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**Impact of Cotton Production Among Cotton Farmers in Maringue
District of Sofala Province – Mozambique**

By

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in Economics, Management and Administration Degree

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DECLARATION

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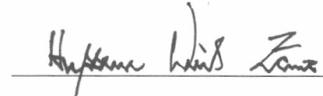
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DEDICATION

This thesis is especially dedicated to my parent Cardoso Pedro Esboi and my sister Páscoa Cardoso Esboi who passed away during my school enrolment. May God provide an eternal rest. My mother Cecilia Avalinho, brothers Pio, Leonardo, Leopoldina, Gorete, Felisberto, Assane and Viano.

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ABSTRACT

The study evaluates the ex-ante economic impact of cotton production among rural cotton farmers, more specifically the study seeks to address. 1) The economic benefits of cotton production at smallholder level as way of poverty reduction. 2) The major factors that affect cotton production at household level. The study attempts to provide insights for decision making on cotton sub-sector in Maringue district even in Mozambique, which are likely to consider the adoption of cotton as form of poverty reduction in rural area. To achieve the main goal, the study has target population as the cotton smallholder farmer in 2005/06 season; the sample was 200 cotton household farmers. And it was selected using cluster or area random sampling. The survey is based on questionnaire, using personal interview methods, and it is based mainly on purpose of the study and research question. The study concludes that under current low education level and the dependence on natural factors such as weather and pests, cotton in Maringue district is only a cash crop that has direct impact on household economy. In fact, the cotton production increases earnings and purchase power for most rural cotton farmers. In term of value relative to others agriculture crops and as source of income, cotton stands as the highest earning non-food crop and creates the auto-employment for most rural household. Due to importance of cotton for rural household economy, most of them have not been able to take full advantage of favorable macro-environment. The dependence of natural factors, low level of education and the lack of social infrastructure such as clean drink water, shops and others basic social service constrain most cotton farmers to develop their cropping activities as much as possible.

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LIST OF ABBREVIATIONS

AAM	Associação Algodoeira de Moçambique.
Bt	Bacillus thuringiensis.
CFDT	Compagnie Francaise pour le Development des Fibres Textiles.
CF	Contract Farming.
CIDT	Cote d'Ivoire Development Textile.
CIRAD	Center International de Recherch Agronomique et Development.
CMDT	Company Malienne pour le Development Textile.
CNA	Companhia Nacional Algodoeira.
CSPR	Centrale de Sécurisation des Paiements et des Recouvrements.
CPI	Center for Investment Promotion.
EU	European Union.
FONPA	Forum Nacional dos Produtores do Algodão.
GDP	Gross Domestic Products.
GIS	Geographic Information System.
IAM	Instituto do Algodão de Moçambique.
INTA	Instituto Nacional de Tecnologia Agropecuaria.
IP	Independent Producers.
MDGs	Millennium Development Goals.
MA	Ministry of Agriculture.
MVP	Marginal Value product.
PARPA	Action Plan for Reduction of Absolute Poverty.
PA	Plantation Agriculture.
SADC	Southern African Development Community.
SEA	Southern and Eastern Africa.
SPSS	Statistical Package for Social Science.
USA	United States of America.
UCM	Catholic University of Mozambique.

DEFINITION OF TERMS

Cotton: One of the most important of the world's money crops. It is a tropical plant, adapted to temperate zones, thriving best with high temperatures, considerable sunshine, abundant but not excessive moisture and high soil fertility.

Cotton smallholder farmer: People or household that concentrate mainly on cropping and livestock management. The smallholders in focus area are based on food and cash crop and small scale of livestock. In term of cash crop, cotton is the most important crop for increasing household income.

Pest: Of all agricultural products, cotton seems designed by nature for special insect attack. Its lush foliage, succulent leaves, large flowers, all with nectarines, and its heavy fruitage urge insects to feed upon the plant or even to reside within its tissues. The bollworm *-Heliothis armigera-* is known in most temperate and tropical countries, often by others names because it attacks not only cotton, but many others agricultural crops.

Poverty: PARPA I, defines poverty as inability of individuals to ensure for themselves and their dependents a set of basic minimum conditions necessary for their subsistence and well-being in accordance with the norms of society.

CHAPTER ONE: INTRODUCTION

1.0: Preface

Priority solved by policy makers in developing countries is the problem of widespread poverty. It constitutes the majority threat to society where most of the population lives in rural area and depends heavily on agriculture as their principal source of live. There remains the major challenge to development efforts, (Todaro et al, 2006). The alleviation of poverty also constitutes one of the major challenge of the Millennium Development Goals (MDGs) which recognize substantial progress on agriculture toward eradication of poverty and achieve the human develop goal.

The importance of agriculture is not only limited to food security, but it is also considered as source of social and economic development, particularly in developing countries. It constitutes one of the government global growth strategies that engage on poverty reduction and accelerate the economic growth rate based on food security and cash crop.

The adoption of cash crop can ameliorate the rural competition, and it can also alleviate significantly the household life level “poverty” and increase the rural purchase power. If the small scale, resource poor farmers in developing countries gain some economic benefits from the cash crop it should shift income, which can be used to buy goods and service, improving so demand and supply in rural area. Cotton appears as non-food cash crop that plays a significant importance for rural household.

1.1: World Cotton Overview

There are more than 70 cotton producing and exporting countries, while many developed and developing countries import lint for their spinning/textile industry. World wide cotton production and consumption has increased significantly during the last four decades, from 9.8 million tons in 1960/61 to 18.5 millions in 1998/99 and reached 21.1 millions tons in 2001/02, (Larsen, 2003). The production and processing provide some or all of the cash income of over 250 million people worldwide, including the available labor force in developing countries. Cotton cultivation covers nearly 33 million hectares, equivalent to about 2.5 percent of all cultivable land of world's cotton. Cotton textiles constitute approximately half of the total textile fibre and arguably the largest industry in the world. The rapid expansion of the textile industry among growing countries is closely related to the increasing cotton production.

The table bellow shows the world cotton performance, production, consumption, exports and imports, since 1990 to 2003. During the focus period, cotton production grew of an annual average rate of 1.8 percent to reach 20 million tons in 2001 from 10.2 million tons in 1960, (Baffes, et al, 2004). Most of this growth came from China and India, which doubled and tripled their production, respectively, during 40 years ago. The other country that significantly increased its share of cotton production was Pakistan. Some new entrants, also contributed to this growth such as Francophone Africa that produces ten times more than the previous years. The Units State like the Central Asia Republics of the former Soviet Union have maintained their cotton output level.

Table 1.1: Global Balance and Trade of Cotton Market (Thousand Tons)

PRODUCTION	1990	1999	2000	2001	2002	2003
China	4,508	2,830	4,417	5,324	4,916	4,870
US	3,376	3,694	3,818	4,420	3,747	3,968
India	1,989	2,650	2,380	2,686	2,312	2,968
Pakistan	1,638	1,911	1,816	1,783	1,736	1,700
Uzbekistan	2,593	1,128	975	1,055	1,022	915
Franc. Zone	562	881	728	1,039	952	967
World	18,970	19,070	19,437	21,485	19,301	20,212
Consumptions						
China	4,225	4,700	5,200	5,700	6,500	6,750
India	1,958	2,939	2,924	2,910	2,927	2,950
Pakistan	1,343	1,700	1,764	1,855	2,042	2,100
USA	1,885	2,230	1,929	1,676	1,583	1,350
World	18,585	19,610	19,844	20,284	21,119	20,978
Exports						
USA	1,697	1,470	1,472	2,395	2,591	2,862
Franc. Zone	326	592	527	506	567	731
Uzbekistan	397	893	800	810	798	643
Australia	329	696	849	662	575	360
World	5,081	6,107	5,857	6,470	6,618	6,932
Imports						
China	480	30	52	98	685	1,500
Indonesia	324	450	570	460	500	470
India	0	348	350	425	350	200
Turkey	46	575	383	624	516	400
Pakistan	0	103	101	191	186	425
World	5,222	6,050	5,747	6,159	6,577	6,932

Source: Cotton: Market Structure, Policies and Development Issues (2004)

The cotton consumption is determined by the size of textile industries of the dominant cotton consumers. China, the leading textile producer, absorbed more than one-quarter of global cotton output during the late 1990s. Other major textile producers and hence major cotton consumers are India, Pakistan and USA. One-third of cotton production is traded internationally. The four dominant exporters are US, Uzbekistan, Francophone Africa and Australia which account for more than two-thirds of world exports. The four major

importers are also the major producer such as China, India, Pakistan and Turkey which import cotton to supply their textile industry.

According to Larsen, (2003) the first three countries caused instability and significant downward trend in world cotton prices. The fluctuation in world market prices is influenced by unpredictable fluctuation in production and export from the China, India and Pakistan. These countries are major consumers of their own cotton; hence lint is only exported when the cotton harvest is larger than domestic demand. China in particular is the main swing factor in world cotton trade and therefore it has very strong impact on cotton price.

However, with the scale and scope of cotton production in developing countries, in which two thirds of global production occurs, the importance of cotton trade to whom economic growth and poverty reduction prospects cannot be overstated by extension, neither by the damage engendered by subsidies and domestic support, (Primack 2005). The impact of cotton subsidies on world cotton price and production is reflected in developing countries like Sub-Saharan Africa and some countries of Asia, which depend on the crop production for foreign exchange earnings, (Odi Briefly Paper, 2004). However, the large increase in subsidies to cotton producers place a downward pressure on cotton price. This facilitates the level of production and exports that did not reflect their cost realities; thereby inducing excess supply and helping to lower global price.

According to Primack, (2005) the annual government supports to the cotton industry worldwide have ranged from US\$ 3.8 to 6 billion for the period 1997/98 to 2001/02. In term of absolute support, the USA provides the highest level averaging US\$ 2.5 billion annually, followed by China US\$ 1.2 billion and EU US\$ 0.8. Additionally being by far the largest exporter, USA subsidies exert the strongest influence on world price, followed by EU, which offers the highest per unit support. The impact of Chinese subsidies on world prices depends largely on whether it finds itself in a position of net importer, pushing the prices higher, or net exporter, depressing prices. Cotton subsidies are mostly provided by governments in high income countries, which results in meaningful price

distortions and injury to other producers, especially in lower income countries. It also depends on foreign exchange earning. The main reason is that the subsidies and tariffs affect the gains and welfare for lower income cotton producers.

Most reports on cash crop focus on cotton as crop that has significant importance in household income more particularly in developing countries. It is a predominant smallholder crop in Sub-Saharan Africa, with over two million of poor rural households depending on it as their main source of cash income, (Boughton et al, 2003). It constitutes one of the most important merchandise in international trade, in which developed and developing nations are interested in obtaining the control and earning for their subsistence.

In term of value relative to others agriculture activities, and as source of income in developing countries, cotton stands as the highest earning non-food crop globally. It has been estimated to employ seven percent of all developing countries labor, largely in smallholder farms. Due to the use of manual harvesting techniques, it has resulted in good quality fibre delivered at highly competitive international market, (Primack, 2005).

In spite of the lower labor intensive cost involved, most of developing countries are believed to hold comparative advantage on labor intensive on cotton production than the developed countries that spend more on subsidies. The adoption and expansion of cotton production in most of the developing countries constitutes the main government strategic challenge of poverty reduction that are related to the life improvement in rural area which is considered as the base of development, (Primack, 2005). In Mozambique for example, agriculture is defined as the base of socio-economic development. This challenge are complemented the agro-industrial sector that give the agriculture output some added value for local and international market, (*Proposta de Programa do Governo 2005-2009*, Mar. 2005)

1.2: Background

Mozambique is one of the developing countries with more than 70 percent of population living in rural area. A large proportion of population depends heavily on subsistence agriculture as the source of living and also applies the non mechanized technology to produce their output, (*Plano de Acção para Redução da Pobreza Absoluta - PARPA I*). Agriculture contributes around 30% of national Gross Domestic Product (GDP) with predominantly poor smallholder household. For this reason agriculture and rural development play the priority area in strategy poverty reduction. The main objectives of rural development are related to increase in opportunities and income for household. The large number of poor smallholder household is illiterate. This factor constitutes one of constrain of poverty eradication in rural area. Moreover, cotton production forms the most important cash crop used to increase some dynamic in rural area and smooth the widespread poverty, (Pitoro, 2004). It is also one of the most important cash crops which contributes significantly on (GDP) and smoothes the balance of deficit payment.

The cotton production was introduced by the colonial government in 1926 (Negrão, 2001). During the colonial period, all cotton in Mozambique was produced by Portuguese settlers who mainly employed labor force from the native people. Traditional large companies played the major role in promoting the crop in the country, which operated typically as monopsonies. After the independence in 1975, Mozambique started to seek well defined paths for sustainable agriculture development. The role of cotton in agriculture development is attributed to smallholder farmer, (Pitoro, 2004). This is the main reason why the companies appear as fomenters in terms of technology accessibility.

Since the colonial period, the cotton production in Mozambique has been under concession system and this continued to present period in cotton sub-sector. The most of smallholders' cotton production is carried out under contract arrangements agriculture exports with several large ginning and trading companies. While companies provide seeds, previous inputs and some extension services in return for right to purchase the cotton at price set annually by the Ministry of Agriculture (MA) via *Instituto do Algodão*

de Moçambique” (IAM). The cotton price level was published at beginning the season by IAM and all companies must buy in predetermined level, or may add some percentage. The trading companies process and bale the cotton, extracting the products in the process, and sell on international markets. These companies themselves employ full time and seasonal workers, providing additional opportunities and income for poor household.

A small number of farmers are organized in farmer associations, in which some of them are locally organized in groups that are promoted by the cotton companies. The main purpose of this strategy is to reduce transaction costs. Where farmer associations have been established, firms have frequently signed contracts with associations that represent a group of farmers. The government direct role in cotton sub-sector is via IAM that performs several tasks including statistical management, classification of lint to export, and supervision of cotton production regulations established by MA.

According to Benfica et al, (2002), the farming contracts in Mozambique are predominantly found in the cotton and tobacco sub-sector. Most schemes take the form of forward resource/management contracts¹. Given the current stage of development of rural agricultural inputs and credits markets in the country, farmers have little access to those resources due to fill that gap. They consist essentially in the firms supplying, on credit, seeds and other inputs including the chemical and technical assistance for the production by farmers on specific areas of land of crop in question. Farmers agree to utilize the inputs as instructed, and to sell all their production to the firms at harvest at agreed prices. The costs initially supported by the firms are deducted at harvest’s time. In most cases in Mozambique, the government has granted the firms monopsony power, in order to avoid the free rider problem. The contract coordination is important to deal with market failure, to reduce uncertainty for farmers regarding access to market and for processors regarding access to sufficient raw material of acceptable quality.

¹ This differ from the simple sale /purchase contracts because they include stipulations regarding the transfer and use of specific resource and managerial function.

There are many cotton varieties in Mozambique and each company adopts the variety according to yield Kg/ha of each variety. Another reason that is closely related to the choice of variety is the attack of insect, because each variety has different propriety, in term of pest resistance. Most of these varieties resisting as much as possible to pest, have lower productivity on average. In this manner, the adoption of cotton varieties depends on the companies' pest management and the productivity desired. The most common variations are ISA-205, CHURENZA, REMU-40, and STAMU-42.

ISA-205, recently adopted from East Africa developed by *Centre International de Recherch Agronomique et Developpement (CIRAD)*, is a yielding variety, with potential yield of 2,010 Kg/ha. But it is more susceptible to pests. It requires more sprays and expenditure on protection than the last three varieties. These are more tolerant to sucking pests. In fact with five sprays and effective overall management, ISA-205 could easily yield more than a ton.

The productivity of cotton sub-sector in Mozambique depends heavily on the weather and it has chronic attack on sucking-insect from the beginning of the planting period of cotton and bollworms in the middle stage to the end of the growth. The precipitation condition in the last five years was irregular. Due to the lack of rainfall, the scope of cotton and then the cotton output were affected. In others, their large of insects in cotton field which increase the damage cotton pest. To control this, it required the use of insecticides three to six times according to the region and cotton variety. These pests effect the cotton yield and lint quality of cotton.

In term of the performance, the cotton sub-sector in Mozambique has fluctuated from low to high performance. The table 1.2 summarizes the cotton sub-sector performance in Mozambique. There are many reasons that played to the lower performance in cotton sub-sector in Mozambique, which are related to the last civil war for 16 years, weather shortage and insect attack. The civil war was the factor that contributed negatively to the bankruptcy for most textile industries in Mozambique. As a consequence, all cotton companies in Mozambique are oriented to the international market. But the system of

international market has also come under stress recently. The world prices have declined to sharply the lowest price in 30 years. The falling on prices contributed in part to the failure of Mozambique's largest trading companies. Several others companies are reported to be experiencing financial difficulty.

Table 1.2: Real Data of Cotton Campaigns (from 1998/99 to 2004/05)

SEASONS	TOTAL COTTON SEED	TOTAL FIBRE	TOTAL EXPORT OF FIBRE		NATIONAL MARKET	
	(ton)	(ton)	(ton)	10 ⁶ \$ US	(ton)	10 ⁹ MT
1998/99	116,716	35,677	34,472	28,6	359	3,2
1999/00	35,000	12,200	11,593	11,1	0	0
2000/01	71,000	24,400	20,800	13,9	0	0
2001/02	84,674	31,396	31,396	27,2	0	0
2002/03	54,144	19,114	18,826	21,9	0	0
2003/04	93,205	32,924	31,500	31,2	0	0
2004/05	78,683	27,700	5,400	5,3	0	0

Source: Instituto do Algodão de Moçambique(2006)

This performance was the lowest compared to neighboring countries e.g. Zimbabwe, Zambia and Tanzania, (Pitoro, 2004). In these countries the privatization and liberalization of the cotton sector have been characterized. Allowing privates companies to compete for seed cotton market and ginning share and prices are determined by prevailing market conditions. The liberalized cotton sectors have contrasting experiences in the area of quality control and provision of inputs. In addition, competition in the cotton market has undermined the links between inputs supply on credit and output marketing by increasing the scope for side marketing of farmers.

According to the under concession system that is operating in Mozambique, Manica and Sofala provinces are the areas of the *Companhia Nacional Algodoeira*, (CNA). In both provinces the CNA adopts the same strategy of management. Each district in both

provinces corresponds to one zone which is managed by one chief. All zones are divided by agencies and finally each agency is composed by groups of market and each group of market has one monitor. Maringue is one of the most potential cotton zone in Sofala province from which the company expect high productivity.

In Maringue district, the area cultivated by smallholder household during the last campaign was 11,264 hectares that correspond to 1.5 percent of all available land. The accessibility of lands is determined by traditional, religious and district administrative authorities. The main crops cultivated are sorghums, beans, maize and cotton. The last two constitute the cash food and non-food crops respectively, (*Directório Comercial de Moçambique*, 2006). In the last season (2005/06) few smallholder farmers adopted sesame as new cash crop, because this cash crop, even maize, does not have fixed buyers.

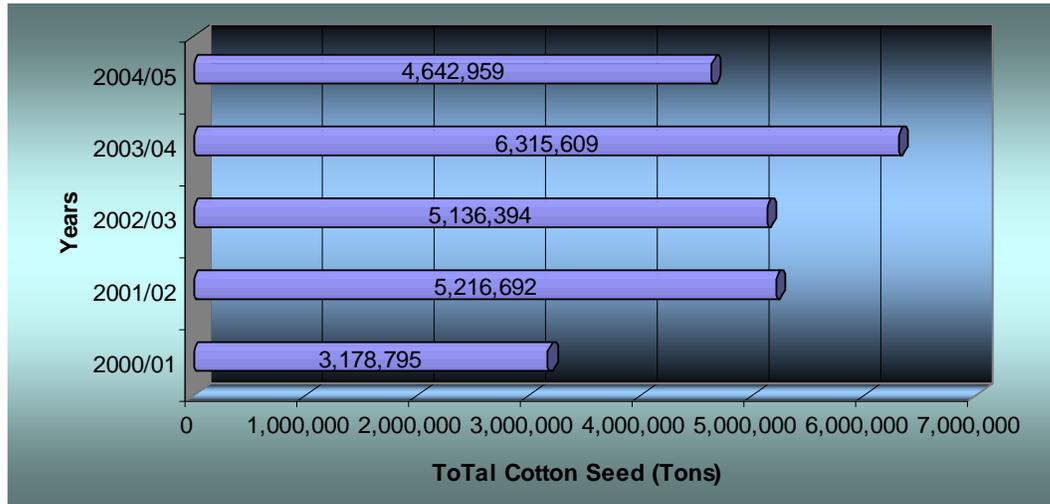
In Maringue, the precipitation, pest, lack of uses and inputs, and the lower land quality constitute the major factors that affect direct or indirectly agriculture production at smallholder's level, (*Directório Comercial de Moçambique*, 2006). Moreover, the small scale farmers planted cotton on average 0.82 ha, taking into account that the high area is 11 ha, and 0.25 ha as the lowest. For last season (2005/06), the company expected Súbwè agency to have a higher yield than others agencies.

The CNA has expanded its activities in Maringue since 1996/97. In season 2005/06, it started to share its experience and organize the local farmers association in Samatere market. All farmers in this market work together in association. In this new strategy, the company gets advantages for reducing the cost of assistance for each farmer.

During the focus seasons, from 2000/01 to 2004/05, the cotton performance in Maringue district fluctuated from the high to low performance. The highest level was achieved in 2003/04 season and the lowest was in 2000/01. The figure 1.1, below summarizes the performance of cotton in Maringue from 2000/01 to 2004/05. The main reasons for the fall during these seasons are attributed to the lack or delay of rainfall associated to pest

infestation. Moreover, this district constitutes the majority of Sofala province cotton production, even the cotton fluctuation scenarios.

Figure 1.1: Cotton Performance in Maringue District



Source: Companhia Nacional Algodoeira (2006)

1.3: Statement of the Problem

Mozambique has been reported as a post-war rehabilitation success. Since the end of the civil war in 1992, the country has embarked upon a series of impressive macroeconomic and structural reforms that have resulted in remarkable rates of economic growth over the last years. However, Mozambique's economic growth is very volatile. This reflects the structural fragilities of its productivity basis, the concentration on farming or agricultural based industries, and a geographical localization that makes the country vulnerable to natural disasters such as flood and drought. Agriculture still represents the bulk of the economy involving some 80 percent of the population. The sector comprises a large rural smallholder sector that produces around 95 percent of agriculture value-added, mainly food and cash crops.

In Mozambique, most of the population is concentrated in rural areas where farmers and households have not been able to take full advantage of the favorable macro-environment. Poverty tends to increase household dependency rate; low level of education and also the dependency of natural factors characterize the households' farmers in rural areas.

Most of household farmers use the non-mechanized agriculture and depend on natural factors such as rainfall and natural pest control for all farming process. A change in regular rainfall pattern has considerable influence on household output. The effect of pest infection constitutes a high problem for the cotton industry and also for the small-scale farmers. Poor pest management decreases considerably the smallholder cotton farmers' output.

Education plays a key role in the dynamics of components of demographic change and in the productivity of labor, and the opportunity to enjoy the benefits of the extraordinary worldwide progress in science and technology. Thus education level represents a further important dimension of human development and it constitutes one of the basic conditions for the construction and development the Mozambican Nation. In Mozambique, a larger number of rural household has not enjoyed access to modern school. This fact is one of the indicators that reflects negatively and debility level of education mainly in rural area. In Maringue district, for instance, the education level is very low and the illiteracy characterizes large number of smallholder farmers in the rural area. This situation creates difficulties and puts constraint on the smallholder farmers to learn new technology and receive new information to improve their cotton production activities.

1.4: Purpose of the Study

The main objective of the study is to evaluate the ex-ante economics impact of cotton production among rural cotton farmers. More specifically, the study seeks to address the following objectives:

- To identify the economic benefits of cotton production at smallholder level as a way to alleviate poverty in Maringue district.
- To identify the major factors that affect cotton production at smallholder's level in Maringue district.

The study attempts to evaluate the impact of cotton production among cotton farmers in Maringue district and provides insights for decision making related to cotton sector in Maringue, even in Mozambique, with smallholder production that are likely to consider the adoption of cotton as form of poverty reduction. To achieve these objectives, an economic analysis is conducted to determine the net economic benefits from the adoption of cotton in rural area by the household farmers.

1.5: Research Questions

Among the factors that affect the cotton sub-sector in Maringue district, the research seeks to address the following issues:

- Does the adoption of cotton production in rural area, (Maringue), provide an increase in household income?
- What are the major factors affecting the cotton production at smallholder farmers?

This study attempts to test the assumption that, in situation of all factors that play the cotton sub-sector since the government supports and subsidies in international market, which create distortions on cotton prices and decrease the foreign exchange earning for low economy countries; the dependence of natural factors “weather and pests”, which

poor smallholder farmers depend to produce their output: The adoption of cotton production increases the household income.

1.6: Significance of the Study

Agriculture guarantees food security all over the world and it is the source of social and economic development in developing countries. It is used as form of reducing absolute poverty, because it employs most of population in rural area; it also contributes to rise the balance of payment through producing and exporting the cash crop. More than 70 countries in the world produce and export cotton, while many developed and developing countries depend on imports of cotton lint for their spinning and textile industries.

In a low income economy, where the majority of the poor live in rural areas, an increase in income from the export cash crop production is widely recognized to be one of the best short-term measures to alleviate poverty. This is because the direct increase in income can be widely distributed within the rural population. In addition the consumption patterns of smallholder cash crop producers mean that much of their additional income is spent on locally produced goods and services; this generates large multiplier effects that benefit other poor households.

In Mozambique the government has put the eradication of poverty at the top of its agenda since at least 1995. With the introduction of Action Plan for the Reduction of Absolute Poverty “*Plano de Acção para Redução da Pobreza Absoluta – PARPA*” finished in April 2001, there was an overall objective of reduction incidence of absolute poverty. In order to achieve this objective, the government has pursued actions and policies aimed at promoting sustainable expansion, concentrating its attention on sectors with the broadest impact on poor, including agriculture.

Agriculture is already the most important sector in Mozambique, accounting for about 35 percent of GDP and 40 percent of national exports. Most of the agricultural output of Mozambique is produced by rural smallholder households that grow both subsistence and cash crop. They depend on agriculture as the source of their income and as means to improve their purchasing power.

Due to the importance of cash crop in household's income in particular and the national economy as whole, cotton is a predominantly smallholder crop in Mozambique, with over 500 thousand poor rural households depending on it as their main source of cash income. This crop has a potential significance for increasing household income, purchasing power and for improving the human conditions in terms of basic needs, and people's choice.

1.7: Scope of the Study

The focus of the study is based on Maringue district with the aim of analyzing the economic impact of cotton production as a way of poverty reduction from 2000/01 to 2005/06 and identifies the factors that limit the cotton farmers at household's level. The main variables to be studied are all those that contribute negatively and positively for the household's motivation to cultivate this cash crop as form to smooth poverty in rural area, namely natural factors such as rainfall and pest control for all farming process, and education level.

1.8: Limitations of the Study

The study relies on dataset that was collected with the plan to understand the effects of cash cropping on smallholders income as opportunities to reduce poverty in rural area, not with the objective of bringing out the cotton management strategies, and subsidies that are the focus of this study. Consequently, it gathered partial information on cotton

management and subsidies which would improve the result of the study. In addition to data limitation, it is likely that none the results of the data collection conducted in Maringue district, which is the case study, can be applied for all smallholder in Mozambique. Because, cotton sub-sector in Mozambique performs under concession and for this reason each company has different characteristic on management strategy. The final judgment of the economic impact of cotton in smallholder income has to take into account other factors that were not included in the analysis, such as the non-market effect on environment, including the impact on ecosystem.

1.9: Organization of the Study

The present study is composed of five chapters. The first chapter focuses on introductory issues such as preface, background of the study, statement of the problem, purpose of the study, research questions, significance and scope of study. This chapter is conceptualized mainly to focus on cotton introductory issues from the world cotton overview to Mozambican cotton sub-sector performance.

The second chapter summarizes the literature that is divided into two parts such as the empirical literature review and focused literature review. In this section are given some relevant literature related to cotton production in the world, particular of in developing countries, where most of them depend on cotton production as foreign exchange earning and theoretical empirical agriculture model. Chapter three presents the study's research methodology, covering in detail the target population, the study area, the sample and sampling techniques, the data source, sample population, data collection and research duration. Chapter four gathers the data analysis in main factor that affected the cotton sub-sector. It describes also the demographic characteristics of cotton household farmers, agriculture production, the cotton production and inputs use such as labor force and pesticides; the main household farmers expenditure and constraints on cotton production. The last chapter draws the, conclusions and recommendations. In conclusion the research came up the main conclusion undertaken by the impact of cotton production among

cotton farmers. The recommendation, the study presents some important suggestions in order to help and contribute in part some decision making to achieve the main goal that the research projected.

CHAPTER TWO: LITERATURE REVIEW

2.0: Introduction

Due to the importance of cash crop for world wide economy, the cotton sub-sector's strategies management has changed substantially in most countries. This chapter is divided to three main parts. The first part describes the theoretical model which the study seeks to test. It also identifies the economic impact of cotton production among cotton farmers in Maringue district, and the major factors affecting smallholder cotton. The second part illustrates the empirical literature and performance of cotton in Sub-Saharan Africa and the final part depicts the focus literature review.

2.1: Theoretical Empirical Agricultural Model

In many times, agricultural economists have modeled the output of systems involving damage agents, including pest, using standard production functions that treat all inputs as if they are affected by yield directly, fertilizer and by what the labor does. The damage function approach is drawing from biological literature on pest control indicating that pesticides belong to class of damage control inputs. These inputs are different from conventional inputs because they affect output only indirectly, by dropping the damage in case it occurs. In this manner, productivity depends on the existence of pest in field. In contrast, conventional inputs like fertilizer and labor, increase output directly, making them well-matched to standard production function approaches. This is represented as follows:

(2.1) $Q = f(Z)$, where Q is output, and it is the function of Z , the vector of all inputs.

Lichtenberg and Zilberman (1986) introduced a new way of modeling functions for inputs such as pesticides by recognizing that the final output is a mix of the potential output and losses caused by damage agents. These losses are a function of environmental conditions that dictate the destructive capacity of the relevant damaging agents, and of damage control agents through reducing efforts. So, damage can at most be equal to potential output at maximum destructive capacity of damage agent, and at least be equal to zero maximum control capacity of damage control agent. Then, the abatement function $G(\mathbf{X})$ is defined as a proportion of the destructive capacity of damaging agent eliminated applying \mathbf{X} amount of damage control agent. Therefore, this function will have properties of cumulative probability distribution $[0, 1]$, $G(\mathbf{X})=1$ meaning complete eradication of the destructive capacity, and $G(\mathbf{X})=0$ meaning zero elimination. Recalling that, the characterization of actual output is a combination of potential output and losses as mentioned earlier, then, Q can be expressed as:

$$(2.2) \quad Q = f[(Z)G(\mathbf{X})]$$

where, Q is the actual output, the potential pest-free output is given by $f(Z)$, $f(\cdot)$ is concave in Z and $G(\mathbf{X})$, \mathbf{Z} is a vector of all other inputs except damage control agents, \mathbf{X} is a vector of damage control agents, pesticide in our case, and $G(\mathbf{X})$ represents the pest damage function and is increasing in \mathbf{X} . This new modeling approach suggested by Lichtenberg and Zilberman (1986), demonstrates why the commonly used production functions were theoretically inappropriate for inputs that protect yield against damage, and why such functions may commonly lead to overestimation bias of the productivity of damage control inputs.

They also state that in econometric work, the measurability of \mathbf{X} will be limited by data availability. Then, failing to measure \mathbf{X} it turns out that the actual output is determined by factors affecting the potential yield, and the production function becomes standard production function, resulting in overestimation of the marginal productivity of damage control inputs. However, Carrasco-Tauber and Mofft (1992) testing the modeling

approach suggested by Lichtenberg and Zilberman, using different models, concluded that in practice, pesticides productivity results did not differ significantly across models.

Due to better estimation of pesticides productivity which determines in large part the level of cotton production per hectare, it is necessary to set the damage control function, but the limitation on data forced to restrict the model to standard agriculture production function. So, based on limitation on data the cotton yield model, per hectare among the cotton farmers in rural area is suitable to adopt a production function approach as follow:

$$(2.3): Q = f(Z) \text{ where } Z = N, I, K, V.$$

i: Natural Factors (N)

Land quality, precipitation and the level of pest infestation constitute the three main natural factors which are believed to affect cotton productivity. The land qualities and fertility level of fields determine the cotton production. The second natural factor is precipitation. The rainfall quantity and its distribution within the cropping season are essential to agriculture production. The third natural factor focused to influence agriculture output is the level of insect infestation during the cropping season, (Pituro, 2004).

ii: Input (I)

Good management inputs during the cotton cultivation are closely related to the output yield. The first aspect of inputs is the planting-date that is hypothesized to have a significant effect on cotton yield. As reason of this assumption, the planting after December 31st contributes to decrease on cotton output, (Pituro, 2004). The second aspect in the inputs is the weeding labor. After the planting time, the first weeks after germination is the crucial time of labor demand for weeding and thinning time. The last aspects is the insecticides. For pest management, the insecticides are the most important

chemical used by the cotton farmers. The farmers must apply chemical input to control the pest for all time of cotton cultivation.

iii: Household Characteristics (K)

The first household characteristic factor is the education level. Education is closely related to economic development, (National Human Development Report – UNDP, 1999 and 2000). A low education level can constrain the small scale cotton farmers to learn new technologies in order to grow as much as possible their field. The second factor is age. The use of teenage labor force in cotton field influences in part on cotton output. The critical effect occurs during weeding, harvesting and picking cotton time. The last factor is the access of information such as extension services. The lack and delay of this factor has strong effect on household farmers yield.

iv: Village level (V)

The infrastructure and natural endowment across the villages are the factors that can contribute to cotton output. Many infrastructure characteristics may affect productivity. But the key types include distance of social infrastructure, such as road quality, market for cotton and other goods and services and the water availability. In rural area most of labor forces loses a lot of time to getting social infrastructure. The accessibility of social services can improve the household working time in field, and can increase the cultivation area.

2.2: Empirical Literature Review

Qaim and de Janvry (2002), studied empirically analyzing the economic, social and environmental repercussions of the *Bacillus thuringiensis* (Bt) in Argentina, where the technology was commercialized by Monsanto starting in 1998. As effect of Bt cotton on

pesticides use, it provides strong resistance to the tobacco *Heliothis virescens* and fairly good resistance to cotton bollworm *Helicoverpa gelopoeon*, which together are often referred to as bollworm complex. This complex is a major pest in Argentina. The data set covers both adopters and non-adopters of Bt technology. Furthermore, the authors examined possible Bt resistance development in pest population, which would influence the technology's sustainability.

As data basis and pesticide use, there is an interview-based survey of 299 cotton farmers, made in 2001 in collaboration with Argentina's *Instituto Nacional de Tecnologia Agropecuaria* (INTA). The survey covered the two major cotton growing provinces, Chaco and Santiago del Estero, which together account for almost 90 per cent of Argentina cotton area. Because the number of Bt adopters is still comparatively small, Qaim and de Janvry (2002) stratified random-sampling procedure, differentiating between adopters and non-adopters of the technology. They defined complete list of adopters as farms that had used Bt at least once during the previous two cropping seasons. To obtain a picture of potential technological effects they used econometric models to predict the impact of Bt on different types of non-adopters.

$$INS = \alpha + \beta_1 Bt + \beta_2 P + \beta_3' PEST + \beta_4' A + \beta_5' H + \varepsilon$$

Where *Bt* is a dummy which takes a value of one *Bt* plots and zero otherwise. *P* is the insecticide / cotton price ratio. *PEST* is a vector of plot-level variables describing the degree of pest pressure ex-ante to spraying decisions. *A* includes different agro ecological factors, and *H* captures farm and household characteristics. ε is a random error term with mean zero.

The econometric analysis can also be confined to the sub-sample of Bt adopters to control for unobserved farmer characteristic and avoid a possible selection bias. As production function analysis, Bt cotton in Argentina not only reduces insecticides applications, but also increases yield to significant extent. These yield advantages are larger than in many countries. The net yield effect can be estimated econometrically by using an explanatory

variable. The authors used a quadratic specification, which generally shows a good fit in empirical studies at the micro level.

Use of certified seeds leads to an average gain of 163 kilogram. Usually, certified seeds have higher germination capacity and produce more vigorous plants, especially at the early growth stages. More favorable agro-ecological conditions, especially irrigations, are associated with higher yield, as it is the farm size and farmer's level education. Interacting education with Bt did not produce a significant coefficient. Obviously, technology effects do not depend on human capital endowment. The age has a slightly positive effect in the production function; it might be attributable to the older farmer's longer experience with cotton cultivation.

2.3: Performance of Cotton Sector in Sub-Saharan Africa

Historically, cotton production was promoted in Africa through state monopolies, in Francophone West Africa by the French Government which owned the '*Compagnie Francaise pour le Development des Fibres Textiles*' (CFDT) and in the Anglophone countries in East and South Africa. By parastatal marketing boards and/or cooperative unions. This section provides the performance of cotton sector and the strategies of management in SADC's region and Francophone West Africa.

2.3.1: Cotton in SADC Region

Mozambique is one of SADC member where the cotton production has significant importance to household income. For this reason, the paper focuses on two countries of SADC region, namely Zambia and South Africa. These countries have adopted different strategies on managing the cotton crop. As result they have a better performance of cotton sub-sector than Mozambique performance.

i: Zambia's Cotton Sector

Zambia was liberalized the cotton sector in late 1994 when the state monopoly (Lintco) was sold to two private companies. Cotton production had been trending downwards under Lintco and the company had accumulated debts. The performance of Zambia's cotton sector compares favorably with its neighbors in Southern and Eastern Africa, (SEA). The mean exports values per hectare were yield above those in Uganda and Mozambique and the producer shares exceeded those in all SEA countries. The level of concentration among ginneries in Zambia appears to be an important factor underlying the sector's relatively good performance under liberalization. Competitions from smaller companies, from each other in one key producing area, and the lack of any government role regulating that competition, combine to encourage innovation in credit recovery systems, (Boughton et al, 2003).

ii: South Africa's Cotton Sector

In South Africa, cotton sector has grown about 100,000 ha and has suffered significant damage from bollworms. The small scale farmers are planted cotton on average between 1.5 and 3.0 ha with some planting up to 10ha, (Pitoro, 2004). In South Africa farmers started adopting Bt cotton commercially in the 1998/99, and the area of planting cotton increasing from 900 ha in 1998/99 to 2,155 ha in 1999/00. The increasing numbers of farmers are chosen to grow Bt cotton due to multiple advantage of increasing productivity and decreasing use of pesticides, (Pitoro, 2004).

During the 1998/99 season, the average yield for adopters Bt cotton was 576 kg/ha. In the 1999/00 cropping season, however, the average yield fell for both groups which adopt and non-adopt Bt cotton. The main reason for these lower yields in this season is attributed to excessive rainfall, (*ibid*).

2.3.2: Performance of the Cotton Sector in the Francophone Region

Complete and competent input-credit systems in arrangement with extensive research in seed varieties suitable to local conditions as well as the condition of support services and infrastructure have been largely dependable for the quick development of cotton cultivation by smallholder farmers in the Francophone region, with high average crop yields, by international standards, and consistently good quality cotton. Production has matured five-fold over two decades, making the region as a whole the third and occasionally second largest recent exporter of lint. At the commencement of the 1980s the Francophone region accounted for only 4 percent of total world exports, but approximately 15 percent of total world exports emanated from this region at the end of the 1990s. In 2001/02 the region accounted for 13 percent of world cotton exports, second to only the US, (Larsen, 2002).

Nonetheless, the Francophone region is under rising pressure to liberalize its cotton sectors as part of the World Bank launched structural revolutionize program and some current changes have emerged as quite a lot of countries have opened up for private participation at the ginning level and marketing of lint on export markets. The only country where cotton ginning and export promotion is still managed by a single company is Mali, where the parastatal '*Malienne pour le Development Textile*' (CMDT) still operates as a monopoly and structural adjustment programs have not yet affected the production-marketing sequence for cotton, except in a few marginal aspects. The CMDT still manages input delivery and credit improvement, but private companies are allowed to bid to import inputs and supply CMDT with them. Producer prices are still set by CMDT within the framework of a strategy of price stabilization. As a effect, gains from increases in world market price go to CMDT, but when prices fall, the CMDT absorbs the losses, hence protecting farmers from rapid fall in income. However, the system in Mali has forced heavy financial support costs on the government and in recent years with declining world lint prices the CMDT deficits have piled up, (*ibid*).

Additionally the Malian's performance was reported by Cotton Policy Brief in 2000, which focused the same 2.3 million people, for about 22 percent of Malian total population, nearly 162,000 cotton household farmers live in the cotton zone in Southern part of Mali. During the period from 1990 to 1999, seed cotton production grew from 265,400 tons to 524,000 tons, that made Mali the second major cotton producer in Africa, after Egypt. Cotton crop contributed for more than half of the country's total exports from 1997 to 1998 and accounted 11 percent of government revenues. Moreover, the Building on Success in African Agriculture (2004), reported this performance and in term of equity, most of smallholder cotton farmers grew, earned highly incomes and invested more in agriculture than smallholders in others zone; Cotton Policy Brief, (March 2000).

The Malian system of control the procurement of inputs associated with the marketing of seed cotton constitutes a typical example of the managed monopoly model that is characteristic of the cotton sector in West and Central Africa. The model's viability is concerned essentially with its ability to tax producer and accumulate profits in period of high export prices and to rely on budgetary support from national government in period of low worldwide price. However, strong weakness of centralized management is based on difficulty to adapt in time to demands of its business environment. This slow reaction and risk of uncontrolled operation costs, and make highly vulnerable to market downturns, (*ibid*).

In Benin quite a lot of private ginning companies survive together with the former and rather improved parastatal and ginning companies are allocated to seed cotton market shares comparative to their installed capability. For this reason in these countries there are alternative forms of managerial distribution of seed cotton. The sectors remain heavily regulated in all cases and producer prices are still set centrally; they are either announced before the start of planting or before the start of marketing of seed cotton - after negotiations between the government and the private sector, (Larsen, 2002).

The export segment, on the other hand, has become rather more competitive due to the entry of private domestic and worldwide ginning and trading companies. Virtually all

cotton lint produced in the region is exported, and a huge share of exports is still marketed by the CFDT's affiliated trading wing COPACO the 10th largest international trading company. So far, COPACO has recently misplaced considerable market shares to new private trading companies, remarkably *L'Aiglon* a Swiss-registered but Malian-owned company founded in 1994. *L'Aiglon* has established a major presence in West Africa and it is the COPACO's direct competitor now, and it is also thought to have grown in recent years and become one of the biggest trading companies worldwide, (*ibid*).

At this present time the company is involved in cotton lint trading in Mali, Benin, Togo and *Coté d'Ivoire* as well as ginning operations in the last country. In addition, Reinhart operates ginneries in *Coté d'Ivoire*, through a joint venture and the company trades cotton lint from the other most important producing countries as too. Quite a lot of Liverpool-based trading companies have extended trade operations in West Africa, counting Plexus and Bauman Hinde. Smaller and less known trading companies are also involved in cotton trade in West Africa, for instance Mambo Commodities, a relatively new trading company founded in 1994, based in France and operating at least in *Coté d'Ivoire*. Even a Singaporean trading and spinning company Olam International, has extended its trading operations to Benin, Togo and *Coté d'Ivoire*, (*ibid*).

The increasing cotton production in the Francophone region has been associated with national schemes that enable competent conditions of quality-inducing inputs fertilizers and pesticides, in particular under encouraging credit terms to smallholders. Despite recent changes at the ginning and export levels, input credit systems have been maintained in all but one country, Benin. Ginning companies, public or private, are predicted to provide input credit to all cotton farmers in their particular concession areas and recover it by making deductions at point of sale. This system can be preserved mainly because effective competition in seed cotton market shares among ginning companies does not yet subsist. In *Coté d'Ivoire*, however, increasing conflicts between various actors in the sector may result in the collapse of the input credit system based on exclusive purchasing agreement within zones, (*ibid*).

The most far-reaching reforms have been implemented in Benin. Until 1999, private Companies could obtain licenses to import inputs, but the parastatal SONAPRA remained responsible for distribution and credit recovery as the parastatal continued to collect seed cotton and allocated agreed volumes among the ginning companies. Apparently, in order to decrease problems of rent looked for, responsibilities for bid selection and distribution of inputs were transferred from SONAPRA to CAGIA, a cooperative of producers, in 1999. But the ‘de-linking’ of the provision of inputs from seed cotton purchase and ginning created a major problem of credit recovery. The problem of side-selling was solved in 2000 when the CSPR (Centrale de Sécurisation des Paiements et des Recouvrements) became the sole agency responsible for recovery of credit. On the input side, the CSPR has to register every input sale from input providers to producer groups and every credit extended for purchasing these inputs. On the output side, it is mandated to register sales of seed cotton from each farmer group to each ginning company, (*ibid*).

2.4: Focused Literature Review

Benfica et al (2002) studied the impact of alternative agro-industrial investments on poverty reduction in rural Mozambique. The general objective of the study was to explore policy options aimed at strengthening the relationship between agro-industrial investments and the smallholder farm sector, in order to increase the impacts of those investments on poverty reduction in rural area. The specific objectives were to provide a brief overview of the types of agro-industrial investments currently existing and planned in Mozambique; they aimed also to develop an initial assessment of the likely effects of these investments on rural poverty reduction.

The field research activities in phase included the establishment and a review of investment database on rural investments, and the sited visits around the country. This effort consisted of constructing an agriculture and agro-industry investment data set

based on information collected on projects approved by the Center for Investment Promotion (CPI). The analysis of the impact of alternative agro-industrial investments on rural poverty reduction assumes that if properly structured to relate to the smallholder sector, those investments can play an important role in reducing rural poverty in the current stage of economic development of Mozambique.

As transaction costs analysis of option arrangements, cotton production is usually grown in areas where cotton processing capacities are installed. The dependence of quality raw materials for processing, that highly depend on the use of chemical inputs in a country that has high level of market failure in both input and credit markets, creates the need for some vertical integrations, where two or more separable stages of production are combined under common ownership and management. Full vertical integration is not attractive because of the nature of the crop characterized by high labor intensity in production that significantly increases the supervision costs in a plantation context, and of lack of economies of scale in production. Dispersed production is possible due to the relatively high value-weight ratio, which reduces the impact of transport costs.

Cotton under Contract Farming (CF) is driven by the fact that the crop is demanding the use input, but the system is characterized by credit and input market failure. At present, it faces problems of default due to price competition between the regional monopsonies and new buyers that take advantage of the weak legal system when buying from farmers to whom they have not provided services; there is also lack of incentives that farmers have to face due to the monopsony power used by the cotton companies in negotiating prices. Room for interventions are only in influencing the legal system and facilitating the empowerment of farmer associations in order to reduce their dependence on cotton companies and to increase their negotiating power, allowing increased direct benefits. The alternatives appear to be even more difficult and not desirable from a poverty reduction standpoint. Using Plantation Agriculture (PA) as an alternative there are problems related to labor intensity and lack of economies of scale in production that rend that alternative highly infeasible and leaves little room for policy interventions. Relying on Independent Producers (IP) is not likely in the short run due to the specificity and

complexity of production techniques and the level of chemical input used. Over a longer term, appropriate interventions that revive input markets and appropriate widespread extension services and education in rural areas can help reduce the need for CF arrangements and increase the number of smallholders producing cotton as independent producers. Furthermore, investments in market information and physical infra-structure such as roads are the key ingredients to improve market efficiency.

As a conclusion, Benfica et al (2002), agreed that poverty is a widespread problem in much of the developing world. Mozambique is not an exception. Absolute poverty is more accentuated in rural areas where about 80% of the country's population lives; in fact the work - poverty levels in these areas reach about 71%. Most of these people draw their incomes from agriculture and non-farm rural based activities that are strongly linked to agriculture. Rural agro-industrial development has a very high potential to help by reducing rural poverty levels. The effects of particular agro-industries in a given region, however, can vary depending on how closely related they are to the rural poor and, more specifically, the set of factors that condition that relationship, ranging from crop specific characteristics to the economic and political environment. Research efforts towards a better understanding of those relationships and the potential direct and indirect impacts on rural poverty to inform policy decisions are, therefore, very relevant.

Existing results indicate that, since the signing of the peace accord in 1992 and the subsequent first democratic elections in the country in 1994, there has been a significant inflow of capital to support investments in Mozambique. Some general and sub-sector specific patterns observed include the value of agro-industrial investments which represented, on average, almost 60% of all investments in rural based projects in the period 1985-mid 2001. The total value invested in agro-industry increased about 5 times from the period 1985-1990 to 1991-1996, from \$33.4 million to over \$161 million. Then it doubled more in that period than in 1997-2001. Over the entire period, the focus of investment has moved from cotton and tobacco (1985-1990) to a more balanced diversification of investments in sectors like maize, cotton, and cashew in the first half of the 1990's. Since the late 1990's, there have been significant investments in the sugar and

tea sectors. In fact, investment in tea only during the final period exceeded all recorded agro-industrial investment during the first period. There has been a recent emergence of investments by several tobacco companies in contract farming and processing operations in the center/north of the country, accompanied by a large increase in production from perhaps 1,000 metric tons in 1995 to an estimated 15,000 in 2001.

Rural agro-industry can have direct and indirect effects on poverty. Direct effects come from wage employment of the rural poor in processing facilities, and from increased earnings to smallholders, who supply raw material to the processing firm. Indirect effects can be substantial, and come primarily from wage earners and smallholders re-spending their earnings in the rural economy. Much of this re-spending will be on items produced in the local non-farm economy, fueling its growth and increasing its contribution to poverty reduction.

The relation between poverty alleviation and the institutional arrangements governing the relationship between farmers and agro-industrial firms is not linear and is likely to be commodity specific. However, two key facts can be referred to within the current context. First, it is largely due to information problems and to the failure of input and credit markets, spot markets IP are frequently unable to support high value crops in Mozambique. If smallholders are confined to low value crops, escaping poverty will be very difficult. Second, plantation agriculture PA generates only one direct effect on poverty - wages – and tends to use capital intensive technologies. It will therefore almost always generate less poverty reduction than will reasonably successful CF schemes.

Cotton is produced almost entirely under contract farming arrangements between large companies and small farmers and has been very successful in stimulating rural income growth and poverty reduction. Currently it faces serious problems in terms of the quality of assistance offered by companies. Government policy in this crop should be focused on achieving a better balance between competition and coordination, in order to better safeguard the interests of farmers. Facilitation of the empowerment of farmer associations

to reduce their dependency from cotton companies and increase their negotiating power to allow increased direct benefits should be one key pillar in this effort.

The challenge is in balancing the costs and benefits of alternative policies and investments on efficiency and equity grounds, finding the right kind of incentives, and monitoring the effectiveness of the mechanisms expected to affect rural poverty. It would be very helpful to government, in the process of evaluating alternative investment proposals, if a short-hand method for predicting the investment's effects on poverty reduction could be developed.

Pitoro (2004), studied the assessing the potential economic benefits of transgenic cotton in Mozambique. The objectives of the study were to determine the financial advantage of Bt cotton to the farmers, and the economic benefits of Bt cotton to the economy as a whole. The survey consisted of five rounds of interview to cotton and maize farmers between 1994 and 1996. Among the different aspects contained in the data set, there are information farm budget, including detailed material on input use. The second source of information consist of a survey of more than 900 cotton growers in 2000 in Nampula province, designed to collect information on cotton production.

The marginal value product (MVP) of insecticide application is \$9.59/application, about triple of its cost, 3.31 applications. Similar to Tauber and Moffitt (1992) they finding the study suggested that pesticide is under use below their potential optimal level, in contrast with number of studies of productivity of chemical pesticides in agriculture. The conclusion was that there was overuse of the pesticides.

Pitoro (2004) concluded that under current practices, especially low level of insecticide applications, adoption of Bt cotton, it is not expected to increase net income for farmers. For Bt cotton to be attractive to farmers, its yield including refuge loss is 826 kg/ha and 1,488 kg/ha under lower and higher input use, respectively. Many other factors could be affecting the level of yield gain besides bollworm infestation level and input market failure. Mozambican farmers have lower production costs under the low-input use regime

(\$0.08/kg) compared to South Africa (\$0.15/kg) excluding weeding labor, and Argentina (\$0.13/kg). From the society point of view, Bt cotton appears to increase net income to the Mozambican economy under both input use levels.

Benfica et al (2005) studied the economics of smallholder households in tobacco and cotton growing areas of the Zambezi Valley of Mozambique. The objectives of the paper was to present a picture of the smallholder economy in cash cropping areas of Zambezi valley of Mozambique, where four firms operate contract farming schemes with smallholder farmers. The ultimate goal was to identify and present some key representative characteristics of farming households engaged, and those not engaged, in those schemes of both cotton and tobacco growing areas.

In order to get the necessary reliable data to undertake the analysis contained in the report, a multi-visit survey was undertaken in the study region. The study followed a stratified random sample procedure. It covered the concession areas for four firms operating contract farming schemes in the Zambezi Valley. Two of them were the only two tobacco firms operating in Tete province and the other two were cotton companies, one operating in Tete province and the other in the North of Sofala province. The survey targeted 300 smallholder farmers in the region to be interviewed in two rounds, each one covering six months of the 2003/04.

Cotton crop in Mozambique has been floating up and down over the years. The historical data of 144,061 tons achieved over 20 years ago is far of being achieved. Current production is 61.2 percent of that level. That is due to factors associated with unstable prices and demand conditions in the world market, as well as domestic issues related to the organization and performance of the contract farming arrangements between ginning/exporting firms and smallholder farmers, under which virtually all the production in generated. The production level of 88,172 tons achieved in 2003/04 still falls short of ten years high achieved in 1998/99.

As the conclusion the Benfica et al (2005) found that in terms of access of land the majority of smallholders in all areas, it is through non-market ways. Access through traditional authorities, free occupation and inheritance are the most common ways. Land renting or purchasing is seemingly non-existent. While in tobacco areas cash cropping smallholders put a larger amount of land into the cash crop relative to other crops, in cotton growing areas, maize area among growers is higher than that for cotton. In each area non-growers put a significant level of effort in maize production. In tobacco growing areas, a significant amount of maize is marketed and very likely used for in kind payments in the very active labor market. While over fifty percent of smallholders in tobacco areas and over third in cotton areas grow other crops such as groundnuts, beans and vegetables, its marketing is rather limited. With respect to the use of chemical inputs, the study found that in tobacco areas it is extended beyond cash crop growers, which in cotton areas it is exclusively used by cotton growers linked to contract farming schemes. Fertilizer use is only limited to farmers in tobacco growing areas where they apply it in tobacco maize and vegetable crops.

In term of labor market, the paper concluded that it is much more active in tobacco growing areas. A significant number of households in those areas sell and buy labor for cropping activities. Furthermore, the research indicated that a significant number of permanent laborers, over half of those hired among farmers that hire, are originated from Malawi. An analysis of structure of employment by crop showed that while family labor is very common in all fields such as tobacco, cotton and maize, permanent labor is widely used in tobacco fields 29 percent of total labor used; moderately used in maize field 13 percent, and not important in cotton fields, only 2 percent, where temporary labor is relatively important. In terms of labor demand, tobacco demands more labor, but a significant part of it is satisfied through the labor market, while family labor undertaken a longer share in cotton fields.

From this literature review the performance of cotton sub-sector depends on the strategies adopted by the countries. The liberalization strategies in cotton sub-sector adopted by the countries in Francophone and Anglophone regions, such as some countries in SADC

region launched the companies to competition and encouraged the innovation in credit recovery systems, in combination with extensive research in seed varieties suitable to local conditions as well as provision of support services and infrastructures. But if a country seeks to promote the growing of firms, the better strategy is the under-concession arrangement; the advantage is that each firm has a monopsony power in certain area. This strategy avoids free rider problem, and reduces uncertainty regarding the access to markets.

In term of the analysis of the potential economic benefits of introducing Bt cotton in Mozambique, it makes a methodological contribution by illustrating an approach to conduct an ex-ante analysis with limited information on pest management practices. This approach can be useful in benefiting other developing countries with smallholder cotton production, which may get access to the potential benefits of Bt cotton. However, in Mozambique the adoption of genetically modified cotton, even others crops, are not allowed by the government.

CHAPTER THREE: RESEARCH METHODOLOGY

3.0: Introduction

This chapter presents the research methodology. It describes in detail the techniques and methods used to obtain the target population and its sample, how the data was collected and processed. It also attempts to gather necessary information to analyze the economic benefits of cotton crop at household level. The chapter is divided mainly into seven parts. The first part presents in details the characteristic of target population for study. The second part is the study area, which introduces the geographic situation of the case study, as well as the main activity of household. The third section takes into account the sampling frame, which describes a list of total cotton population and the company structure. The fourth section comprises sample and sampling techniques. It presents the scientific approach that was adopted to obtain the sample population and its advantage. A fifth part explains the data source, that the supports this study and presents out the main sources resorted. The sixth section describes the techniques used on data collection such as questionnaire, pilot text and the period of data survey. The last section relates the data analysis techniques and explains the main process used during the data analysis stagy.

3.1: Population of Study

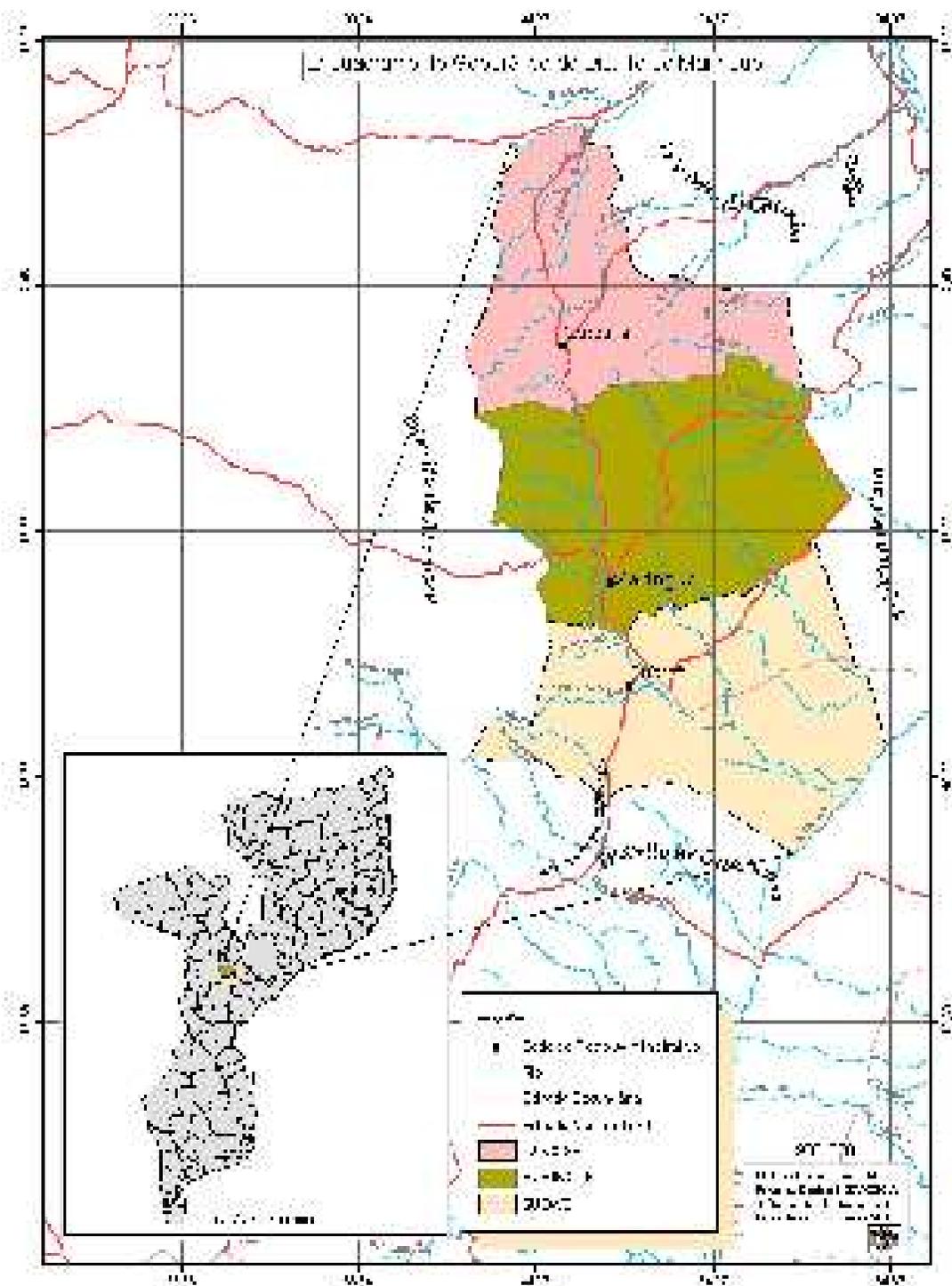
The target population for this research is the cotton smallholder farmer. According to the CNA the total household that adopted cotton in last season (2005/06) was 7,289 with 6,038.75 ha of area distributed in four agencies, according to the CNA structure, namely Subúè, Maringue village, Phango and Canxixè. The household's cotton farmers represent 12.26% of Maringue total population. The cotton areas grow by rural household in Maringue ranges from 0.25 ha to 11 ha with the mean 0.82 ha. The CNA has its branch in

Subúè which is expected have higher cotton yield, where the expected cotton yield ha/kg ranges from 900 to 1000 Kg/ha.

3.2: The Study Area

Maringue district is the case of study. It is situated in the North of Sofala province one the central regional of Mozambique. The total area corresponds to 5,085 Km² with 59.469 inhabitants. The district is divided into three administrative posts Maringue village, Subúè and Canxixe. The main domestic language is Chisena. The government is represented by different ministries: Agriculture, Education, Plan and Rural Development, Finance and Health Ministers, (*Directório Comercial de Moçambique, 2006*). According to the figure it has borders with Gorongosa district in the South, in the North the district of Chemba, in the West the district of Macossa in Manica province and Caia district in East. The focus district is considered one of the potential farmer district of Sofala province, where stock raising, or livestock and production of cash and food crops are the main activities of subsistence.

Figure 3.1: Map of Maringue District



Source: UCM-GIS 2006

are related to distance and time, cost and accessibility to households. Then, to achieve the main goal the survey attempts to accuracy, because the quality of supervisions is higher and the quality of data collection is better. This strategy consists to offset the variability in the results arising from the sampling process. For this reason all the interviews were conducted by the author and the other interviewers were trained previously for this proposal by the author and under higher supervision level. The company staff appears mainly as facilitators with the cotton household and as translator of the local language.

According to the national law of concession, CNA maintains the local monopoly position of cotton ginning in Maringue. It organizes its cotton household in small groups that are called Markets. Each market is headed by a traditional authority or kinglet that cultivates cotton, or influences cotton farmers. Then, the cotton farmer sample size was determined using statistic formula and it was randomly selected using the company structure. This methodology has low cost in field during the data collection because the researcher selected the sample based on existent company structure agency and *markets*.

3.3: The Sample Frame

At the beginning of the season the CNA inscribes all households that are interested in cotton growing and the relative area each household expects to cultivate. This strategy helps the company on seed distribution and others plans that are related to all cotton growing process. According to the CNA list in season 2005/06 the total cotton household farmer was 7,289. The population was distributed in four agencies and each agency in market or groups of cotton household to facilitate all assistance service provided by the company. In Maringue small-scale cotton farmer are those growing less than 12 hectare in 2005/06 season. The data collection was conducted using the company structure. The markets were selected using the agency list and map of markets and based on all factors that are referred previously. During the data collection period, for each days one and different monitors headed the team according to the plan defined by the chief of agency for this effect.

3.4: Sample and Sampling Techniques

According to the CNA list, in 2005/06 season, the total cotton household farmers in Maringue district was 7,289. Based on company list the sample size was determined using the Yamane (1967:886) approach that provides a simplified statistic formula to calculate sample size combining the levels of precision, confidence and variability. It is also a useful guide for determining the sample size instead of tables. In terms of level of precision the population is estimated using the range expressed in percentage points and the author consider for this study 7% of precision level. The level of confidence or risk that is based on ideas encompassed under the central limit theorem. On the other hand the value obtained by this sample is normally distributed true the population. Based on precision and confidence level, the sample size was determined using the formula:

$$n = \frac{N}{1 + N (e)^2}$$
 Where: n = is the sample size, N is the population size and e is the level of precision.

For this paper $N= 7,289$ and $e=7\%$. Then, the sample size for our survey was 199 cotton smallholder farmers. Moreover, to be variable and representative 0.014% was added to the sample. As the consequence the sample used in this paper is 200 cotton households' farmers that represent 2.70 and 0.35 percent of total cotton population and total inhabitant in Maringue district, respectively. This approach is much easier to use, because the size of population is available using the company list.

The validity of any statistical inferences drawn from the impact of cotton production among cotton farmers in Maringue district is the results of appropriate sample frame that gives sufficient information required to draw a cluster or area random sample. This technique is useful when we have to sample a population that is disbursed across a wide geographic region like cotton population in Maringue district we have to cover a lot of ground district in order to get each unit that the study needs to sample. Avoiding long time, distance between agencies and market, higher cost in field, the cluster or area random sampling was used for this paper as appropriate sample technique to achieve a the desired goal.

In cluster or area random sampling population is divided into area, usually along geographic boundaries. In this case the CNA structured the district in four agencies and we randomly sample the Subúè agency for data collection. Finally using the agency map and the list of market or groups of cotton household farmer we randomly chose the markets. The chose sampling technique was related to efficiency of administration using the existent company structure, which contributed as much as possible on sampling technique.

3.5: Data Source

Following up the related sources and recommendation contacts such as people and institutions that are likely to be interested in the results of the survey purpose. The first institution resorted was the IAM, its main purpose was to obtain annual report of cotton performance in Mozambique. However, all annual cotton reports and other papers related to cotton are concentrated in Maputo. This reason performed negatively on availability of actual and current data.

The second institution was the DUNAVANT Company in Morrumbala district; it operates in the district and has high reputation on world cotton ginning. In this company the researcher did the internship and selected it as the first target district for research. However, the distance and the lack of availability to access information contributed to the change of target district for the actual one. Then, the CNA was resorted as the company that operates in target district.

Moreover, the accessibility of data and a good collaboration constituted the main advantage, such as accessibility to the company annual performance report, meetings, some visits of CNA infrastructure and target district, and contacts to influent cotton household during a visit period. All events provided by CNA contributed not only on

defining the statement of problem and the objective of the study but also on questionnaire draft.

Other sources used in this paper are website and some published reports. The website has contributed significantly to get necessary information related to world cotton performance. However, the lack of a lot of experience on research constrains the selection of appropriate web to obtain all recent and actual information for free and in short time as quickly as possible to give more validity the research.

3.5.1: Primary Data

To achieve the main goal of this research, the study resorts mainly the primary data. The primary data survey is questionnaire. This data survey provides very detailed information about cotton adoption, since agriculture production to buying process, and all the problems encountered in cotton farming process. The questionnaire was also conceptualized to produce data to build tables and figures, whose analysis and interpretation were complemented by observations during the field time.

3.6: Data Collection Techniques

The survey is based mainly on questionnaire, using personal interview methods with open and close questions. The main objective of the impact of cotton production among cotton farmers in Maringue district questionnaire is to gather necessary data to evaluate the economic impact of this cash crop at household level. It also attempts to identify the factors that affect this cash crop. The questionnaire was used as best instrument in rural area, more particular in developing countries since their socio-economic structure makes special difficulties of conducting surveys, because the greater mobility characterize this area. Indeed this area lives a period of rapid transition as that is visible not only

demographically, but also economically and culturally. To achieve the main goal conceptualized by this research, the questionnaire was administrated based mainly on research questions and purpose of the study.

3.6.1: Pilot Test

The key instrument for this research is questionnaire. To adequate it to the reality, the questionnaire is necessary to pilot. It was elaborated in English and translated to the official language of Mozambique, Portuguese. However, the majority of cotton household farmers speak the local language, then it was necessary to find a translator to adequate the current portugues used in cotton growing area for data collection process. The questionnaire was conducted in Sena, the local language. The pilot test was made during the first visit in cotton growing area, which consisted in two stages. The first stage, on interviewing the cotton farmers during the buying process, one or two household in each market according to time. The last stage consisted of sending the questionnaire to the chief of the zone, the engineer Osvaldo, to appreciate and give the feedback according to reality.

3.6.2: Data Collection

After the pilot test, the questionnaire was adjusted according to reality. It was divided into five parts. The first is the household demographic characteristics, which comprise the main cotton adopter, age structure, gender education level and the active household. The second part is the agriculture production, which includes the main household's crops, periods in which cotton household adopted this cash crop, their relative motivation, characteristic of household field its distribution and yield. The third part presents the main inputs used, such as the crops that use pesticides, times of spraying the cotton field, labor force used, its forms of payment and sources of money to pay labor force. The

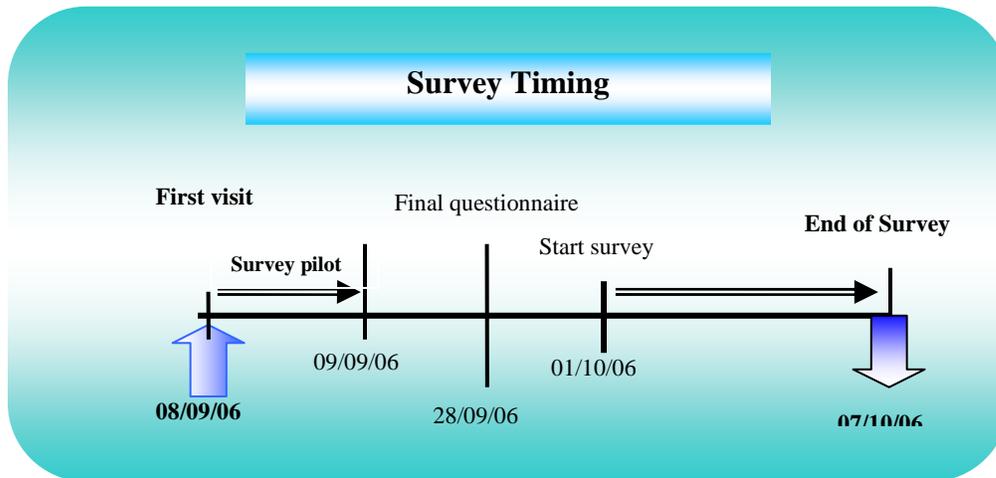
fourth section presents the commercialization and how the household use their income from the cotton crops. The last section is the main constrains on cotton production and comparison between the actual of cotton household economic situation and that before adopting cotton crop.

The data collection was conducted in markets where the cotton household have habitual meeting. A day before the data collection meeting the monitor communicated each chief of market according to calendar. However few cotton households corresponded positively. This was the reason for taking the researcher takes randomly five or ten households in each market according to presence. The total number of cotton households that compose each market can achieve more than 30 cotton households.

3.6.3: Survey Duration

As planned initially the survey was designed for two weeks and two days effectively. However, several factors constrained the time. In this way, the researcher encountered difficulties in making many appointments related to the first time table determined to end the dissertation. Oher factor was the thesis seminary and presentation that coincided with the second week of research. The main problem was that the research seminary forced to reduce of survey duration from two weeks and two days to one week and two days. The figure below, shows in summary, the timeline of the complete survey.

Figure 3.2: Timeline for complete survey



Source: The Researcher

3.7: Data Analysis Techniques

This section consists mainly in coding the questionnaire, data entry and clearing, regression analysis, and presenting the results and the data. After the data collection process, the research started immediately the coding the questionnaire. It consisted of numbering all questionnaires using the Arabic numbers, starting from one to two hundred. This process facilitates the correction of eventual mistakes occurring the data entry process.

For better analysis and description of primary data, it was processed using the Statistical Package for Social Sciences (SPSS) and Microsoft Excel computer packages. To use both packages, the researcher started the data entry technique. Firstly, the questionnaire designed in SPSS packages. It consisted of categorizing the possible answer attributing to the number, which facilitated data entry.

The data cleaning occurred in two stages. The first during the data collection time in field; at the end of each day, all questionnaires that had mistakes such as double pick in the same question was selected. The questionnaires with this or other mistakes were

automatically invalidated. The last stage was during the data entry. This consisted of correcting all errors occurred in data entry, according to the questionnaire code.

To better analyze and interpret the results, the primary survey was processed using SPSS computer package. The main objective was to bring out the survey output in percentage and frequency and to export to Excel computer package for future graphs table. All outputs used in Pie charts are converted in role numbers and those tables and other type of chart used are in decimal numbers.

CHAPTER FOUR: DATA ANALYSIS AND INTERPRETATION

4.0: Introduction

This chapter analyzes and interprets in detail the primary data survey. The main objective is to analyze the economic benefits of cotton production at rural household level in Maringue district. The analysis is based mainly on descriptive methods through the administrated questionnaire on Maringue cotton household. The chapter is divided mainly in six parts. The first part is household demographic characteristics, which describes the household age structure, gender incidence, education level and household labor force. The second is the agriculture production; it describes the main household crops, period in which household adopted cotton crop and their main motivation, characteristic of household fields and distribution of cotton field. The third is cotton production and input use, which describes the labor force used in cotton field, the main form of remuneration of labor force and the main source of money to pay labor force. The fourth is process that household selling other crops, which present the process of selling others crops, the cotton household profits in 2005/06 season, the main expenditure and household saving system. The fifth is constraints on cotton production which describes the main constraints that affect the cropping process. The last is the household economic situation which presents a comparison of household economic situation before and after adopting cotton crop now, the household food security and some suggestion to overcome the main household challenges..

4.1: Demographic Characteristics of Cotton Smallholder Farmer

The demographic characteristic of cotton household farmers presented in the table below, include the cotton adopter, age structure, gender incidence, education level and active household size. Household is defined as a social unit characterized by the sharing of the same abode. The useful of this unit hypothesized to analyze their characteristic given the

assumption that within the household resources are pooled, income is shared, and decisions are made jointly by adults' household members.

Cotton crop is adopted by the head of family and/or single. The common adopters are characterized by the head. According to the local uses, this group has strong influence on household decisions. Then, for each household, the cotton field is managed by family head, even in other crops adopted by family, a crucial decision comes from the head of family. A few sizes of cotton fields are managed by single adopters, which composed mainly by widows and small number of students. The widows group cultivates the cotton mainly as forms of subsistence and it also increases their purchasing power. According to the results 90.5 percent of cotton fields are managed by head of family and single manage 9.5 percent.

The age structure of cotton household farmers has the same characteristics as most of the less economy countries where the life expectancy is low. In all surveys the age are ranged from 15 to more than 45 years old. The larger number of adopters is more than 45 years old. However, evidences show that, in this group less cotton household farmers have reached 60 years. The second group of adopters represents 24.5 percent, situated in the intervals of 35-45 years. The third group of 23.5 percent is located in the interval of 25-35 years. The last group of cotton adopters represents 11.5 and 1.5 percent, in intervals 15-25 and 10-15 years, respectively. The data shows that less dependency children aged less than 15 years and elderly people, aged over 60 years. The limit interval of labor force is characterized from 15 to 60 years.

Table 4.1: Demographic Characteristics of Cotton Smallholder Farmers in Growing Area

Items	Selected Characteristics	Percent
Adopter	Head	90.5
	Single	9.5
Age Structure	10-15	1.5
	15-25	11.5
	25-35	23.5
	35-45	24.5
	+45	39
Gender	Male	84
	Female	16
Education Level	Never went to school	71.5
	Primary level 1 ^o degree (1 ^a -5 ^a)	23
	Primary level 2 ^o degree (6 ^a -7 ^a)	5.5
Household labor force	1-5	62
	5-10	24
	10-20	11.5
	+20	2.5

Source: Primary Data, (2006)

The female headed household is relatively low among cotton household farmers. When comparing to male incidence, the results show that 84 percent of cotton fields are headed by male and 16 percent by female. The female incidence headed cotton crop is composed only by single adopters who cultivate cotton as way of subsistence and also increasing their purchasing power.

Although education is important to low economy countries in terms of ability to absorb modern technology, to develop the capacity for self sustaining and promotion of

economic growth and development in Mozambique the largest poor rural households are illiterate. The Mozambican debility education level comes from the colonial period, when the rural area was conceptualized mainly to supply labor force to majestic companies. Maringue is not an exception. According to the results 71.5 percent of smallholder cotton farmers never went to school, that means illiteracy, 23 percent attended primary level of 1st degree and 5.5 percent attended the 2nd degree. However, the new education curriculum assumes literacy after the 2nd degree. In general, in Maringue district the education level is very low at cotton household level.

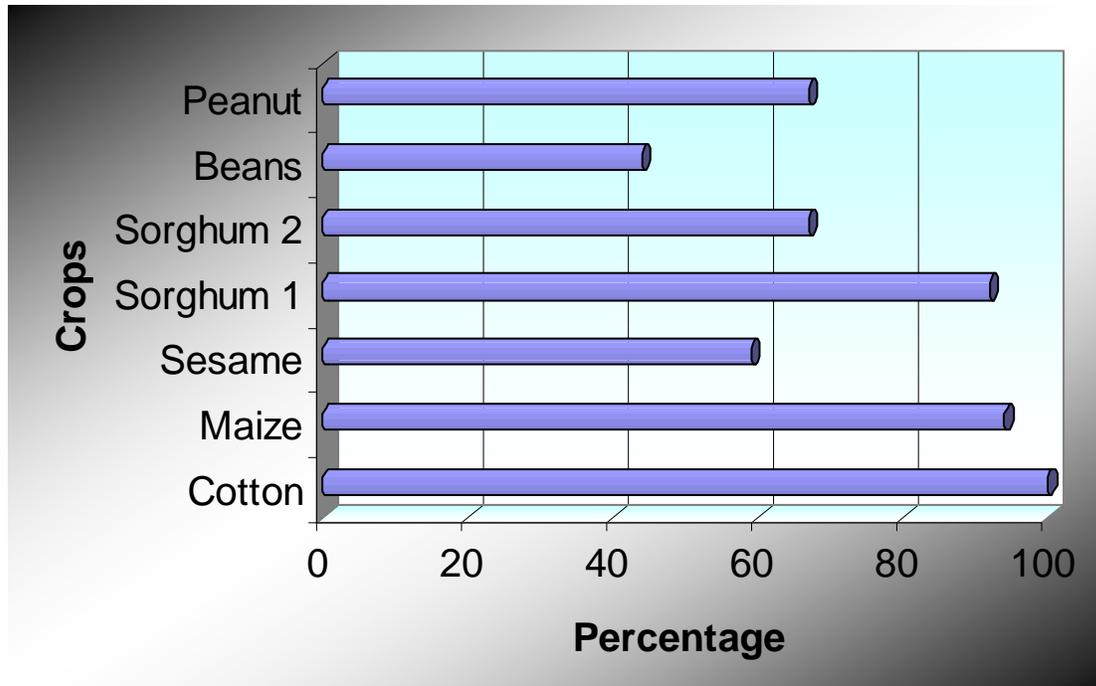
With the scale of labor force demanded in cotton field, the study regarded the active cotton household member. The results found that 62 percent of cotton households have labor force in interval 1-5 labor, 24 percent correspond to interval 5-10 labor and 11.5 and 2.5 percent have labor force in interval of 10-20 and more than 20 active labor force. One of the crucial sources of labor force is spouses. In Maringue district the polygamy phenomenon is higher. Most of men have more than one wife, as way of increasing the family labor force. Other source of active labor force is related to children, as consequence of polygamy the number of children for each household is relatively high. The study widely agrees that strong reliance on family labor defines the economic characteristics of cotton household.

4.2: Agriculture Production

Due to the importance of agriculture in rural household life, maize in cotton growing area is a larger crop adopted and it assumes a multidimensional function that is food and cash crop. It has strong effect on household income after cotton and has substitute effect on non-cotton adopter income. Moreover, cotton has comparative advantage in term of price determination, pesticides assistance and commercialization mechanism. In contrast, the maize price depends only on market condition. Evidences on data survey show that other

food crops which have crucial importance on household food security are sorghum² 1 and 2, peanut and beans. These crops are cultivated mainly to provide food for rural household. Few numbers of households use also the food crops as terms of payment of labor force. Sesame appears as a new cash crop which has low significance on household income, given a few number of adopter.

Figure 4.1: The main household crops



Source: Primary Data, (2006)

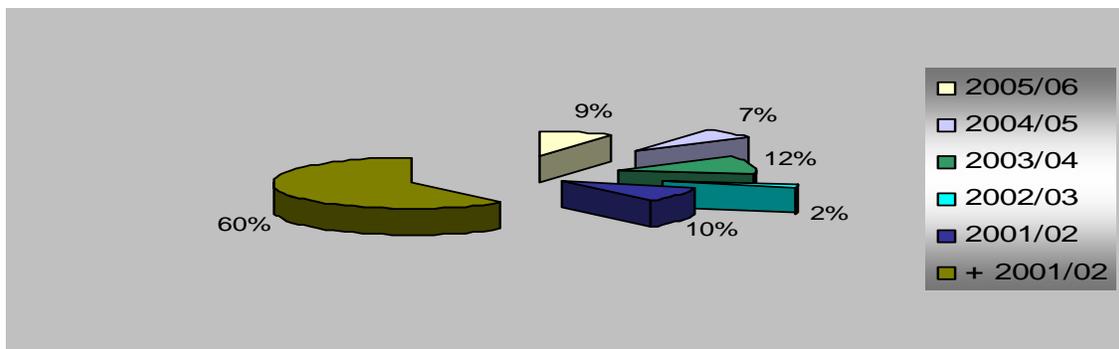
4.2.1: Period from Which Household Adopted Cotton Crop

When the colonial government implemented cotton crop in Mozambique, Maringue was planed to be as one of the potential cotton district in the Center of Mozambique, but the civil war has cut off the cotton performance in Maringue, even in most rural area. With the signing of peace in 1992, and after the general democratic election, cotton has been

² Sorghum, cereal crop probably originated and grown in many African countries. The study divides it into 1 and 2, because there are two different cereal crops in the study area, such as *mapira* sorghum 1 and *mexoeira* sorghum 2.

readopted by smallholder household in Maringue. The figure below summarizes the periods in which most cotton households adopted cotton after the civil war. The results show 60 percent of household adopted cotton before 2001/02 season. The second large group of household which adopted cotton in 2003/04 season represents 12 percent. Other groups of households adopted cotton in 2001/02, 2005/06, 2004/05 and 2002/03 seasons and represent 10, 9, 7 and 2 percent respectively. If we relate to household demographic characteristics in age structure category, most of cotton smallholders that represent 60 percent are more than 45 years old. This group has strong experience on cotton cultivation, but, a low education level constrains their ability to absorb a technology to grow as much as possible.

Figure 4.2: The period which Household Began Cultivate Cotton



Source: Primary Data, (2006)

4.2.2: Rural Household Motivation to Cultivate Cotton

Regarding the household motivation on cotton adoption, evidences show that 70 percent of target population cultivates cotton as only the best alternative in terms of increasing the household income and purchase power. According to the under concession arrangement that regulates cotton in Mozambique, results show that 27.5 percent of rural household adopt cotton because it has fixed buyers. Price of cotton is published by the Ministry of Agriculture via IAM, after The price adjustment meeting that involve three

different groups the *Associação Algodoeira de Moçambique* (AAM) congregates all farmer which ginning cotton in Mozambique, the *Forum Nacional dos Produtores do Algodão* (FONPA) involves all cotton farmers and the last group is the Government represented by IAM. For this reason 6 percent of rural households cultivate cotton using the price motivation than other crops. At the end of the season, cotton farmer receive their income from the cotton cropping, so, 2.5 percent of household are assumed a critical motivation.

Table 4.2: Relative importance of cotton for rural household

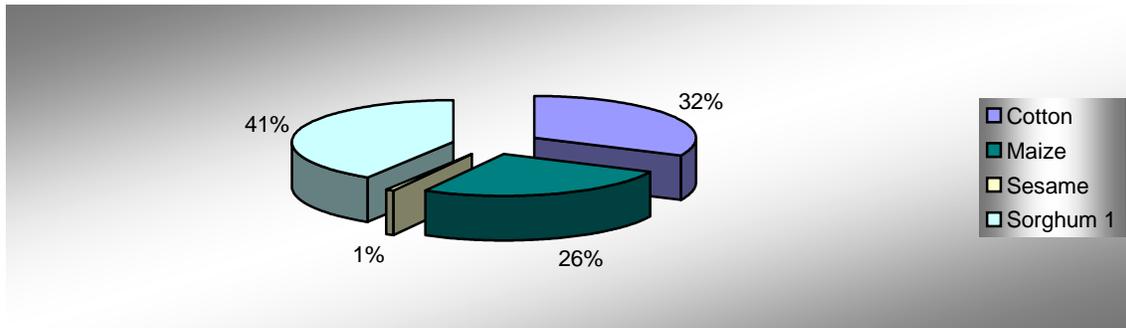
<i>Selected reasons</i>	<i>Percent</i>
Cotton crop is only the best alternative	70
Cotton has fixed buyers	21.5
Cotton price compensate (good)	6
Household receives their income at the end of season	2.5

Source: *Primary Data, (2006)*

4.2.3: Characteristics of Household Fields

With the diversification of crops adopted by cotton smallholder farmers in Maringue district, most of them have chosen the crops that have a significant impact on food security or cash income. This strategy constitutes a crucial household ability to get equilibrium in socio-economic function that agriculture plays in rural area. Evidences on data survey show that a great number of cotton household's farmers prefer to guarantee food security than cash crop. This group represents 41 percent and has greater area of sorghums 1. The second group of rural household that represents 32 percent growing cotton at first than others crops. The third group that represents 26 percent, greater number adopts of maize, and little number prefers sesame at first than other crops.

Figure 4.3: The major crops in cotton growing area

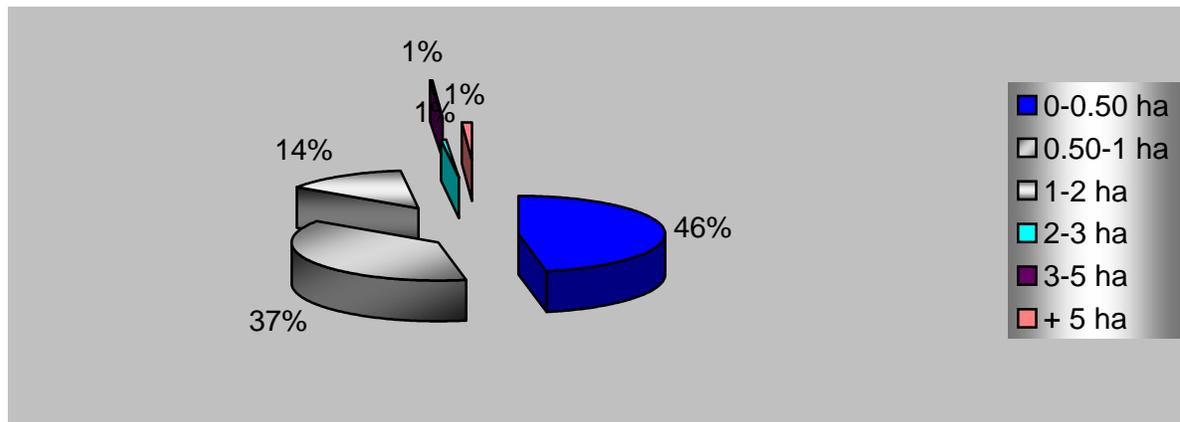


Source: Primary Data, (2006)

4.2.4: Distribution of Cotton Field

In Maringue district cotton is only a cash crop that has significant importance on household income. However, the area cultivated by the greatest part of cotton householders is relatively low if comparing to its importance. Evidences on data survey shows in summary the distribution of cotton field. The majority of cotton household fields range in interval of 0-0.50 hectare, which represents 46 percent. Secondly 37 percent of household growing cotton from 0.50 to 1 hectare. The third area is 14 percent and represents the interval 1-2 hectare.

Figure 4.4: Household cotton field distribution



Source: Primary Data, (2006))

4.3: Cotton Production and Input Use

The cotton produced in Maringue district almost entirely under contract farming arrangements between the CNA and small farmers, has been very successful in stimulating rural income growth. However, the production mechanism is very low. All cotton farmers use non-mechanized instrument on farming process. The most important inputs are pesticides and cotton seeds. The pesticides are provided by company on credit, including the use of *micro-uvas*³ and battery. The costs for each spray reach 110.00 Mt thus, during the farming process the cotton farmers have credit of 660.00 MT in pesticides. During the payment process the company debts each cotton household this amount that corresponds to six stage of spray. The most important pesticides used to pest control are *Vulprimeder*, *Endosulfan* and *Cypercal*

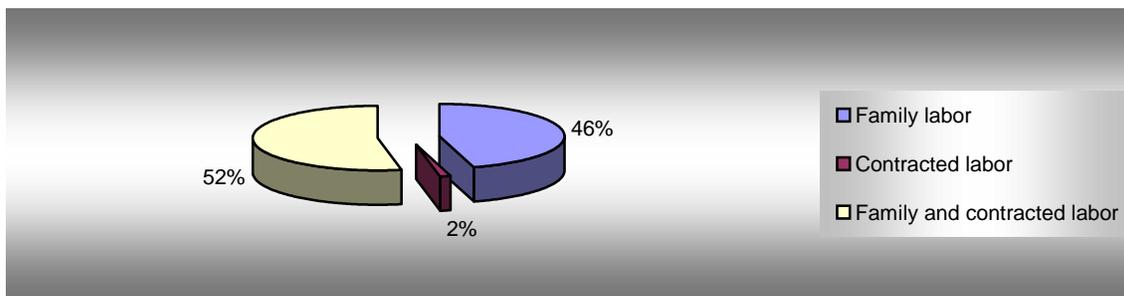
4.3.1: Labor Force Used in Cotton Field

As referred in chapter one about the intensity labor required in cotton field, evidences show that most smallholder cotton farmers use both family and contracted labor force.

³ Instrument used in cotton field for spraying.

The use of both labors expresses the crucial importance of this cash crop to local household purchase power. It was also reported that agriculture sector is the socio-economic source for many rural households. Moreover, cotton is an important crop and assumes this function also in Maringue district. Evidences on data survey show that in cotton growing area a greater number of households, 52 percent, are employed in familiar and contracted labor force. 46 percent of households use only family labor, confirming thus the critical characteristics of demographic household.

Figure 4.5: Labor force used in cotton field



Source: Primary Data, (2006)

4.3.2: Labor Used During the Cotton Cultivation Stages

For better interpretation, cotton cultivation is divided into mainly five stages namely farming, seeding, weeding, spraying and harvesting and post-harvesting. Each stage requires a different level of labor force. After the harvesting period, smallholder farmers start the faming process. The main objective of this stage does not limit only on desegregation of the land to seeding stage, but it consists on soft land to a germination of seed and its growth, and it constitutes one of way to control pest. A good time to farming is after the harvesting. According to data survey, in this stage 72.5 percent of cotton households employ labor force in interval of 1-5 workers. 19.5 percent uses in interval of 5-10 workers. Few numbers are employed in interval of 10-15 workers, which represent 8 percent.

After the farming and the first rainfall, cotton households begin the seeding stage. It constitutes the crucial stage on cotton plantation and its output. According to Gonçalo (2003), empirical evidences show that an ideal period to seeding in Sofala and low land Zambézia is from mid November to mid December. However this timing constrains with a delay of rainfall. In this stage the number of labor force required and its distribution has little difference than the first stage. According to the data survey, evidences show that in interval of 1-5 workers, cotton smallholders' farmer employed 54.5 percent, 37.5 percent in interval of 5-10 workers, 7.5 percent in interval of 10-15 workers and 0.5 percent for more than 15 workers.

The weeding stage is crucial for the growth of cotton plant and its productivity. This stage starts after seeding and normally after the cotton germination. In term of labor force use a greater number of cotton household employed labor in interval of 1-5 works that represent 48.5 percent. The other groups are employed in intervals of 5-10, 10-15 and more than 15 workers which represent 38.5, 12.5 and 0.5 percent, respectively.

Cotton is the only a crop that uses pesticides in Maringue district. Given the level of infestation reported in chapter one, the company introduced in last season six rounds of spraying. During this process, and given the low level of job, the number of labor required in this stage concentrated largely in interval of 1-5 workers, which represents 96.5 percent of population sample. The other subsequent two intervals employed 2.5 and 1 percent respectively.

The last stage, but not less important, is harvesting and post-harvesting that comprise all process from the harvesting to selling cotton. This stage is more critical than the others because the households expected their investment return to make plan in terms of expenditure. In concerning to labor force used in this stage the results shows that greater number of households employs labor in interval of 5-10 workers that corresponds 38 percent. The second group of household employs 30.5 percent, which represents in

intervals 10-15 workers. The others intervals are 1-5 workers and more than 15 workers, that represent 29.5 and 2 percent respectively.

Table 4.3: Labor Use Patterns to Cotton Cultivation per Each Stage

Selected Cotton Stages	Selected Intervals	Percent
Farming Stage	1-5 workers	72.5
	5-10 workers	19.5
	10-15 workers	8
Seeding Stage	1-5 workers	54.5
	5-10 workers	37.5
	10-15 workers	7.5
	+ 15 workers	0.5
Weeding Stage	1-5 workers	48.5
	5-10 workers	38.5
	10-15 workers	12.5
	+ 15 workers	0.5
Spraying Stage	1-5 workers	96.5
	5-10 workers	2.5
	10-15 workers	1
Harvesting and Post-Harvesting Stage	1-5 workers	29.5
	5-10 workers	38
	10-15 workers	30.5
	+ 15 workers	2

Source: Primary Data, (2006)

4.3.3: The Form of Remuneration Labor Force

All the smallholders that use contracted labor force adopt different forms of payment. Evidences on data survey show that the common forms of payments are cash, food and

others goods, and animals. The results obtained on research field emphasizes the cash as the most important form used by a greater number of cotton household, that represent 54.5 percent. Other cotton households that use food and other goods and animals represent 6.5 and 2.5 percent respectively.

Table 4.4: The Main Forms of Payment of Labor Force

<i>Selected Forms of Payment</i>	<i>Percent</i>
Cash	54.5
Food and others goods	6.5
Animals	2.5

Source: Primary Data, (2006)

4.3.4: The Source of Money to Pay Labor Force

The cotton growing area is characterized mainly by non-existent capital market. Credit is obtained from merchants or money lenders at interest rates which reflects the individual's circumstances of each transaction. For this reason most cotton households that employ the contracted labor force pay in cash, 25 percent of them resort the local loan, 17.5 percent pay the labor force using their saving, and 11.5 percent pay the labor force by selling their agriculture surplus and animals.

Table 4.5: The Main Source of Money to Labor Source

<i>Selected Source of Money</i>	<i>Percent</i>
Loan	25.5
Saving	17.5
Selling Food and Animals	11.5

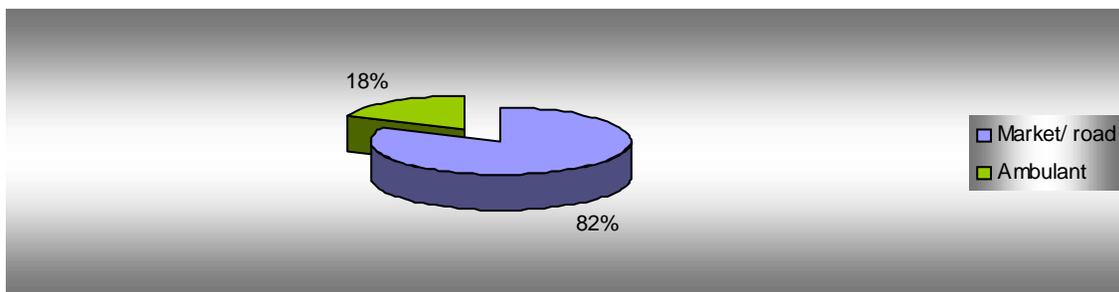
Source: Primary Data, (2006)

In term of source of credit, the table 4.6 in appendix B shows that large number of households obtain credit from individuals with interest rate. That number represents 22.5 percent of all households demanding local credit. 2.5 percent demanding credit from informal merchants. Few number obtained credit from the individuals without interest rate. However, the interest rate used in local credit system is relatively high; evidences on data survey show that all borrowers pay at the end of the period⁴ 100 percent of the interest rate.

4.4: Process of Selling Others Crops and Household Productivity

In cotton growing area the importance of other crops is relatively strong. From time to time smallholder farmers sell their agriculture surplus to access the basic good and services. For these reasons most rural households selling their surplus according to different circumstances and places. Evidences on data survey show that 82 percent of rural households are selling their surplus in market or near the road, and 18 percent sell their cropping surplus to ambulant. These processes of selling the household agriculture surplus have distorted the household gain because there is not fixed price and it is determined mainly by the buyer, without observing all factor that can influenced on price determination.

Figure 4.6: Process of selling others crops



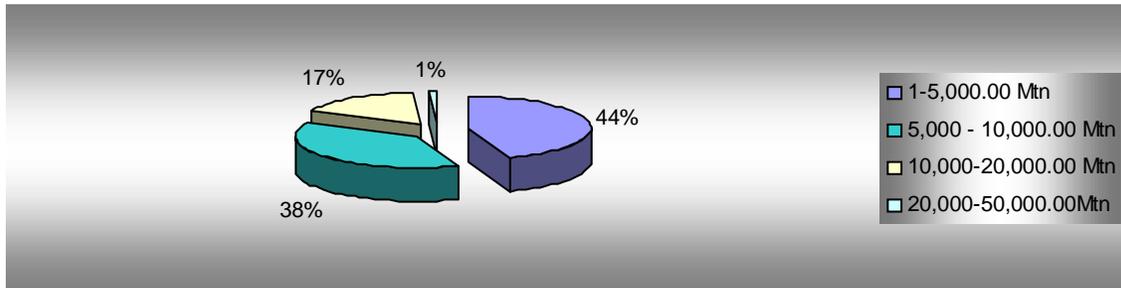
Source: Primary Data, (2006)

⁴ Most of households in Maringue take into account the end of period after buying cotton seed.

4.4.1: Cotton Household Profits in 2005/06 Season

After the post-harvesting stage, cotton smallholder farmers sell their cotton output to the CNA. The results show that a greater number of cotton household gain profits from the last season in intervals of 1-5,000.00 Mt, which represent 44 percent of the target population. 38 percent gain in intervals of 5,000-10,000.00 Mt. The others cotton households receive in intervals 10,000-20,000.00 Mt and 20,000-50,000.00Mt, that correspond to 17 and 1 percent respectively.

Figure 4.7: Household profits from the last season

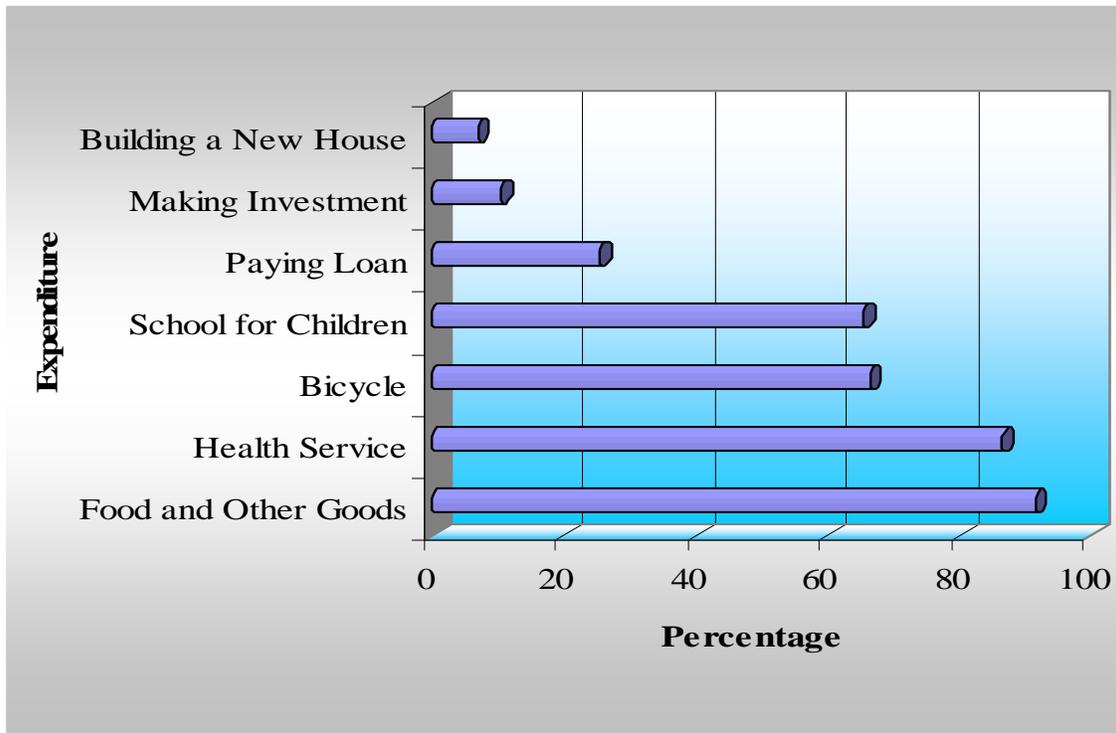


Source: Primary Data, (2006)

4.4.2: The Cotton Household Expenditure

As referred in chapter one and two the adoption of cash crops ameliorate the poor rural household competition for increasing their purchase power. Evidences demonstrate that the main household expenditures in cotton growing area, is food and other goods. Mostly households spent on them a greater amount of their income. Health services constitutes the second large. Other households planed to spend their income on bicycle and school for children. All households that use loan for many activities paid the loan as form to access the same services next season. In cotton growing area few numbers of households spent their income to make investment or to build a new house respectively.

Figure 4.8: The main household expenditure

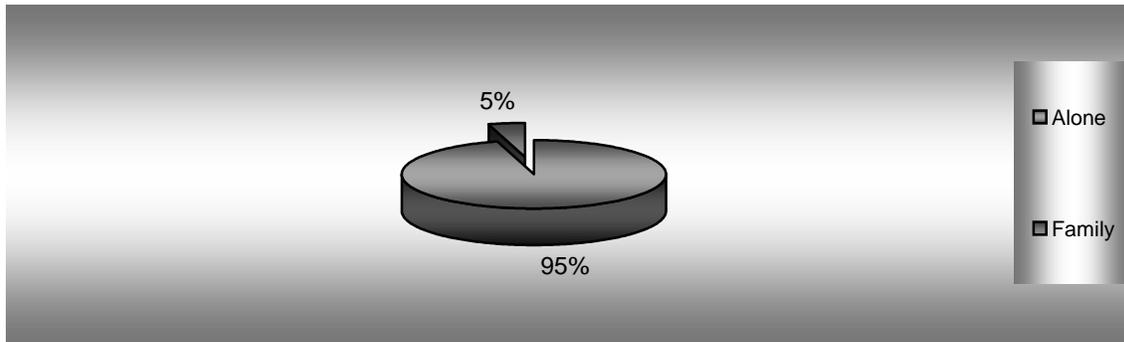


Source: Primary Data, (2006)

4.4.3: The Household Saving System

One of the common characteristics of rural area in most developing countries is the lack of banking system. Then, the poor rural household adopts traditional or local form of saving the money, running all risk related to this system. For this reason many household keep the money in land and/or in tin. Evidences show that 95 percent of household keep their money alone and 5 percent use family to keep their income.

Figure 4.9: The household saving system



Source: Primary Data, (2006)

4.5: Constraints on Cotton Production

In Mozambique agriculture constitutes the most important sector and the priority sector for poverty reduction mainly in rural area where greater poor households live and depend heavily on it as source of subsistence. However, the dependence on natural factor and the lack of input constrains a lot possible rural household farmers. The table below, summarizes the main constraints that affect the cotton smallholder farmers to develop their activities. The rainfall constitutes the most determinant on rural household cropping. Evidences show that in the last season there was insufficient rainfall, which represents 71.5 percent of sample population and 28.5 percent agreed on delay of rainfall. With a higher level of pest infestation the research results found that 62 percent smallholder farmers assume insufficient pesticides to control pest, and 29 percent agreed on delay of pesticides distribution. Results on other inputs use the study shows that there is the lack of local shop to access the household the traditional instruments of production.

Table 4.7: The major constraints on cotton production

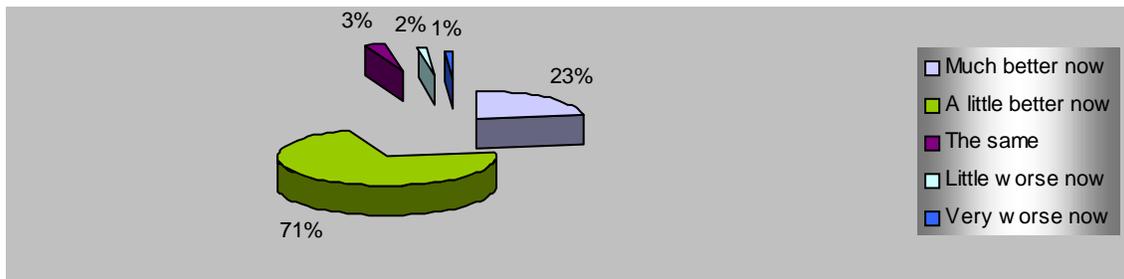
Selected constraints	The Factors	Percent
Weather	Insufficient rainfall	71.5
	Delay of rainfall	28.5
Access to Pesticides	Insufficient pesticides	62
	Delay on pest distribution	29
	Higher cost of pesticides	3.5
Others Inputs Use	Lack of shop selling the inputs	96.5
	lack of labor force	3.5

Source: Primary Data, (2006)

4.6: Household Economic Situation

This section analyzes the household economic situation comprising the current situation to that before the adoption of cotton. The study also mentions the household food security. The results show that 71 percent of rural households assume their economy a little better now. Much better represents 22 percent of rural household. While the same,, little worse and very worse represent 3, 2 and 1 percent respectively.

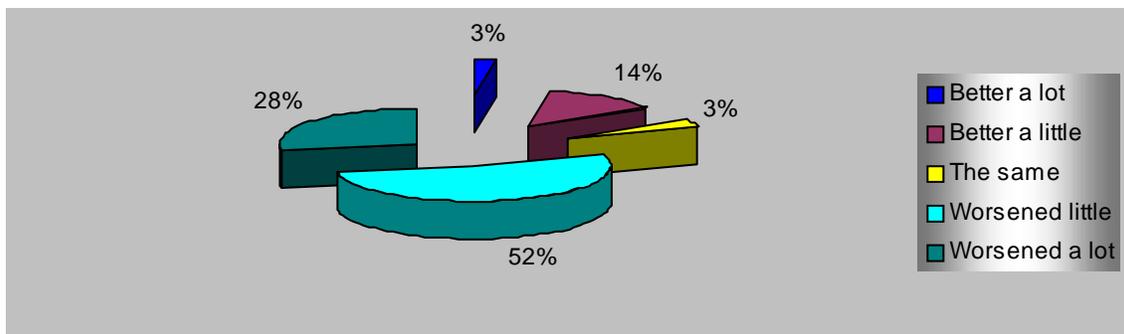
Figure 4.10: Household Relative comparison of economic situation



Source: Primary Data, (2006))

If we look at the household economic situation before the cotton adoption, evidences on data survey show that 52 percent of cotton households lived a little worsened than after their adoption. 28 percent of rural households have much worsened their economic situation, 14 percent assume that they live a little better, the same and better a lot represent 3 percent for each group respectively. This fact confirms the importance of cotton for most rural households. The adoption of cash crop such as cotton increases the purchase power for most poor rural household that depend heavily on it as source of subsistence.

Figure 4.11: The Household Life Before Adopting Cotton

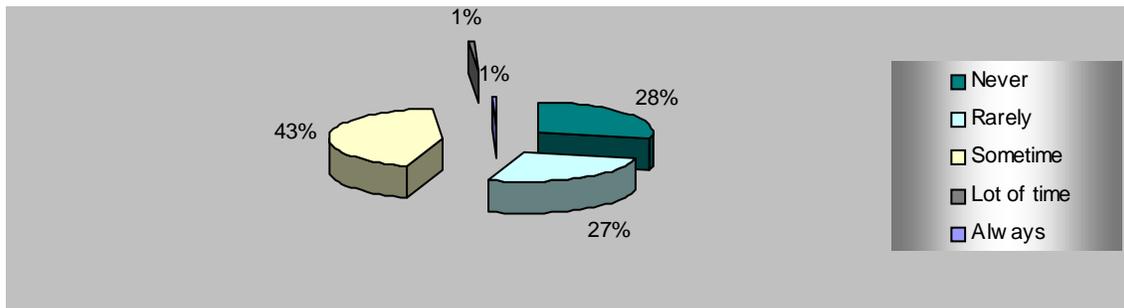


Source: Primary Data, (2006)

4.6.1: Cotton and Food Security

The relationship between cotton and others crops is strong for rural household because rural smallholder farmers grow the cash and food crop simultaneously or in the same period. That means they find any equilibrium to guarantee the income and food security. Results on data survey show that 43 percent of cotton household sometime have encountered famine from the period they adopted cotton until now, 28 percent have never encountered famine's problems, 27 percent rarely and 1 percent for each lot of time and always respectively.

Figure 4.12: Cotton and food Security

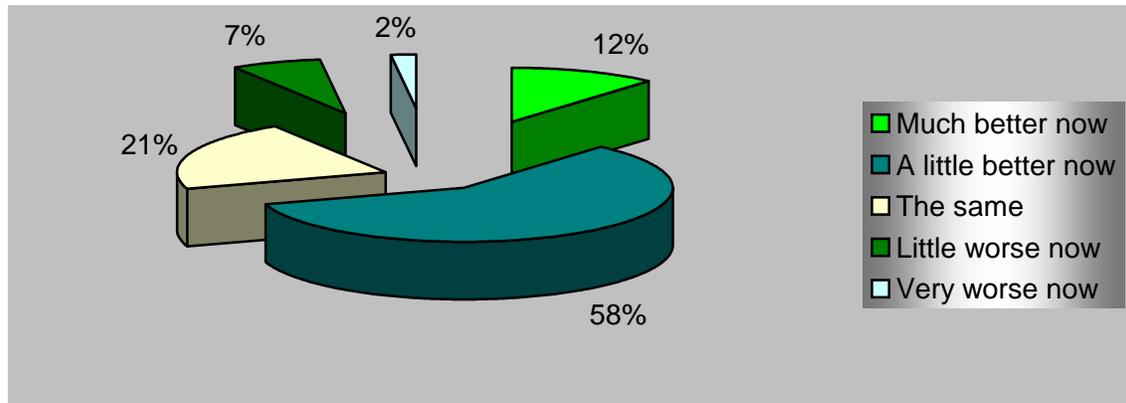


Source: Primary Data, (2006)

4.6.2: Cotton Household Satisfaction

The relationship between the cotton company that operates in Maringue district and cotton household in the study area is relatively strong and good. In the last season the company introduced a new process of buying cotton from the household farmers. The process consisted on two different rounds, weight and payment. The results of the new strategy adopted by *Companhia Nacional Algodoeira* show that 58 percent of rural cotton considered the new process a little better, 21 percent represents households that considered the same or unchanged, 12 percent represent much better, 7 and 2 percent considered little worse and very worse respectively.

Figure 4.13: The new process of buying cotton adopted by CNA



Source: Primary Data, (2006)

4.7: Suggestion to the Company and Government to Overcome the Main Household Challenges

This section analyzes the cotton farmers opinion regarding to the company and the government in order to overcome the main challenges. Evidences on figure 4.14 in appendix show that 46 percent rural cotton household suggest the company on increasing the cotton price according to cost of living. The lack of social infrastructure is critical in Maringue. For this reason, 22 percent suggest the access of water, 13 percent the assistance on other crops to improve the food security, 12 percent schools, 5 percent credit and 2 percent road. Other hand, for government evidences show that 28 percent of rural household suggest on improving the water access, 36 percent suggest on schools, 22 and 14 percent suggest on credit for farming process and tractor respectively.

CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS

5.1: Conclusions

In this research, we have examined the impact of cotton production among cotton farmers in Maringue district. Its purposes were to identify the economic benefits at household level as way to poverty reduction and to identify the factors that affect this cash crop. Cotton is only a cash crop that has main importance on household life in Maringue district. Because it has direct impact, on the other hand, it comes from increasing earning and purchase power for most cotton farmer. Given the predominance of intensive labor that cotton production requires in most developing countries, in Maringue, the employment of local labor force creates an other dynamic that is, increasing the purchase power for most household.

In terms of value relative to other agriculture crop and as source of income in Maringue district, cotton stands as the highest earning non-food crop and creates the auto-employment for most rural households. In spite of the low and intensive labor cost involved, most cotton household farmers are believed to hold a high earning on adoption cotton. Most of them use it on expenditure of basic needs as form of life improvement that is considered as the base of development. Additionally the adoption of cotton ameliorates significantly the poor rural household competition for increasing the purchase power.s

Given the benefits that cotton brings to rural household and related to poverty reduction, the study agrees that it is possible. But it is not linear, that means cotton is not the only sufficient condition to poverty reduction. The reduction of poverty in cotton growing area depends mainly on the government, the company and the household. The first two agents together must encounter a platform action according to the necessity for each area. The household in this case appears as collaborator, because this group does not have sufficient sources.

Cotton in Maringue is predominantly adopted by the head of family who it is as the best alternative for household subsistence. However, the production mechanism is very low. All cotton farmers use non-mechanized instrument on all farming process. Pesticides, cotton seeds and labor force constitute the most important inputs used in cotton production process. Due to the importance of cotton for rural household economy, most of them have not been able to take full advantage of favorable macro-environment. The dependence on natural factors, low level of education, the lack of social infrastructure such as water and lack of shop constrain most cotton farmers to develop their activities as much as possible.

Looking to the agricultural model and using the evidences on data collection, the researcher concludes that natural factors such as land quality, precipitation and the level of pest in field contribute on high cotton yield. The use inputs, pesticides, contribute substantial to high yield. Among the household characteristics the education level is a crucial factor which is closely related to human development. That means, it absorbs modern technology to develop the capacity for self sustaining and promotion of economic growth and development. In cotton growing area the predominance of low level of education is high. This factor constrains in parts most smallholder farmers to learn new technology in order to grow as much as possible.

5.3: Recommendations

The key research of this study is that the adoption of cotton production in rural area increases the household income. To achieve this objective it is necessary to draw some policies as recommendation in order to overcome the main cotton household challenges. The selected policies are the combination of results finding on data survey and research conclusions. The main recommendations are:

- Cotton is only a crop that has main importance on household income. However, the area cultivated by household is relatively small. In this sense, the household must increase the area of adoption in order to gain more and to invest as much as possible on farming process.
- As a form to reduce the transaction cost in cotton growing area, the CNA should continue to promote the local cotton household association, started in Samatere market to other areas or markets. The local association can facilitate the access to credit for farming process. The credit facilities should also reduce the informal loan, whose interest rate reflects each circumstance.
- The CNA should identify the potential cotton farmer who grows more than five hectare, in all zones in order to draw policies to motivate on increasing or maintaining the area of farming. The policies should involve credit of farming.
- The CNA should be involved on social activities, such as building social infrastructure, as former to reduce the gap existing in cotton growing area. The social infrastructure should develop on road quality, water availability and access to basic farming instruments.

5.3.1: Future Research

Cotton in rural area has a significant importance for household subsistence and it constitutes one form of poverty reduction. Therefore, the necessity to help this group is high, mainly on managing the profits. For future study the researcher propose *To identify how to transform the cotton farmers to small and medium entrepreneurs.*

REFERENCES

Baffes, J.; Badiane, O. and Nash, J. (2004): *Cotton: Market Structure, Policies and Development Issues*, World Bank. Paper presented at the WTO African Regional Workshop on Cotton Cotonou, Beni. March 23-24 2004

Benfica, R.; Zandamela, J.; Miguel, A. and de Sousa, N. (2005): *The Economics of Smallholder Households in Tobacco and Cotton Growing Areas of Zambezi Valley of Mozambique*, Ministry of Agriculture of Mozambique. March 2005.

Benfica, R.; Tschirley, D. and Sambo, L. (2002): *The Impact of Alternative Agro-Industrial Investment on Poverty Reduction in Rural Mozambique*. Ministry of Agriculture and Rural Development. Directorate of Economics. November 2002.

Boughton, D.; Shirley, D.; Zulu, B.; Ofiço, Afonso O.; Marrule, H. (2003): *Cotton Sector Policies and Performance in Sub-Saharan Africa: Lessons Behind the Numbers in Mozambique and Zambia*, Durban, South Africa. August 16-22, 2003.

Building on Successes in African Agriculture. (2004): *Mali's White Revolution: Smallholder Cotton*. International Food Policy Research Institute. <http://www,ifpri.org>

Carrasco-Tauber, and Moffitt, L. (1992): *Damage Control Econometrics: Functional Specification and Pesticides Productivity*, American Journal of Agricultural Economics 76:158-162

Cotton Policy Brief. (2000): *The Administered Monopoly Model in the Era of Competition and Globalization*.

Directório Comercial de Moçambique. (2006): 7º edição Directório Comercial de Moçambique. Maputo.

Gonçalo, Manuel José. (Maio de 2003): *Estudo de Alguns Constrangimentos que Afectam o Desempenho das Associações de produtores de Algodão em Monapo e Meconta, Província de Nampula, Tese de Licenciatura na Universidade Eduardo Mondlane. Faculdade de Agronomia-Maputo*

Instituto Do Algodão de Moçambique.(2006): *Ponto de Situação das Campanhas do Algodão de 2003/04, 2004/05 e 205/06, Relatório do 4º trimestre de 2005.* Maputo 22 de Fevereiro de 2006.

Larsen, Marianne Nylandsted. (2003): *Quality Standard-setting in Global cotton chain at Cotton Sector Reforms in Sub-Saharan Africa.* Institute for international Studies. Copenhagen

Lichtenberg, E. and D. Zilberman. (1986): *The Econometrics of Damage Control. Why Specification Matter:* American Journal of Agricultural Economics 68: 261-273.

MOA/MSU/UA. (1991): *A Socio-Economic Survey in the Province of Nampula: Cotton in the Smallholder Economy.* Working paper

Negrão, José. (2001): *Cem Anos de Economia da Família Rural Africana, Colocação Identidades*

Odi Briefing Paper. (2004). *Developed Country Cotton Subsidies and Developing Countries: Unravelling the Impacts on Africa,* England; July 2004.

- PARPA 1. (2001-2005): *Documento de Estratégia e Plano de Acção para Redução da Pobreza e Promoção do crescimento Económico*, República de Moçambique; Maputo
- Pitoro, Raul Oscar. (2004): *Assessing the Potential Economic Benefits of Transgenic Cotton in Mozambique*, M.S. Thesis at Michigan State University, Department of Agricultural Economics.
- Primack, David. (2005): *Addressing Global Cotton Subsidies Uprooting the Seeds of Poverty in Hong Kong and beyond*, 5 December, 2005.
- Qaim, Matin and De Janvry, Alain. (2005): *Bt Cotton and Pesticide use in Argentina: Economic and Environmental Effects*; Cambridge University
- República de Mozambique. (2005): *Proposta de Programa do Governo para 2005-2009*, Maputo, Março de 2005.
- Todaro, P. and Smith, C. (2006): *Economic Development*, 9^o edition. Pearson Addison Wesley. England.
- Trade Note. (March 30, 2006). *WTO's Doha Cotton Initiative: How will it affect Developing Countries?* The World Bank Group.
- UNDP. (1999): *Mozambique National Human Development Report*. Maputo, 1999.
- UNDP. (2000): *Mozambique National Human Development Report*. Maputo, 2000.
- Yamane, T. (1962). *Statistic, An Introductory Analysis*, 2nd edition, Harper and Row, New York.

APPENDIXES

Appendix A: Questionnaire



CATHOLIC UNIVERSITY OF MOZAMBIQUE
FACULTY OF ECONOMICS AND MANAGEMENT
GRADUATE SCHOOL OF BUSINESS
MASTER OF ARTS IN ECONOMICS AND MANAGEMENT

Inquiry to Smallholder farmers in Maringue District – Sofala Province.
Impacts of Cotton Production Among Cotton Farmers

The main objective of this questionnaire is to evaluate the economic impact of cotton production among cotton farmers in Maringue district. It attempts to gather necessary information to analyze benefits of cotton production at household level and to identify the factors affecting this cash crop. The result will be used to write the thesis of Master of Arts in Economics, and it can help the Government, Company and Society in decision marking.

GENERAL INFORMATION

Dates of interview: ___/___/___ (D/M/Y)

Name of interviewer _____

Administrative area _____

Starting Time: ____:____ (Hour: Minute)

PART A: GENERAL INFORMATION ABOUT THE HOUSEHOLD

1: Can you provide the household's data following the table?

Adopter	Age	Gender	Education level	Number of Family
1: Head	1: 0-15	1: Male	1: Never went to school	1: 1-5
			2: Primary level 1°	2: 5-10
2: Single	2: 15-25	2: Female	degree (1 ^a -5 ^a)	
			3: Primary level 2°	
	3: 25-35		degree (6 ^a -7 ^a)	3: 10-20
			4: Secondary level 1°	
	4: 35-45		cycle (8 ^a -10 ^a)	4: + 20
			5: Secondary level 2°	
	5: +45		cycle (11 ^a -12 ^a)	
			6: Higher education	

PART B: INFORMATION ABOUT AGRICULTURAL PRODUCTION

2: Which crops do you cultivate?

Selected Crops	Yes	No
<i>Cotton</i>		
<i>Maize</i>		
<i>Sesame</i>		
<i>Sorghum 1</i>		
<i>Sorghum 2</i>		
<i>Bean</i>		
<i>Peanut</i>		

3: For how long have you been cultivating cotton?

Selected years	Please pick only one
1) 2005/06	
2) 2004/05	
3) 2003/04	
4) 2002/03	
5) 2001/02	
6) + 2001/02	

4: What was the reason that motivated your adoption of cotton production?

<i>Selected motivation</i>	<i>Please pick only one</i>
<i>Cotton has fixed buyer</i>	
<i>Cotton has fixed prices</i>	
<i>Cotton is the best alternative in term of income</i>	
<i>Household receives cotton profits at end of year</i>	
<i>Others, Specify</i>	

5: Which crop you cultivate has major area (hectare)?

<i>Crops</i>	<i>Please pick only one</i>
<i>Cotton</i>	
<i>Maize;</i>	
<i>Sesame</i>	
<i>Sorghum 1</i>	
<i>Sorghum 2</i>	
<i>Bean</i>	
<i>Peanut</i>	

6: How many hectare of cotton did you cultivate in last season?

<i>Selected area</i>	<i>Please pick only one</i>
<i>0-0.50 ha</i>	
<i>0.50-1 ha,</i>	
<i>1-2 ha</i>	
<i>2-3 ha</i>	
<i>3-5 ha;</i>	
<i>+ 5 ha</i>	

7: How many kg did you get in last season?

<i>Selected area</i>	<i>Please pick only one</i>
<i>0-500 kg</i>	
<i>500-1,000 kg</i>	
<i>1,000-2,000 kg</i>	
<i>2,000-4,000 kg</i>	
<i>+ 4,000 kg</i>	

PART C: INFORMATION ABOUT INPUTS USE

8: In which crop do you use pesticides?

<i>Crops</i>	<i>Please pick only one</i>
<i>Cotton</i>	
<i>Maize;</i>	
<i>Sesame</i>	
<i>Sorghum 1</i>	
<i>Sorghum 2</i>	
<i>Bean</i>	
<i>Peanut</i>	

9: How many time do you use pesticides in field for season?

<i>Selected time</i>	<i>Please pick only one</i>
<i>0-3 times</i>	
<i>0-4 times</i>	
<i>0-6 times</i>	
<i>+6 times</i>	

10: How do you obtain the pesticides?

<i>Selected time</i>	<i>Please pick only one</i>
<i>Buying by credit</i>	
<i>Buying by cash</i>	

11: Apart from the pesticides credit, do you have any other credit benefit from the company or other agencies?

<i>Selected Option</i>	<i>Please pick only one</i>
<i>Yes</i>	
<i>No</i>	

12: Which labor force do you use for cotton production?

<i>Selected Characteristic of labor</i>	<i>Please pick only one</i>
<i>Familiar labor</i>	
<i>Contracted labor</i>	
<i>Familiar and contracted labor</i>	

13: For each cotton cultivation stage, how much labors force do you employe?

Number of labor force	Stages of cotton production				
	Farming	Seeding	Weeding	Spraying	Harvesting

Key: (1): 1-5 workers; (2): 5-10 workers (3): 10-15 workers
(4): + 15.

14: How do you pay the labor force?

<i>Selected type of payment</i>	<i>Please pick only one</i>
<i>In cash</i>	
<i>Food and other goods</i>	
<i>Animal</i>	
<i>Others. Specify</i>	

15: What is the source of money to pay the labor?

<i>Selected Source</i>	<i>Please pick only one option</i>
<i>Loan</i>	
<i>Saving</i>	
<i>Sell of agriculture surplus or animal</i>	
<i>Other sources. Specify</i>	

16: From where do you obtain the credit for labor force?

<i>Selected Source</i>	<i>Please pick only one option</i>
<i>Individuals without interest rate</i>	
<i>Individual with interest rate</i>	
<i>Informal businessman without interest rate</i>	
<i>Informal businessman with interest rate</i>	

17: What is the interest rate paid for the loan?

<i>Selected Source</i>	<i>Please pick only one option</i>
<i>0-15%</i>	
<i>15-25%</i>	
<i>25-50%</i>	
<i>50-75%</i>	
<i>+ 75%</i>	

PART D: INFORMATION ABOUT COMMERCIALIZATION AND INCOME APPLICATION

18: How do you sell the other crops?

<i>Selected buyers</i>	<i>Please pick only one option</i>
<i>Market or road</i>	
<i>Ambulant</i>	
<i>Fomenter</i>	
<i>Others. specify</i>	

19: What is your income from the last harvesting?

<i>Selected income</i>	<i>Please pick only one option</i>
<i>0-5.000.00Mtn</i>	
<i>5.000-10.000,00Mtn</i>	
<i>10.000-20.000.00 Mtn</i>	
<i>20.000.-50.000.00 Mtn</i>	
<i>+50.000.00 Mtn</i>	

20: How do you use the income from the cotton production?

<i>Selected expenditure</i>	<i>Yes</i>	<i>No</i>
<i>Bicycle</i>		
<i>Health services</i>		
<i>Food and other goods</i>		
<i>School for Children</i>		
<i>Build a new house</i>		
<i>Paying loan</i>		
<i>Investment</i>		

21: How do you save your money?

<i>Selected expenditure</i>	<i>Please pick only one option</i>
<i>Alone</i>	
<i>In bank</i>	
<i>Familiar</i>	
<i>Others</i>	

PART E: INFORMATION ABOUT PROBLEMS FACING DURING COTTON PRODUCTION

22: Have you encountered any problems on cotton cultivation in concerning?

a) Rainfall

<i>Selected constraints</i>	<i>Please pick on one option</i>
<i>Delay on rainfall</i>	
<i>Insufficient rainfall</i>	
<i>Flood</i>	

b) Land

<i>Selected constraints</i>	<i>Please pick on one option</i>
<i>Access to land</i>	
<i>Access to arable land</i>	

c) Pest control

<i>Selected constraints</i>	<i>Please pick on one option</i>
<i>Insufficient pesticides</i>	
<i>Delay on pesticides distribution</i>	
<i>High cost of pesticides</i>	

d) Others inputs

<i>Selected constraints</i>	<i>Please pick on one option</i>
<i>The lack shops of inputs</i>	
<i>The lack of labor force</i>	

23: Do you have information about cotton price at the beginning of the season?

<i>Selected option</i>	<i>Please pick on one option</i>
<i>Yes</i>	
<i>No</i>	

24: Have you encountered any problems in providing food to the household members after having adopted cotton crop?

<i>Selected option</i>	<i>Please pick on one option</i>
<i>Never</i>	
<i>Rarely</i>	
<i>Sometime</i>	
<i>lot of time</i>	
<i>Always</i>	

26: How do you compare the current household economic situation with that of last year?

<i>Selected options</i>	<i>Please pick on one option</i>
<i>Much better now</i>	
<i>A little better now</i>	
<i>The same</i>	
<i>Little worse now</i>	
<i>Very worse now</i>	
<i>Do not know</i>	

27: How do you compare the current household economic with that without you the adopting cotton?

<i>Selected options</i>	<i>Please pick on one option</i>
<i>Better a lot</i>	
<i>Better a little</i>	
<i>The same</i>	
<i>Worsened little</i>	
<i>Worsened a lot</i>	

28: How do you compare the new process of buying cotton adopted by CNA with others?

<i>Selected options</i>	<i>Please pick on one option</i>
<i>Better a lot</i>	
<i>Better a little</i>	
<i>The same</i>	
<i>Worsened little</i>	

29: In your opinion what should the CNA improve regarding the household major challenges?

<i>Selected options</i>	<i>Please pick on one option</i>
<i>Improving the cotton price</i>	
<i>Access to water</i>	
<i>Assistance on others crops to improve the food security</i>	
<i>School</i>	
<i>Credit</i>	
<i>Road</i>	

30: In your opinion what should the government improve regarding the household major challenges?

<i>Selected options</i>	<i>Please pick on one option</i>
<i>Access to water</i>	
<i>Access to school</i>	
<i>Credit facility</i>	
<i>Tractor</i>	

31: Have you any idea to address about the cotton production at smallholder level?

Thank you for your comprehension!

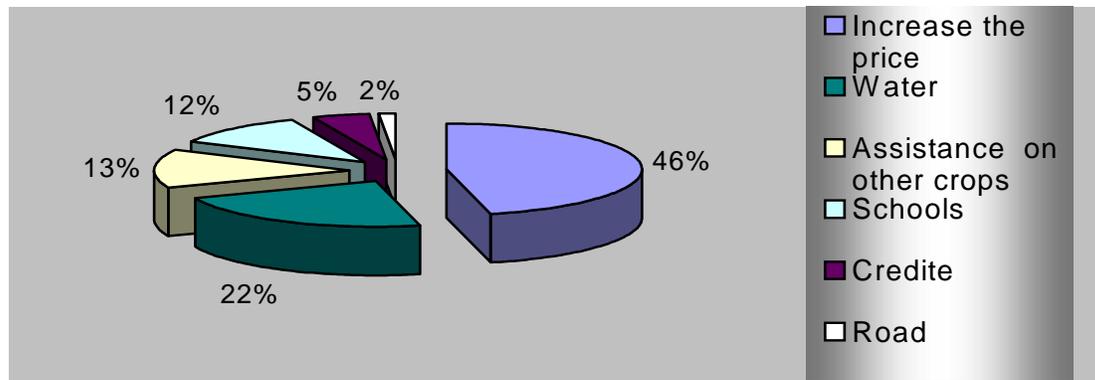
Appendix B: Primary Data Output

Table 4.6: The main source of loan

Selected source of loan	Percentage
Individuals with interest rate	22.5
Informal businessman with interest rate	2.5
Individuals without interest rate	0.5

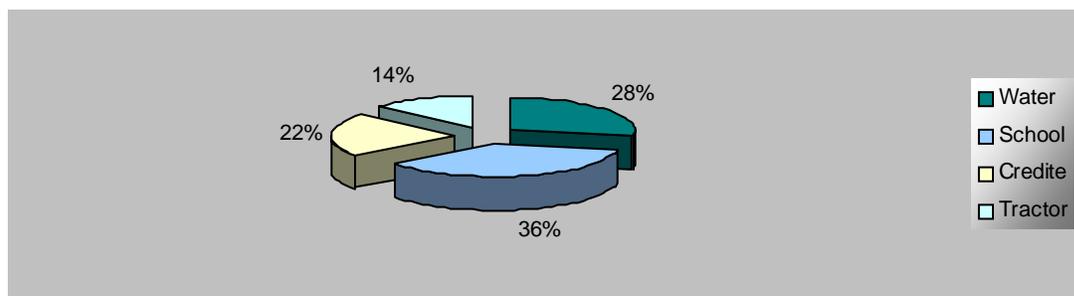
Source: Primary Data, (2006)

Figure 4.14: How the CNA can improve the life of household cotton farmer



Source: Primary Data, (2006)

Figure 4 15: How the government can improve the lie of household cotton farmer



Source: Primary Data, (2006)