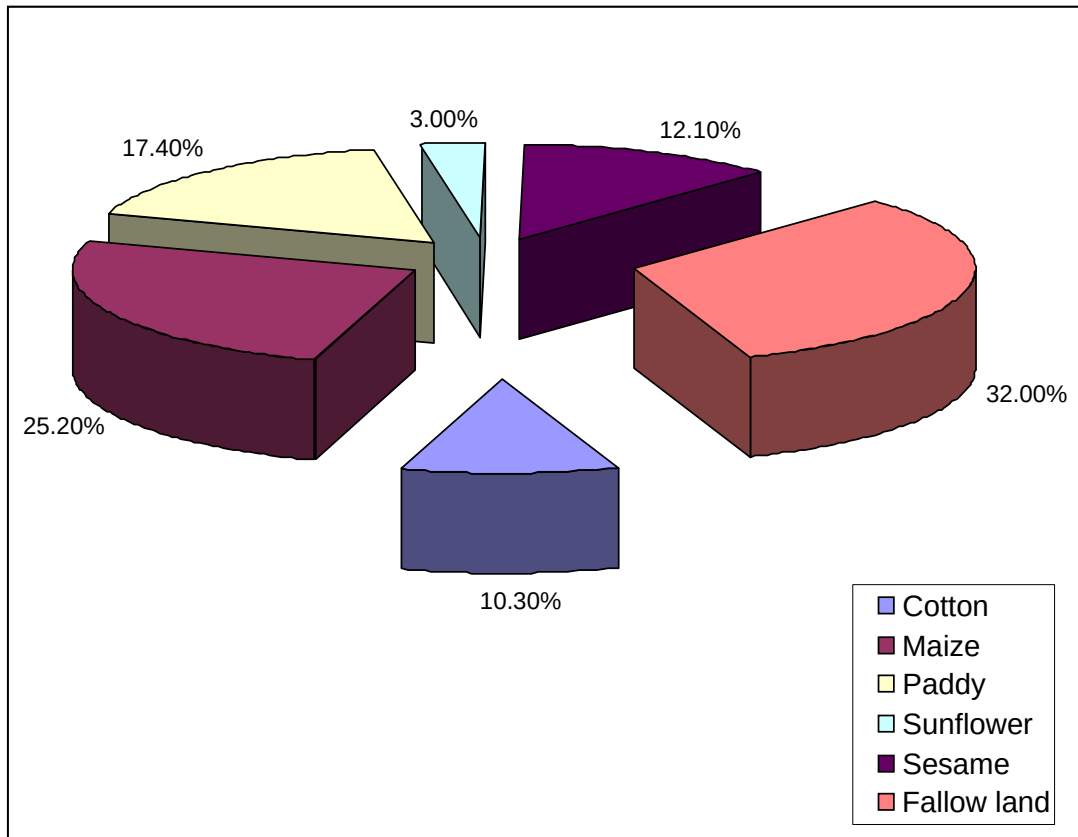


Figure 6: Allocation of land to various crops

4.2.1 Establish farmers' perception on cotton production

As explained before, perception is defined as how you look at others and the world around you. Being able to select, organize and interpret information starts the conceptual process. Also perception is defined as a process by which organisms interpret and organize sensation to produce a meaningful experience of the world (Donald, 2006). In order to understand the perception of farmers regarding cotton production, farmers were asked to state on how they perceived cotton production as a cash crop in terms of generating income and profitability. About 60.0% of the respondents in Morogoro district perceived that cotton is not a profitable crop. Likewise in Kilosa district 76.0% of the respondents perceive that cotton production is not a profitable crop. Only 25.0% and

8.8% of the respondents in Morogoro and Kilosa district respectively perceived cotton production as profitable enterprise (Table 8). Basically, there was significant difference ($p < 0.020$) in perception between the two settings regarding profitability of cotton production

Table 8: Distribution of respondents by perception on profitability of cotton

| Description | Morogoro | | Kilosa | | χ^2 | df | Significance |
|----------------------|----------|------|--------|------|----------|----|--------------|
| | N | % | N | % | | | |
| Profitable | 20 | 25.0 | 7 | 8.8 | | | |
| Sometimes profitable | 12 | 15.0 | 12 | 15.0 | | | |
| Not profitable | 48 | 60.0 | 61 | 76.2 | 7.810 | 2 | 0.020 |

Such results were expected because most farmers stopped growing cotton due to a number of problems as itemized in Table 6 in the cotton sub-sector and hence most farmers opted to go for other crops believed to have high marginal value.

4.2.2 Farmers' perception on provision of agricultural extension services

On the other hand, it was found important to understand the perception of farmers on the provision of agricultural extension services. This is because various agricultural innovations are disseminated through different extension methodologies in an attempt to influence farmers' perception and decisions. During the study farmers were asked to state their perception regarding provision of extension services. The survey results in Table 9 indicate that 26.2% of the respondents in Morogoro district perceived extension services provision as fair. Likewise, 28.8% of the respondents in Kilosa district perceived extension services provision as fair where as 42.5% and 50.0% of respondents in Morogoro and Kilosa districts respectively perceived that it is not easy to get extension

services. This is an implication that extension services provided to farmers is not adequate to influence farmers' perception. This result is in line with the expectations of the researcher because most of the extension staff refrains to promote cotton production because of not being sure of the market of the crop.

Table 9: Distribution of respondents by perception on accessibility to extension services

| Description | Morogoro | | Kilosa | | χ^2 | df | Significance |
|-------------|----------|------|--------|------|----------|----|--------------|
| | N | % | N | % | | | |
| Fair | 21 | 26.2 | 23 | 28.8 | 2.101 | 2 | 0.35 |
| Fairly easy | 25 | 31.2 | 17 | 21.2 | | | |
| Not easy | 34 | 42.5 | 40 | 50.0 | | | |

Despite of all the short comings in the provision of extension services, it remains the method used in agricultural information dissemination to farmers. According to Dulle and Aina (1999) in Tanzania it is recognized among government and non-governmental organization that provision of information to rural communities can best be carried out using extension methodologies. However, the result indicates that there is no significant difference in farmers' perception between the two settings regarding accessibility to extension services (Table 9)

4.2.3 Farmers' perception on accessibility to labour

Labour is an important input in agricultural production. Is one of the factors of production together with land, capital and entrepreneurship. Labour can be family or hired labour. During the study farmers were asked to indicate their perception on the accessibility of labour for their agricultural activities. The study found that 52.5% of respondents in Morogoro district were not accessible to labour where as in Kilosa district respondents who were not accessible to labour accounted to 58.8%. About 27.5% and 22.5% of

respondents in Morogoro and Kilosa districts respectively were accessible to labour (Table 10).

Table 10: Distribution of respondents by perception on labour accessibility

| Description | Morogoro | | Kilosa | | χ^2 | df | Significance |
|----------------|----------|------|--------|------|----------|----|--------------|
| | N | % | N | % | | | |
| Not accessible | 42 | 52.5 | 47 | 58.8 | 0.713 | 2 | 0.700 |
| Sometimes | 22 | 27.5 | 18 | 22.5 | | | |
| Accessible | 16 | 20.0 | 15 | 18.8 | | | |

Basically, accessibility to hired labour depicts the ability of farmers to have income to pay for the labour provided. Since resources are scarce, most farmers do allocate their resources to the enterprise with high marginal returns. Kadigi (2006) observed that resources should be allowed to flow to the sector generating the highest marginal value. However, perception on labour accessibility between the two settings was found to have no significant difference (Table 10).

4.2.4 Farmers' perception on the importance of insecticides in cotton

Insecticide application in cotton production is equally important because during production, cotton is normally attacked by different insects. Therefore, to get good harvest farmers are entailed to use insecticides to ensure that there is intensive control of insects which attack cotton. Thus, during the study respondents were asked to indicate their perception on the importance of insecticides application in their cotton fields. The survey result in Table 11 indicates that 57.5% of the respondents in Morogoro district perceived insecticide application as always important. Likewise, in Kilosa district about 60.0% of the respondents perceived insecticide application in their farms is always important. About 5.0% and 2.5% of the respondents in Morogoro and Kilosa districts respectively perceived insecticide application to their farms as not important (Table 11).

Table 11: Distribution of respondents by perception on importance of insecticides

| Description | Morogoro | | Kilosa | | χ^2 | df | Significance |
|----------------------|----------|------|--------|------|----------|----|--------------|
| | N | % | N | % | | | |
| Always important | 46 | 57.5 | 48 | 60.0 | 0.709 | 2 | 0.701 |
| Not always important | 30 | 37.5 | 30 | 37.5 | | | |
| Not important | 4 | 5.0 | 2 | 2.5 | | | |

These results are in line with the expectation of the researcher because insecticides are one of the agricultural inputs which are very important in cotton production. Kabwe (2007) observed that cotton production is dependent upon external inputs and relative capital intensive. However, the results in the same table show that there was no significant difference between the two settings in regard to perception on the importance of insecticide application in their fields.

4.2.5 Farmers' perception on resource allocation preference

During the study farmers were asked to indicate their perception on the preference in resource allocation regarding food security, income generation and making of local brew. The result in Table 12 shows that about 72.5% of the respondents in Morogoro district perceived to allocate their resources for food security as important aspect where as in Kilosa district respondents who perceived it was important to allocate their resources for food security accounted to 52.5%. About 23.8% of the respondents in Morogoro district allocated their resources for income generation while in Kilosa district 37.5% of the respondents perceived to allocate their resources for income generation as an important aspect. In addition, 3.8% and 10.0% of the respondents in Morogoro and Kilosa districts respectively perceived to allocate their resources in local brew as their preference. These results concur with the expectation of the researcher in that the most important thing for a

household is food production to ensure food security. The result shows that there is significant difference ($p < 0.026$) in terms of perception in preference in resource allocation between the two settings (Table 12).

Table 12: Farmers' perception on preference in resource allocation

| Description | Morogoro | | Kilosa | | χ^2 | df | Significance |
|---------------|----------|------|--------|------|----------|----|--------------|
| | N | % | N | % | | | |
| Food security | 58 | 72.5 | 42 | 52.5 | | | |
| Income source | 19 | 23.8 | 30 | 37.5 | | | |
| Local brew | 3 | 3.8 | 8 | 10.0 | 7.302 | 2 | 0.026 |

4.2.6 Farmers' perception on cotton production by gender

It was thought important to consider farmers' perception by gender so as determine whether there were any significance differences in perception gender wise. Farmers were asked to give their perception on cotton production gender wise (Table 13). The survey result shows that about 63.8% of male respondents had negative perception regarding cotton production where as 23.1% of female respondents had negative perception on the same. On the other hand 10.6% of the male respondents had positive perception on cotton production and 2.5% of the female respondents had positive perception.

The high percentage of males in both cases; negative and positive could be due to the fact that the sample comprised of many males than females. However, the result concurs with the expectation due to that traditionally males are more involved in cash crops production such as cotton and coffee where as female deals with food crops production to take care of food security in the household.

Table 13: Farmers' perception on cotton production by gender

| Perception | Frequency | Gender (%) | | Total percent |
|------------|-----------|------------|--------|---------------|
| | | Male | Female | |
| Negative | 139 | 63.8 | 23.1 | 86.9 |
| Positive | 21 | 10.6 | 2.5 | 13.1 |

As explained above, in most cases females deal with food crops production such as maize, sorghum, paddy and vegetables although to a less extent female participates in cash crops production. Table 14 shows the analysis of perception by gender with consideration of minimum, maximum, mean and standard deviation. The result shows that minimum male with negative perception was -10.2 and the maximum was -1.0 with a mean of -5.9. The minimum male with positive perception was 0.2 and the maximum was 7.0 with a mean of 4.1. However, the result shows that there is no significant difference in terms of perception between male and female. What makes differences was observed to be of more traditional in the sense that most women are involved in food crops for food security than cash crops production.

Table 14: Distribution of farmers according to perception by gender

| Gender | Perception | n | Minimum | Maximum | Mean | Std Deviation |
|--------|------------|-----|---------|---------|------|---------------|
| Male | Negative | 102 | -10.2 | -1.0 | -5.9 | 2.0 |
| | Positive | 17 | 0.2 | 7.0 | 4.1 | 2.3 |
| Female | Negative | 37 | -9.9 | -0.4 | -5.7 | 2.3 |
| | Positive | 4 | 3.3 | 7.5 | 5.2 | 2.1 |

4.3 Relationship Between Farmers' Perception on Cotton Production, Farm Resources And Household Characteristics

4.3.1 Farmers' perception on involvement in cotton production

Farmers have multiple objectives ranging from livestock keepers to crop producers. Their multiple objectives vary depending on the environment in which they make decision, household resources, and household characteristics. Thus, considering this aspects, farmers were asked whether they were involved in cotton production or not. The survey result in Table 15 shows that about 62.5% of the respondents in Morogoro district were involved in cotton production and 65.0% were involved in cotton production in Kilosa district where as 37.5% and 35.0% of the respondents in Morogoro and Kilosa districts respectively were not involved in cotton production. This shows that about half of the respondents were involved in cotton production where as half of them were not involved in cotton production. However, the difference was not significant between the two locations (Table 15). The expectation was to get such results because most farmers stopped dealing with cotton production due to various reasons most of them being institutional.

Table 15: Farmers' perception on involvement in cotton production

| Perception | Morogoro | | Kilosa | | χ^2 | df | Significant |
|------------|----------|------|--------|------|----------|----|-------------|
| | N | % | N | % | | | |
| Yes | 50 | 62.5 | 65 | 65.0 | | | |
| No | 30 | 37.5 | 28 | 35.0 | 0.108 | 1 | 0.742 |

However, those farmers who were not involved in cotton production gave various reasons which made them to opt for other crops. Some of the reasons which were given are; the enterprise is laborious to undertake, lack of credit and unreliable market.

4.3.2: Farmers' perception on motivation to cultivate cotton

Motivation is very important for increased agricultural production. Motivation can be in different forms. To mention a few, farmers can be motivated by being assured of markets for their crops, timely selling of their crops, increased farm gate prices of crops especially cash crops, presence of infrastructures such as road networks and having adequate provision of extension services. During the study farmers were asked to mention the factors which motivated them to cultivate cotton (Table 16). The survey result indicates that most of the farmers (68.8%) of the respondents in Morogoro district perceived increased income as one of the motivation to produce cotton where as in Kilosa district 83.8% of the respondents perceived the same. About 17.4% of the respondents in Morogoro district produced cotton due to political pressure. Likewise, in Kilosa district 16.2% of the respondents produced cotton as the result of political pressure. However, most political leaders insist farmers to cultivate cotton while they don't have reliable information on the market of the crop and eventually most of the farmers face problems in selling the crop. In addition, the result shows that there is significant difference ($p < 0.002$) in perception between the two locations regarding cotton production motivations (Table 16).

Table 16: Farmers' Perception on motivation for cotton production

| Motivation | Morogoro | | Kilosa | | χ^2 | df | Significance |
|--------------------|----------|------|--------|------|----------|----|--------------|
| | N | % | N | % | | | |
| Increase income | 55 | 68.8 | 67 | 83.8 | | | |
| Maintain status | 11 | 13.8 | 0 | 0.0 | | | |
| Political pressure | 14 | 17.4 | 13 | 16.2 | 12.217 | 2 | 0.002 |

4.3.3: Farmers experience in cotton production

Age of the farmer is one of the factors that can explain the level of labour force that could be employed by the household. Age is thought to influence attitudes and perception towards technologies as it is associated with experience, and decision-making. In Tanzania case where institutions responsible for provision of agricultural information have never been operating, farmers depend mostly on personal experience for their farm activities. A study by Schnitkey *et al.* (1992) pointed out that age is related to experience.

That is farmers with more experience have less demand for external information for both production and marketing. Cotton farming experience was estimated using the number of years that the respondent had worked in cotton production (Table 17). The survey result indicates that the minimum years in cotton production in Morogoro district was 15 years and the maximum years was 38 with a mean of 25.6 years. In Kilosa district it was found that the minimum years in cotton production was 8 years and the maximum years was 40 years with a mean of 20.3.

Table 17: Farmers experience in cotton production by district (Years)

| Experience | District | n | Minimum | Maximum | Mean | Std Deviation |
|-----------------|----------|----|---------|---------|------|---------------|
| Age | Morogoro | 50 | 30.0 | 60.0 | 47.7 | 9.0 |
| | Kilosa | 52 | 29.0 | 65.0 | 45.8 | 9.7 |
| Years in cotton | Morogoro | 50 | 15.0 | 38.0 | 25.6 | 5.1 |
| | Kilosa | 52 | 8.0 | 40.0 | 20.3 | 10.1 |

The critical observation in both districts is that respondents who were involved in cotton production were aged between 30 years and 65 years. It was also observed that the maximum duration in cotton production was 40 and 38 years in Kilosa and Morogoro districts respectively. Such results were expected because cotton production is mostly preferred by middle aged farmers and old farmers. While most of the young farmers prefer fast income generating enterprises such horticultural crops.

4.3.4: Farmers' perception on credit availability and use in cotton production

Credit availability is potential in augmenting the flow of returns to the farm enterprises (Kashuliza, 1986). Credit is an important pre-requisite for rural poor farmers to be able to start business and to purchase expensive facilities. However, in cotton production, the survey result in Table 18 indicates that only 21.2% of the respondents in Kilosa district accessed credit where as 0.0% of respondents had access to credit in Morogoro district. About 91.2% of the respondents in Morogoro district had no access to credit where as 56.2% of the respondents in Kilosa district had no access to credit as well. About 8.8% and 22.5% of the respondents in Morogoro and Kilosa districts respectively were not aware of the credit availability. When respondents were asked where do they get finance for cotton production majority of them depended on own savings followed by informal lending from relatives and friends. The result in the same table shows that there was significant difference ($p < 0.00$) in perception regarding credit accessibility between the two districts.

Table 18: Distribution of respondents by perception on credit accessibility

| Description | Morogoro | | Kilosa | | χ^2 | df | Significance |
|----------------|----------|------|--------|------|----------|----|--------------|
| | N | % | N | % | | | |
| Accessible | 0 | 0.0 | 17 | 21.2 | | | |
| Not accessible | 73 | 91.2 | 45 | 56.2 | | | |
| I don't know | 7 | 8.8 | 18 | 22.5 | 28.48 | 2 | 0.00 |

Such observations were expected because little has been done concerning financial support to farmers. Very few financial institutions such as OX - FARM, PASS and PRIDE Tanzania have provision for credits to farmers however with high interest rates that are not affordable to most of the farmers. Basically, the above results indicate that institutional support in the form of credit provision is inadequate in the study area. Hence, for effective cotton production to be realized, institutional support in terms of credit

provision should be in place. However, benefits from credit also depend on the ability of the farmer to use resources productively. As pointed out by Kashuliza (1986) credit access has to be augmented with sufficient farmer's management capacity to optimize the credit benefits.

4.3.5 Farmers' perception on other sources of household income

During the study respondents were asked whether they had other sources of income apart from cotton production. The survey result in Table 19 indicates that about 55.0% of respondents in Morogoro district were selling other crops such as maize and paddy to earn their living where as Kilosa accounted to 62.5% of the respondents who sold other crops. About 5.0% of the respondents in Morogoro district were getting their income through selling chickens and borrowing from their neighbors accounted to 8.8% of the respondents. Likewise 10.0% of the respondents in Kilosa district perceived chicken as source of income and 6.2% of the respondents perceived borrowing from neighbours as source of income. About 7.5% of respondents in Morogoro district obtained their income by making local brews and 5.0% of the respondents in Kilosa district perceived local brew preparation as a source of income while about 23.8% of the respondents in Morogoro district perceived labour provision as a source of income where as in Kilosa district labour provision accounted to 16.2% (Table 19). The high percentage of 55.0% and 62.5% in Morogoro and Kilosa respectively of respondents who get income through selling maize and paddy suggest that most crops which traditionally were known as food crops are now considered as both food crops and income generating crops.

Thus, in this regard there is a need to increase production of food and cash crops such as cotton so as to make farmers be assured of their living. However, it has been observed

that there was no significant difference in perception between the two locations (Table 19).

Table 19: Farmers' perception on other sources of income

| Description | Morogoro | | Kilosa | | χ^2 | df | Significance |
|-----------------------|----------|------|--------|------|----------|----|--------------|
| | N | % | N | % | | | |
| Selling other crops | 44 | 55.0 | 50 | 62.5 | | | |
| Selling chickens | 4 | 5.0 | 8 | 10.0 | | | |
| Borrowing from others | 7 | 8.8 | 5 | 6.2 | | | |
| Local brew | 6 | 7.5 | 4 | 5.0 | | | |
| Provide labour | 19 | 23.8 | 13 | 16.2 | 3.575 | 4 | 0.467 |

As described in chapter three, the Principal Component Analysis (PCA) was applied as extraction method. Principal Component method seeks to maximize the sum of squared loadings of each factor extracted in turn. According to PCA, factor explains more variance than would the loadings obtained from any other method of factoring. The aim of the PCA was to establish indices and used to establish dependent variable (farmers' perception). Variability for factors entered in PCA for Morogoro district is shown in Table 20.

Table 20: Variability for factors entered in PCA for computation Morogoro district

| Component | Total | Total variance explained | | Total | Variance (%) | Cumulative (%) |
|-----------|-------|--------------------------|----------------|-------|--------------|----------------|
| | | Variance (%) | Cumulative (%) | | | |
| 1 | 2.69 | 26.56 | 26.56 | 2.69 | 26.56 | 26.56 |
| 2 | 1.31 | 12.90 | 39.47 | 1.31 | 12.90 | 39.47 |
| 3 | 0.97 | 9.57 | 49.04 | 0.97 | 9.57 | 49.04 |
| 4 | 0.64 | 6.31 | 55.34 | 0.64 | 6.31 | 55.35 |
| 5 | 0.55 | 5.42 | 60.77 | 0.55 | 5.42 | 60.77 |
| 6 | 0.48 | 4.72 | 65.49 | 0.48 | 4.72 | 65.49 |
| 7 | 0.41 | 4.02 | 69.50 | 0.41 | 4.02 | 69.50 |

Moreover, during the study variation of factors entered in PCA was done separately between the two settings. This was done deliberately to determine whether there were

differences. Therefore, Table 21 shows variability for factors entered in PCA for Kilosa district.

Table 21: Variability for factors entered in PCA for computation Kilosa district

| Component | Total | Total variance explained | | Total | Variance (%) | Cumulative (%) |
|-----------|-------|--------------------------|----------------|-------|--------------|----------------|
| | | Variance (%) | Cumulative (%) | | | |
| 1 | 1.89 | 24.13 | 24.13 | 1.89 | 24.13 | 24.13 |
| 2 | 1.22 | 15.49 | 39.63 | 1.22 | 15.49 | 39.63 |
| 3 | 1.02 | 12.95 | 52.58 | 1.02 | 12.95 | 52.59 |
| 4 | 0.65 | 8.25 | 60.83 | 0.65 | 8.25 | 60.83 |
| 5 | 0.48 | 6.12 | 66.95 | 0.48 | 6.12 | 66.95 |
| 6 | 4.24 | 5.38 | 72.33 | 0.42 | 5.38 | 72.33 |

Thereafter, a probit choice model was employed to analyze the relationship between farmers' perception on cotton production household farm resources and household characteristics in both districts of Morogoro and Kilosa. In order to establish relationship between farmers' perception on cotton production, household farm resources and household characteristics, probit model was applied using LIMDEP software. Perception of farmers (1=Perceived Positively, 0=Otherwise) was assigned to be dependent variable while age of farmers, education, marital status, gender, insecticide use, household size, accessibility to extension services, credit accessibility, land resource ownership, hired labour and other sources of income were treated as independent variables. The model was employed so as to find out the strength of influence of these variables to the dependent variable (farmers' perception).

Table 22: Factors influencing farmers' perception on cotton production

| Independent variable | Coefficient | Standard Error | b/st Er | P [Z >z] | Mean |
|----------------------|-------------|----------------|---------|------------|-------|
| Constant | 4.405 | 1.708 | 2.578 | 0.009 | |
| Age | -0.447 | 1.858 | -0.241 | 0.809 | 4.950 |
| Education | -0.137 | 0.303 | 0.451 | 0.652 | 2.663 |
| Gender | -0.865 | 0.412 | -2.097 | 0.036** | 0.781 |
| Marital status | -0.298 | 0.288 | -1.037 | 0.299 | 1.194 |
| Extension services | -2.677 | 0.515 | -5.200 | 0.000*** | 1.232 |
| Credit accessibility | 0.331 | 0.377 | 0.877 | 0.380 | 0.139 |
| Insecticide use | 1.016 | 0.379 | 2.677 | 0.007*** | 0.619 |
| Household size | 0.076 | 0.085 | 0.891 | 0.373 | 4.600 |
| Other income source | 0.065 | 0.263 | 0.250 | 0.802 | 0.330 |
| Land ownership | -0.014 | 0.039 | -0.342 | 0.732 | 6.720 |
| Hired labour | -0.329 | 0.112 | -2.948 | 0.003*** | 1.310 |

Note: *** Significant at $P < 0.01$, ** Significant at $P < 0.05$, *Significant at $P < 0.1$

Morogoro district

Results from the model displayed in Table 22 show that in Morogoro district significant variables are gender of farmers, extension services, insecticide use, and hired labour. Following the theoretical exposition, insight from literature and analytical results, most variables were significant at 1% level. Also, in the analysis insecticide application was found to have positive linkage with farmers' perception on cotton production. This means that cotton farmers perceive that insecticide use in cotton production is very important. This is an implication that if insecticides are timely provided and at an affordable price, farmers are likely to restore their confidence in cotton farming. Thus, due to application of insecticides in the cotton fields keeping other field operations constant the yield of seed cotton per hectare will increase resulting into increased income which again will result into positive perception of farmers regarding cotton production. It was expected that, insecticide is one of the agricultural inputs which are very important in cotton production. Therefore, its availability could influence farmers' perception. Hence, increased use of

insecticides in cotton production together with other agronomic practices will lead onto increased cotton production.

This is supported by Kabwe (2007) who argues that cotton production is dependent upon external inputs and is relative capital intensive. Also it requires efficient distribution of inputs and timely payment to farmers all of which have been lacking to some extent. Because of these constraints, cotton show low results with low returns to farmers. The results also show that, accessibility to agricultural extension services has negative influence to the perception of farmers on cotton production. This is an implication that extension services provided to farmers is not adequate to change the farmers' perception.

The inadequate may be in terms of the approach, the methods used and time of dissemination. This result concur with the expectation of the researcher due to the fact that most agricultural extension officers, do hesitate/fear to sensitize farmers to cultivate cotton because of being not sure of the market of the crop and hence this task has been left to politicians of which most of them if not all lack the skills regarding agricultural extension dissemination. However, in spite of the problems associated with agricultural extension officers in providing agricultural information to cotton farmers, it is still the method used for agricultural information dissemination to farmers. This has been supported by Dulle and Aina (1999) in Tanzania it is recognized among government and non-governmental organizations, those efforts towards the provision of information to rural communities can best be carried out using extension methodology.

Likewise, the gender of the respondent negatively influenced the farmers' perception. Cotton as a cash crop is mostly preferred by males while females prefer to produce food crops mostly for food security purposes. In addition, females are not decision makers

when it comes to who should produce what for the household use and income generation. Hence, most females deal with the production of crops such as maize, paddy, sunflower, sesame and vegetable where as crops such as cotton, sisal and coffee are dealt with males. This is because cash crops in the past used to have high income. Basically, it was expected to have such results because of the historical background that denied women involvement in cash crops production.

Another variable used in the analysis is the accessibility to hired labour. This variable negatively influenced farmers' perception on cotton production. This reveals that with decreased accessibility to hired labour there is likelihood of farmers perceiving negatively regarding cotton production. Likewise, when the accessibility to hired labour is increased there is likelihood of farmers perceiving positively regarding cotton production and hence increase production. Generally, accessibility to hired labour is related to the ability of the farmer or household to have income to pay for the labour with the expectations of getting high market margin through selling the crop. Similar findings was expected because most farmers do allocate their resources where they think there is little chance of failing or where they think there is more chances of generating income.

Similar finding on resource allocation was observed by Kadigi (2006) found that basing on economic efficiency principle, resources should be allowed to flow to the sector generating the highest marginal value. Also as reported by Senkondo (2000) using production theory to explain the main objective of farmers in producing a particular crop is to maximize profit/ utility. However, although accessibility to hired labour has been noted to have a linkage with perception, it should not be forgotten that on the other hand perception influences the objectives of farmers and the farmer's objectives lead into farmer's preferences and hence choice of the crop to be grown (Senkondo, 2000).

Likewise, similar analysis was done to find out how these variables influenced farmers' perception in Kilosa district (Table 23). In Kilosa district results indicate that significant variables are gender of farmers, marital status, extension services, credit accessibility and insecticide use. Most variables were significant at 5% level. Gender of respondents has positive influence on perception of farmers. This is because cotton as a cash crop is mostly preferred by males. Thus most males are influenced when there is any change in the cotton sub-sector. Most females deal with food crops production for food security in the household and other off-farm activities for income generation such as alcohol making.

Table 23: Factors influencing farmers' perception on cotton production

| Independent variable | Coefficient | Standard Error | b/st Er | P [Z >z] | Mean |
|----------------------|-------------|----------------|---------|------------|-------|
| Constant | -0.376 | 2.573 | -0.146 | 0.884 | |
| Age | 0.001 | 0.089 | 0.036 | 0.972 | 4.225 |
| Education | 0.062 | 0.508 | 0.136 | 0.892 | 2.667 |
| Gender | 1.004 | 0.419 | 2.395 | 0.016*** | 0.687 |
| Marital status | 1.128 | 0.561 | 2.009 | 0.044** | 1.213 |
| Extension services | -0.978 | 0.439 | -2.226 | 0.026** | 1.200 |
| Credit accessibility | -0.684 | 0.389 | -1.760 | 0.078* | 0.262 |
| Insecticide use | 0.894 | 0.451 | 1.980 | 0.047** | 0.625 |
| Household size | -0.144 | 0.132 | -1.084 | 0.278 | 4.525 |
| Other income source | 0.185 | 0.383 | 0.483 | 0.629 | 0.312 |
| Land ownership | -0.078 | 0.107 | -0.729 | 0.466 | 6.262 |
| Hired labour | -0.021 | 0.239 | -0.086 | 0.932 | 0.825 |

Note: *** Significant at $P < 0.01$, ** Significant at $P < 0.05$, *Significant at $P < 0.1$

Kilosa district

Another variable used in the analysis is the marital status. This variable positively influenced farmers' perception in cotton production. This relationship is an indication that the situation of being married or not married is one of the aspects which can compel a farmer to go into cotton farming or not. Basically, after marriage a new family is established. Thus, a new family will have to find sources of fund so as to meet family

needs. In addition, as years pass by the family size will tend to increase. Therefore, to meet the expenses emanating from increased family size more income generating activities are required than most farmers who are not married. Also in the analysis agricultural extension services was found to have negative relationship with farmers' perception on cotton production. This is an indication that agricultural extension services provision is inadequate to change farmers' perception. The situation is due to that most of the extension methodologies are not designed to meet the farmer's requirements and their environment.

Furthermore, credit accessibility was found to have negative linkage with farmers' perception on cotton production. This is an implication that with decreased accessibility to credit facility there is likelihood of farmers to have negative perception regarding cotton production. Likewise, when farmers are accessible to credit there is possibility of farmers perceiving positively cotton production and hence increase production. Similar result was expected because most cotton farmers observe cotton farming as capital intensive because it needs intensive application of inputs such as insecticides and fertilizers. This has been observed by Kabwe (2007) who argues that cotton production is relative capital intensive therefore it requires support in a form of credit.

Also in the analysis insecticide application was found to have positive linkage with farmers' perception on cotton production. This means that cotton farmers perceive that insecticide use in cotton production is very important and therefore if insecticides to be applied in cotton fields is timely available and at an affordable price it will reshape the farmers' perception and hence perceive positively. This means that due to application of insecticides in the cotton fields keeping other field operations constant the yield of seed cotton per hectare will increase resulting into increased income which again will result

into positive perception of farmers regarding cotton production. It was expected that insecticide is one of the agricultural inputs which are very important in cotton production. Therefore its availability could influence farmers' perception.

This is also supported by Kabwe (2007) who argues that cotton production is dependent upon external inputs and is relative capital intensive. It therefore requires a high degree of support in form of credit facility, efficient distribution of inputs and timely payment to farmers all of which have been lacking to some extent. Because of these constraints, cotton shows low results with low returns to farmers. Basically, the findings indicated that there are differences and similarities in perception regarding cotton production between Morogoro and Kilosa district. It has been observed that while gender negatively influenced farmers' perception in Morogoro district the same variable positively influenced farmers' perception in Kilosa district. Furthermore, marital status of farmers was found to influence farmers' perception in Kilosa district but this variable was observed to have no influence in Morogoro district. Moreover, while credit facility was found to influence farmers' perception in Kilosa district it was not the case in Morogoro district. Moreover, most of the variables in Morogoro district were found to be significant at 0.01 level while in Kilosa district most of the variables were found to be significant at 0.05 level. This concurs with the expectations because perception is location specific and is very much influenced by the culture of a particular location. This has been noted by Senkondo (2000) that cultural aspects are very important in smallholder decision-making. This is due to the fact that to some extent, the decision-making framework in smallholder farmers is described by the culture of which they are a product and whose complex value, cognition beliefs and experience are important components.

4.4 Institutional Change to Restore Farmers' Perception on Cotton Production

In order to capture the perception of farmers regarding the roles of the institution (government) in cotton production, a set of questions was developed. Farmers were asked to give their perception on what should be done in order to revive cotton production. Table 24 shows that 3.8% of the respondents in Morogoro district were of the perception that the private sector should be improved. Likewise 36.2% of the respondents in Kilosa district were of the perception that private sector dealing with cotton production should be improved. About 62.5% of the respondents in Morogoro district perceived that Agriculture Policy should be reviewed for the purpose of making change while in Kilosa district perception on Agriculture Policy review accounted to 6.2%. About 15.0% of the respondents in Morogoro district indicated that there should be credit facility where as credit provision in Kilosa district accounted to 10.0%. Government intervention accounted to 18.8% of the respondents in Morogoro district where as 47.5% of the respondents in Kilosa district indicated that there should be government intervention at times of problems in the cotton industry.

Table 24: Farmers perception on institutional change to revive cotton Production

| Description | Morogoro | | Kilosa | | χ^2 | df | Significant |
|------------------------|----------|------|--------|------|----------|----|-------------|
| | N | % | N | % | | | |
| Improve private sector | 3 | 3.8 | 29 | 36.2 | | | |
| Policy review | 50 | 62.5 | 5 | 6.2 | | | |
| Provide credit | 12 | 15.0 | 8 | 10.0 | | | |
| Intervention | 15 | 18.8 | 38 | 47.5 | 68.724 | 3 | 0.000 |

Basically, the results in the same table indicate that farmers perceive that the current private sector setup is not working properly hence there is a need to institute amendments such as increasing transparency, improve infrastructures such as road network, storage facilities and electricity to facilitate cotton processing. Also agricultural policy of 1997 should be reviewed for the purpose of instituting favorable environment for increased agricultural production and cotton in particular. This is an indication that farmers perceive that the current agricultural policy is deficient. Particularly in areas concerning cotton production. In addition, respondents indicated that credit should be directed to cotton farmers. This suggests that, current credit facility is inadequate hence there is a need to ensure that cotton farmers are provided with credit for the purpose of improving cotton production. Furthermore, farmers perceived that there is little government intervention at times of problems in cotton sub-sector. This suggests that little has been done in terms of government intervention whenever there are problems. This situation has been observed when cotton is bought on loans basis the government takes quite some time to intervene. Some times intervention is done when approaching to election as one way of campaigning to win the election and not to improve the farmers' income. The result observed that there was significant difference ($p < 0.000$) in perception on the needed institutional change between the two districts (Table 24).

Therefore, concerning the role of the institution, the result concurs with the expectations. It was expected to have such responses because institutional support is a problem in many sectors including agricultural sector. However, of the recent the government introduced subsidy in agriculture as one way of trying to scale up agricultural production. However, this subsidy is limited to few crops (maize and paddy) and caters for only one acre per household. In my view, this strategy will have little impact and its sustainability is still questionable. Hence the government is still compelled to find other alternative if at all

cotton revival is to be attained. Otherwise, the problem will take time to be resolved. Similar findings have been reported by Tanzania Cotton Board (2008) that the institutions have done little in cotton sub-sector because of the inherent problems.

Generally, most cotton farmers perceived that they lacked government support. This has been pointed out by Becker (1998) as non-traditional agriculture sector become an important sector of national economy, small producers who are the main stakeholders weakened considerably partly as a result of lack of government support.

However, my views on the restoration of farmers' confidence so that they can produce, the institution can institute/introduce contract farming. This will enable cotton farmers to sign contracts with the private sector dealing with cotton. The contract signing should be done before production commences under the supervision of the government and the government should ensure that all condition(s) in the contracts are adhered to. Contracts will minimize most risks associated in cotton farming and hence cotton farmers will have confidence and be able to produce more cotton. In addition, the government can establish financial institutions (Banks) which are specific for farmers. The establishment of these banks should focus on the actual situation of the Tanzania farmers such as the education of most farmers, the ability to repay the loans, the repayment period, the interest rate and the general conditions for the farmers to access loans. The established bank should not be for profit maximization but rather a kind of revolving fund with the main objective being to assist farmers to excel. This is because most of the farmers can not access credit from the current financial institutions due to difficult conditions setup one of them being high interest rate. Furthermore, the institution should improve rural infrastructure such as road networks, electrification, tape water systems, health centers and quality schools. Such infrastructures will attract both internal and external investors to invest in other areas such

as cotton processing by installation of processing machine and construction of storage facilities. This is due to the fact that the current situation is not attractive for most of the investors to invest in agriculture.

CHAPTER FIVE

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The main objective of this study was to analyze the farmers' perception on cotton production in the Eastern Cotton Growing Area. Specifically, the study aimed to: assess the status of cotton production in Eastern Cotton Growing Area. Establish perception of farmers on cotton production. Establish relationship between farmers' perception on cotton production, farm resources and household characteristics and lastly determine the needed changes in institutional support to revive cotton production in ECGA.

Data used were collected through a cross section survey of 160 farmers comprising of cotton growers and former cotton growers. Multistage, purposive and simple random sampling techniques were employed to obtain a sample of farmers. Descriptive analyses were used to describe the respondents' characteristics. Principal Component Analysis (PCA) was used to establish perception index. Then the perception indices so established was used to establish the dependent variable. Then, the quantitative analysis was undertaken using the choice probit regression model. The choice probit regression model was used to find out the intensity of relationship between farmers' perception on cotton production, farm resources, and household characteristics. Also cross tabulation was used to determine differences in farmers' perception in two locations of the study.

5.1.1 Status of cotton production in Eastern Cotton Growing Area

The study aimed at finding out the actual state or situation regarding cotton production in the Eastern Cotton Growing Area. The study found that cotton production has declined. In order to understand the status of cotton production three criteria were considered. First,

farmers were asked to indicate their perception whether cotton production has decreased, increased or remained the same. The observation found that 92.5% of the respondents in Morogoro district perceived that cotton production has decreased and 93.8% of the respondents in Kilosa district indicated that cotton production has decreased where as 3.8% of the respondent in Morogoro district agreed that cotton production has increase. About 1.2% of respondents in Kilosa district perceived that cotton production has increased. The second criterion was based on the area allocated for cotton production relative to other crops. The observation found that only 10.3% of the area was allocated for cotton production and 25.2% of area was allocated for maize production. About 17.4% of the area was allocated for paddy producing where as 3.0% of the area was allocated for sunflower production. Sesame production covered 12.1% of the area and fallow land was 32.0%. Maize and paddy were given high priority because they are considered both as food and cash crops. Sesame and sunflower crops were considered as emerging cash crops. Fallow land was big enough (32.0%) given good environment this area could be used to scale up cotton production. Furthermore, the study considered cotton production status by looking on the production trend of cotton in three consecutive years. The result shows drastic decline of cotton especially in 2008/09 season.

5.1.2 Perception of farmers on cotton production

The study found that most of the farmers had negative perception in regard to cotton production. Farmers' perception was established using Principal Component Analysis (PCA). Negative variables indicated otherwise perception of farmers regarding cotton production where as positive variables indicated positive farmers' perception on cotton production. In addition, farmers' perception on preference in resource allocation was considered. Therefore, the study observed that 72.5% of the respondents in Morogoro district their preference was to allocate their resources for food production as a household

food security strategy while in Kilosa district food production accounted to 52.5% of the respondents. Income generation in Morogoro district accounted 23.8% of the respondents and 37.5% of the respondents in Kilosa district. In addition, the perception was analyzed basing on the gender of respondents. About 63.8% of males had negative perception regarding cotton production and 23.1% of females had negative perception regarding cotton production. On the other hand, 10.6% of males had positive perception and 2.5% of females had positive perception. Hence, all these results underline the importance of the government to take deliberate efforts in looking appropriate approaches which will come up with proper solutions on how to change the current perception of farmers and hence revive cotton production particularly in ECGA.

5.1.3 Relationship between farmers' perception on cotton production, farm resources and household characteristics

From the analysis, the results indicated that four variables are significant at different levels in Morogoro district and five variables are significant in Kilosa district. Among the eleven variables which were analyzed; gender, extension services, insecticide use, and hired labour were found to influence farmers' perception in Morogoro district where as gender, marital status, extension services, credit accessibility and insecticide use were found to influence farmers' perception in Kilosa district. The results in Morogoro district indicated that accessibility to extension services, insecticide use and hired labour were found to be statistically significant at 0.01 where as the relationship between gender and perception was significant at 0.05. In Kilosa district marital status, accessibility to extension services, and insecticide use were found to be significant at 0.05 while the relationship between gender and perception was found to be significant at 0.01. Moreover, accessibility to credit facility was found to be significant at 0.1. In addition, most farmers reported that they normally do not use any kind of fertilizers in their farms

giving reason that the fertility status of their farms is still high. However, scientifically it is apparent that whenever there is repeated cropping in the same farms there is absorption of nutrients by crops and eventually depletion of soil nutrients. So addition of nutrients to the soil is equally important. Therefore, these results underline the importance of the government to improve the delivery of agricultural extension services to ensure that farmers are well knowledgeable on different innovations including fertilizer application so as to improve production.

5.1.4 Needed changes in institutional support to restore farmers' perception

Generally, the study found that institutional support is highly needed in different areas. The study found that institutional support such as provision of agricultural extension services and credit facilitation was not adequate. Thus farmers lacked financial support to cater for procurement of insecticides and hiring of labour. Extension services particularly in cotton production were not adequate. Extension services are important in keeping farmers current in day to day agricultural activities. Furthermore, the study found that 3.8% of the respondents in Morogoro district wanted the government to improve the private sector dealing with cotton production where as 36.2% of the respondents in Kilosa district agreed the government on the same. About 62.5% of respondents in Morogoro district indicated that the government entails to review the Agricultural Policy of 1997 for the betterment of farmers and the nation at large. Likewise, in Kilosa district only 6.2% of the respondents indicated that the government should review the Agriculture policy of 1997. The study also observed that 15.0% and 10.0% of respondents in Morogoro and Kilosa districts respectively indicated that the government should provide credit to cotton farmers and 18.8% of the respondents in Morogoro district asked the government to intervene immediately whenever there are problems in the cotton sub-sector. Likewise,

about 47.5% of respondents in Kilosa district indicated that government intervention is needed in cotton sub-sector.

5.2 Recommendations

Based on the observation revealed by this study the following recommendations are made in order to restore farmers' perception and hence revive cotton production.

5.2.1 Revival of cotton production

The study found that cotton production has declined. Therefore, the study recommends strategies to ensure revival of the crop. One of the strategies should be establishment of contract farming scheme. The contract should be between cotton farmers and the private sector dealing with cotton and not between the government and the private sector. However, the government should be responsible to ensure that the contract is profitable to both sides. During the implementation of the contract there should be frequent evaluation of the trend so as to improve or make amendment of the contract accordingly. Basically, contract farming will protect farmers against risks associated with cotton farming. Secondly, the study recommends creation and intensification of the internal market demand of cotton by establishing cloth manufacturing factories which will absorb most of the cotton produced in the country rather than the current system of depending on the external market which has a lot of challenges including frequent price fluctuation. Furthermore, by establishing manufacturing factories the country will get more foreign currency by selling clothes instead of raw cotton which is normally sold at very low price. In addition, the established factories will create employment opportunity to most of Tanzanians. Furthermore, rural infrastructure such as road networks, storage facilities, electrification and cotton processing facilities should be put in place to reduce the cost of

production which has been observed to affect the selling price of cotton. Moreover, installation of infrastructure will attract more investors in the cotton sub-sector.

5.2.2 Restoration of farmers' perception on cotton production

The study found that most of the farmers had negative perception regarding cotton production. The study also found that the current Agricultural Policy and the private sector setup are not meeting farmer's requirements. Thus, the study recommends review of the Agricultural Policy so as to meet the current needs of farmers. Furthermore, in an attempt to restore farmer's confidence the current private sector set up should be reviewed. Particularly, issues related to transparency and participation of farmers should be considered. As it has been observed, perception is not permanent it changes with time depending on the prevailing environment. Well established private sector and Agricultural Policy have great influence on the environment under which a farmer makes various decisions. The decision(s) made by farmers depends on the perception while at the same time perception is influenced by the environment. Thus, improvement of the environment is equally important.

5.2.3 Institutional support

The study, found that institutional support such as provision of credit and extension services for cotton production was not adequate. Therefore, the study recommends for improvements in the provision of extension services and credit facility. Considering provision of extension services, farmers should be provided with frequent trainings and study tours to successful areas in an attempt to increase their capacity in their day to day agricultural activities. Also, in regard to credit facility the study recommends establishment of a new bank (Farmer's Bank) with minimum conditions for farmers to access loans. This is because the current financial institutions (Banks) have difficult

conditions which can not be met by most farmers. On the contrally, most of the Savings and Credit Cooperative Society (SACCOS) have failed to show significant support to farmers. Furthermore, the study recommends the government to establish a subsidy system so as to reduce the cost of production which in turn will increase the profit and hence influence more farmers to cultivate cotton. This is because most cotton farmers can not afford prices of most agricultural inputs including insecticides and fertilizers. Thus when prices are subsidized most farmers will be able to access. In addition, Subsidy provision will reduce the cost of production and hence the country will be able to compete with other countries in the world market.

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APPENDICES

Appendix 1: Farmers’ questionnaire

**FARMERS’ PERCEPTION ON COTTON PRODUCTION UNDER
LIBERALIZED MARKET ECONOMY:
THE CASE STUDY OF EASTERN COTTON GROWING AREA.**

Questionnaire No.....

Date of interview.....

Region.....

District.....

Division.....

Ward.....

Village.....

Name of respondents-----

Module 1: FARMERS CHARACTERISTICS

1.1 Age of the farmer..... (Years)

1.2 Gender: 1= male, 2= female

1.3 Marital status: 1= married, 2= single, 3= divorced,4= widow, 5= others(specify)

1.4 Level of education: 1= None, 2= Adult education, 3= Primary education, 4=
Secondary education, 5= College, 6= others (specify)

1.5 Household size (number) -----

1.6 Household composition

| Age group | Male | Female |
|----------------|------|--------|
| 10- 14years | | |
| 15- 18years | | |
| 18- 45years | | |
| 45-60 years | | |
| Above 60 years | | |
| Total | | |

1.7 Overview of Household Resources

| Resources | Unit | Quantity |
|-------------------------|------|----------|
| Land resources | | |
| Cultivated land | | |
| Fallow land | | |
| Plots for cotton | | |
| Livestock resources | | |
| Cattle | | |
| Sheep | | |
| Goats | | |
| Donkeys | | |
| Chicken | | |
| Radio | | |
| Bicycle | | |
| Ox-plough | | |
| Sprayer | | |
| Crop storage facility | | |
| Iron sheet roofed house | | |
| Grass matched house | | |
| Other assets (specify) | | |

Module 2: Main occupation(s)

2.1 What is your main activity?

1 =Crop farming, 2= Livestock keeping, 3= Fishing, 4= Employee 5= Food service, 6= others (specify)

2.2 Do you grow cotton in your farm?

1= Yes, 2= No

2.3 If answer is no please give reason (s)

2.4 If yes, for how long have you been cultivating cotton

2.5 Who persuaded/ motivated you to cultivate cotton?

1= neighbor, 2= extension officer, 3=relative, 4= politician, 5=others (specify)

2.6 What are the motivations for undertaking cotton production?

1= Increase income, 2= Maintain status, 3= Political presure

Module 3: Cotton marketing

3.1 What factors did you consider when you decide to sell your cotton?

1= The price offered, 2= Personal ties with the trader, 3= Household cash need, 4= Need to repay back the loan, 5=Others (specify)

3.2 Where do you sell your cotton after harvesting?

1= middlemen, 2= cotton traders, 3=cooperative union, 4= others (specify)

3.3 Did you find difficulties to sell your cotton?

1= Yes, 2= No

3.4 If yes what was the problem(s) in selling your cotton

1=The market is very far from home, 2=Few customers, 3=Low demand, 4=Low farm gate price, 5= Lack of transport facility

3.5 At which price did you sell your cotton during the following season?

2006/07.....Tsh/kg

2007/08.....Tsh/kg

2008/09.....Tsh/kg

3.6 Were you satisfied with that price?

1= Yes, 2= No

3.7 If no why (explain)

3.8 How do you access information on market prices?

1=Direct visit to the market, 2= Cross checks with the middlemen, 3= Hear from friends, 4= Hear from radio, 5= Others (specify)

3.9 How far is the selling point of cotton from your homestead?

1= 5 km, 2= Less than 5 km, 3=More than 5 km, 4= Others (specify)

Module 4 Extension services and information

4.1 How easy is it for you to access extension services when needed?

1= is easy, 2= fairly easy=3= not easy

4.2 Please comment on the importance of agricultural extension services and information on cotton production.

1= is very important, 2= is fairly important, 3= Not important, 4= I do not know

Module 5: Farm inputs use and other farm services information.

5.1 Do you normally use farm inputs in your farm?

1= Yes, 2 = No

5.1.1 If yes, what kind of farm inputs do you use?

5.1.2 If no what are the reasons

1= Too expensive, 2= Not available when needed, 3= I don't know

5.1.3. What do you perceive about the importance of insecticide application in your cotton farm?

1= Always important, 2= Important, 3= Not important

5.1.4 What do you perceive about importance of radio as a media for accessing agricultural information?

1= Always important, 2= Important, 3= Not important

Module 6: Credit availability and accessibility for cotton production

6.1 What do you perceive about credit availability?

1= Available, 2= Not available, 3= I don't know

6.2 If yes did you access credit for cotton production last season?

1=Yes, 2= No

6.3 If yes, what was the condition(s) for accessing the credit?

6.4 What was the repayment period to recover the mentioned credit?

6.5 If not what are the reasons for not borrowing? (Explain)

6.6 Apart from credit, do you have any other source(s) of income for cotton production?

1=Yes, 2= No

6.7 If yes, what are they?

1= Selling other crops, 2= Selling chickens, 3= Borrowing from others, 4= From local brew, 5= Provide labour

6.8 How do you access information on credit availability?

1= Radio, 2= Village authority, 3= Microfinance institutions, 4= Private Cotton companies, 5= Primary societies, 6= Others (specify)

Module 7: Perception on ownership of farming tools/resources

7.1 What do you perceive about the importance of owning farming tools?

1= Always important, 2= Important, 3= Not important

7.1.2 What kind of farming tools do you have?

7.1.3 What do you perceive about the importance of land resource?

1= Always important, 2= Important, 3= Not important

7.1.4 What is your preference in land allocation agricultural activities?

1= Food security, 2= Cash income, 3= Local brew, 4= Others (specify)

Module 8 Perception on constraints hindering cotton production

8.1 Please indicate if the following is 1= not a problem 2=is a minor problem, 3= is a big problem, 4= is a biggest problem, 5= others (specify)

| Constraint | Response |
|-----------------------------|----------|
| Problem of land acquisition | |
| Pest and vermin attack | |
| Poor soil fertility | |
| Lack of extension services | |
| Lack of credits | |
| Shortage of labour | |
| Post harvest losses | |
| Low crop prices | |
| Poor transport | |
| Lack of farm implements | |
| Lack of pesticides | |
| High input prices | |
| Unreliable rainfall | |
| Late rainfall | |

| | |
|---------------------------------------|--|
| Lack of off-farm works | |
| Lack of fertilizers | |
| Unreliable markets | |
| Lack of storage facilities | |
| Lack of information on prices | |
| Exploitation by unscrupulous buyers | |
| Price fluctuation | |
| Too much rainfall | |
| Too low rainfall | |
| Lack of title deed | |
| Lack of transparency | |
| Lack of efficient agricultural policy | |

8.2 What do you perceive about cotton production in terms of profitability?

1= Profitable, 2= Sometimes profitable, 3= Not profitable

8.3 What do you perceive about cotton production in your area?

1= Decreased, 2= Increased, 3= remained the same

8.4 If cotton production has decreased what do you perceive to be the reasons

1= Low price, 2= Unreliable market, 3= Lack of credit facility, 4= Poor private sector, 5=

Little government involvement

8.5 In your opinion what do you think the government should do in order to revive cotton production? (Please explain)

THANK YOU FOR YOUR COOPERATION.

Appendix 2: Descriptive statistics for variables entered in factor analysis

| Variable | Mean | Std Deviation |
|--------------------------------|-------|---------------|
| Problem of land acquisition | 1.300 | 0.683 |
| Pest and vermin attack | 2.300 | 0.701 |
| Poor soil fertility | 1.425 | 0.497 |
| Lack of extension services | 1.438 | 0.499 |
| Lack of credit | 3.875 | 0.333 |
| Shortage of labour | 1.625 | 0.537 |
| Post harvest loss | 1.488 | 0.503 |
| Low crop prices | 3.800 | 0.644 |
| Poor transport | 1.775 | 0.914 |
| Lack of farm implements | 2.763 | 0.534 |
| Lack of pesticides | 3.412 | 0.852 |
| High input prices | 3.912 | 0.363 |
| Unreliable rainfall | 3.000 | 0.595 |
| Late rainfall | 1.575 | 1.883 |
| Lack of off-farm activities | 1.563 | 0.524 |
| Too low rainfall | 1.288 | 0.482 |
| Unreliable markets | 3.525 | 0.503 |
| Price fluctuation | 1.788 | 0.706 |
| Too much rainfall | 2.463 | 0.899 |
| Lack of fertilizers | 2.275 | 0.527 |
| Lack of storage facilities | 3.625 | 0.582 |
| Lack of information on prices | 3.775 | 0.420 |
| Exploitation by cotton traders | 3.913 | 0.396 |
| Lack of title deed | 2.088 | 0.799 |
| Lack of transparency | 2.600 | 0.608 |
| Inefficient Policy | 2.525 | 0.711 |

Morogoro district

Appendix 3: Descriptive statistics for variables entered in factor analysis

| Variable | Mean | Std Deviation |
|--------------------------------|-------|---------------|
| Problem of land acquisition | 1.350 | 0.575 |
| Pest and vermin attack | 1.850 | 0.530 |
| Poor soil fertility | 1.888 | 0.551 |
| Lack of extension services | 1.325 | 0.471 |
| Lack of credit | 3.750 | 0.646 |
| Shortage of labour | 3.125 | 0.946 |
| Post harvest loss | 1.675 | 0.471 |
| Low crop prices | 3.163 | 0.371 |
| Poor transport | 2.362 | 0.484 |
| Lack of farm implements | 2.063 | 0.401 |
| Lack of pesticides | 1.988 | 0.373 |
| High input prices | 3.000 | 0.318 |
| Unreliable rainfall | 3.163 | 0.371 |
| Late rainfall | 3.075 | 1.444 |
| Lack of off-farm activities | 1.900 | 0.439 |
| Too low rainfall | 1.788 | 0.495 |
| Unreliable markets | 3.963 | 0.191 |
| Price fluctuation | 2.065 | 0.452 |
| Too much rainfall | 3.113 | 0.389 |
| Lack of fertilizers | 2.375 | 0.817 |
| Lack of storage facilities | 2.700 | 0.461 |
| Lack of information on prices | 3.400 | 0.722 |
| Exploitation by cotton traders | 3.475 | 0.693 |
| Lack of title deed | 1.588 | 0.989 |
| Lack of transparency | 2.725 | 0.449 |
| Inefficient Policy | 2.750 | 0.435 |

Kilosa district

Appendix 4: Component score coefficients for factor analysis Morogoro district

| Variable | Components | | | | | | |
|---------------------------------|------------|--------|--------|--------|--------|--------|--------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Problems of land acquisition | 0.101 | 0.101 | 0.076 | 0.027 | 0.121 | 0.490 | 0.139 |
| Pest and vermin attack | -0.199 | 0.051 | -0.073 | 0.311 | -0.203 | 0.046 | -0.023 |
| Poor soil fertility | -0.027 | 0.021 | 0.037 | -0.100 | -0.045 | 0.173 | -0.055 |
| Lack of extension services | -0.028 | 0.017 | -0.019 | -0.011 | 0.014 | -0.108 | -0.099 |
| Lack of credit facility | -0.008 | 0.037 | 0.016 | 0.000 | 0.073 | 0.039 | 0.042 |
| Shortage of labour | 0.040 | 0.052 | 0.005 | 0.001 | 0.112 | -0.006 | 0.243 |
| Post harvest loss | -0.031 | -0.030 | 0.025 | -0.133 | 0.086 | -0.080 | -0.045 |
| Low crop prices | 0.002 | -0.067 | -0.081 | 0.180 | 0.485 | 0.284 | -0.348 |
| Poor transport | 0.188 | 0.359 | 0.066 | -0.546 | -0.074 | 0.062 | -0.342 |
| Lack of farm implements | -0.022 | -0.013 | -0.067 | 0.023 | -0.225 | 0.232 | 0.194 |
| Lack of pesticides | -0.211 | 0.113 | -0.161 | -0.071 | 0.383 | 0.304 | -0.059 |
| High input prices | -0.009 | -0.010 | -0.034 | 0.078 | -0.006 | -0.021 | -0.075 |
| Unreliable rainfall | 0.054 | 0.068 | -0.025 | 0.251 | -0.201 | 0.116 | -0.032 |
| Late rainfall | 0.260 | 0.025 | 0.061 | 0.201 | -0.182 | 0.158 | -0.161 |
| Lack of off-farm activities | 0.015 | 0.030 | -0.059 | 0.135 | 0.014 | 0.202 | 0.286 |
| Too low rainfall | 0.003 | 0.015 | -0.049 | 0.010 | 0.040 | -0.058 | 0.036 |
| Unreliable markets | 0.037 | -0.013 | -0.042 | -0.069 | 0.122 | 0.151 | 0.191 |
| Price fluctuation | 0.112 | 0.088 | 0.085 | 0.219 | 0.164 | -0.105 | -0.481 |
| Too much rainfall | 0.188 | -0.340 | 0.003 | 0.207 | 0.314 | -0.351 | 0.361 |
| Lack of fertilizers | -0.030 | 0.020 | 0.173 | -0.108 | 0.106 | -0.033 | 0.131 |
| Lack of storage facilities | -0.014 | 0.081 | 0.283 | 0.099 | 0.098 | -0.064 | 0.168 |
| Lack of information | 0.002 | -0.048 | 0.085 | -0.038 | -0.030 | 0.022 | -0.063 |
| Exploitation by traders | -0.003 | 0.040 | 0.021 | 0.000 | 0.127 | -0.047 | 0.007 |
| Lack of title deed | -0.104 | 0.294 | 0.290 | 0.370 | 0.023 | -0.185 | 0.179 |
| Lack of transparency | -0.033 | -0.146 | 0.250 | -0.026 | -0.014 | 0.164 | -0.130 |
| Inefficient Agricultural Policy | -0.042 | -0.234 | 0.295 | -0.011 | -0.140 | 0.305 | -0.144 |

Extraction method: Principal Component Analysis

Appendix 5: Component score coefficients for factor analysis Kilosa district

| Variable | Components | | | | | |
|------------------------------|------------|--------|--------|--------|--------|--------|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| Problems of land acquisition | 0.103 | 0.047 | -0.039 | -0.054 | 0.288 | 0.200 |
| Pest and vermin attack | 0.087 | 0.064 | 0.016 | 0.121 | 0.327 | 0.008 |
| Poor soil fertility | 0.097 | 0.052 | 0.040 | 0.063 | 0.328 | 0.158 |
| Lack of extension services | 0.067 | 0.003 | 0.036 | 0.084 | 0.027 | -0.092 |
| Lack of credits | -0.087 | -0.113 | 0.105 | -0.046 | 0.241 | 0.625 |
| Shortage of labour | 0.103 | -0.669 | 0.242 | 0.024 | 0.098 | -0.183 |
| Post harvest loss | 0.034 | 0.038 | 0.070 | 0.093 | 0.012 | -0.036 |
| Low crop prices | -0.026 | 0.023 | -0.035 | 0.085 | -0.005 | 0.092 |
| Poor transport | 0.088 | 0.022 | 0.103 | 0.070 | -0.053 | 0.004 |
| Lack of farm implements | 0.034 | 0.019 | -0.047 | 0.049 | 0.057 | 0.003 |
| Lack of pesticides | 0.030 | 0.003 | 0.002 | 0.005 | -0.015 | 0.016 |
| High input prices | 0.001 | 0.002 | -0.012 | 0.058 | 0.030 | -0.027 |
| Unreliable rainfall | -0.026 | 0.031 | -0.043 | 0.053 | -0.031 | 0.031 |
| Late rainfall | -0.018 | 0.014 | 0.000 | 0.008 | 0.029 | 0.147 |
| Lack of off-farm activities | 0.060 | 0.011 | 0.050 | -0.028 | -0.030 | -0.081 |
| Too low rainfall | 0.079 | 0.004 | -0.040 | 0.045 | -0.133 | -0.144 |
| Unreliable markets | -0.001 | 0.001 | -0.009 | -0.008 | 0.007 | -0.008 |
| Price fluctuation | 0.085 | 0.040 | -0.007 | -0.050 | 0.014 | -0.104 |
| Too much rainfall | -0.010 | 0.008 | -0.041 | 0.069 | 0.022 | 0.068 |
| Lack of fertilizers | 0.109 | 0.193 | 0.406 | -0.443 | -0.432 | 0.428 |
| Lack of storage facilities | -0.026 | -0.107 | 0.108 | -0.060 | 0.032 | -0.032 |
| Lack of information | -0.215 | -0.032 | -0.163 | -0.216 | 0.015 | 0.057 |
| Exploitation by traders | 0.071 | -0.065 | -0.106 | 0.464 | -0.463 | 0.468 |
| Lack of title deed | 0.344 | -0.190 | -0.579 | -0.465 | -0.198 | 0.200 |
| Lack of transparency | -0.005 | 0.112 | -0.012 | -0.080 | 0.039 | -0.073 |
| Inefficient Policy | -0.024 | 0.037 | 0.055 | 0.132 | -0.067 | -0.066 |

Extraction method: Principal Component Analysis

Appendix 6: Variability for factors entered in PCA for analysis Morogoro district

| Total variance explained | | | | | | |
|---------------------------------|----------------------------|----------------------|---------------------|--|----------------------|---------------------|
| Component | initial Eigen value | | | Extraction sum of square loadings | | |
| | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % |
| 1 | 2.69 | 26.56 | 26.56 | 2.69 | 26.56 | 26.56 |
| 2 | 1.31 | 12.90 | 39.47 | 1.31 | 12.90 | 39.47 |
| 3 | 0.97 | 9.57 | 49.04 | 0.97 | 9.57 | 49.04 |
| 4 | 0.64 | 6.31 | 55.35 | 0.64 | 6.31 | 55.35 |
| 5 | 0.55 | 5.42 | 60.77 | 0.55 | 5.42 | 60.77 |
| 6 | 0.48 | 4.72 | 65.49 | 0.48 | 4.72 | 65.49 |
| 7 | 0.41 | 4.02 | 69.50 | 0.41 | 4.02 | 69.50 |
| 8 | 0.38 | 3.71 | 73.21 | | | |
| 9 | 0.36 | 3.55 | 76.77 | | | |
| 10 | 0.31 | 3.06 | 79.83 | | | |
| 11 | 0.28 | 2.75 | 82.58 | | | |
| 12 | 0.23 | 2.23 | 84.82 | | | |
| 13 | 0.22 | 2.14 | 86.96 | | | |
| 14 | 0.20 | 2.01 | 88.97 | | | |
| 15 | 0.18 | 1.78 | 90.75 | | | |
| 16 | 0.15 | 1.45 | 92.20 | | | |
| 17 | 0.14 | 1.41 | 93.61 | | | |
| 18 | 0.12 | 1.21 | 94.82 | | | |
| 19 | 0.12 | 1.10 | 95.92 | | | |
| 20 | 0.09 | 0.91 | 96.83 | | | |
| 21 | 0.08 | 0.77 | 97.60 | | | |
| 22 | 0.06 | 0.63 | 98.24 | | | |
| 23 | 0.06 | 0.54 | 98.77 | | | |
| 24 | 0.05 | 0.48 | 99.03 | | | |
| 25 | 0.04 | 0.41 | 99.66 | | | |
| 26 | 0.03 | 0.34 | 100.00 | | | |

Extraction method: Principal Component Analysis

Appendix 7: Variability for factors entered in PCA for analysis Kilosa district

| Total variance explained | | | | | | |
|---------------------------------|----------------------------|----------------------|---------------------|--|----------------------|---------------------|
| Component | initial Eigen value | | | Extraction sum of square loadings | | |
| | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % |
| 1 | 1.89 | 24.13 | 24.13 | 1.89 | 24.13 | 24.13 |
| 2 | 1.22 | 15.49 | 39.63 | 1.22 | 15.49 | 39.63 |
| 3 | 1.02 | 12.96 | 52.58 | 1.02 | 12.95 | 52.58 |
| 4 | 0.65 | 8.25 | 60.83 | 0.65 | 8.25 | 60.83 |
| 5 | 0.48 | 6.12 | 66.95 | 0.48 | 6.12 | 66.95 |
| 6 | 4.24 | 5.38 | 72.33 | 0.42 | 5.38 | 72.33 |
| 7 | 0.28 | 3.61 | 75.95 | | | |
| 8 | 0.23 | 2.95 | 78.89 | | | |
| 9 | 0.22 | 2.85 | 81.75 | | | |
| 10 | 0.19 | 2.49 | 84.23 | | | |
| 11 | 0.18 | 2.22 | 86.46 | | | |
| 12 | 0.15 | 1.88 | 88.33 | | | |
| 13 | 0.13 | 1.67 | 90.01 | | | |
| 14 | 0.12 | 1.58 | 91.58 | | | |
| 15 | 0.12 | 1.47 | 93.05 | | | |
| 16 | 0.09 | 1.20 | 94.25 | | | |
| 17 | 0.08 | 1.09 | 95.34 | | | |
| 18 | 0.07 | 0.93 | 96.27 | | | |
| 19 | 0.06 | 0.79 | 97.65 | | | |
| 20 | 0.05 | 0.63 | 97.68 | | | |
| 21 | 0.04 | 0.55 | 98.23 | | | |
| 22 | 0.03 | 0.47 | 98.70 | | | |
| 23 | 0.03 | 0.39 | 99.09 | | | |
| 24 | 0.02 | 0.34 | 99.44 | | | |
| 25 | 0.02 | 0.33 | 99.77 | | | |
| 26 | 0.01 | 0.24 | 100.00 | | | |

Extraction method: Principal Component Analysis