A COMPARATIVE STUDY OF CONVENTIONAL AND ORGANIC COTTON PRODUCTION AMONG SMALL HOLDER FARMERS IN CHONGWE DISTRICT

A Research Report Presented to the Department of Agricultural Economics and Extension Education of the University of Zambia

BY

CHILALA ROYEN HAKOOMA

In Partial Fulfillment of the Requirements for the Degree of Bachelor of Agricultural Sciences

ACKNOWLEDGEMENTS

My deepest thanks go to my supervisor Mrs. R Lubinda for her critical scrutiny and correction of my work from time to time. Her professional contribution and patience has made this research a reality. I also thank the Head of Department Dr T.H Kalinda for his guidance in formatting this work. My gratitude further extends to the entire staff of the Agriculture Economics and Extension Education Department whose directives and constructive advice helped to improve my work.

I would like to thank the staff of CHOPPA especially Mr. Tembo for facilitating the work of the project. Without their help, it would have been impossible to reach the farmers. The information provided by CHOPPA was also very important for this research. The advice from Dr Sekamatte from Dunavant Zambia Ltd can never go unmentioned.

My special thanks go to my Mum Evelyn and Dad Mailon who have been great parents throughout my education. Their moral and material support has made me who I am. My brothers Mark, Choolwe, Brain and Chimuka and sisters Emely and Theresa for being there for me. I would also like to thank my brother in law Lubaba for his support in so many ways. You have indeed been more than a brother. I owe this work to all of you.

Finally, I would like to thank the lord God almighty for giving me the strength to endure the academic pressures. With you my God every thing is possible.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

KATC	Kasisi Agricultural Training Centre
CHOPPA	Chongwe Organic Producers and Processors Association
OPPAZ	Organic Producers and Processors Association of Zambia
WW II	World War II
COMESA	Common Market for Eastern and Southern Africa
FTA	Fee Trade Area
EU	European Union
CDT	Cotton Development Trust
GART	Golden Valley Agriculture Research Trust
NOSB	National Organic Standards Board
SPSS	Statistical Package for Social Sciences
OPFA	Organic Food Production Act
IPM	Integrated Pest Management
ZMK	*Zambian Kwacha*
USA	United States of America
GMO	Genetically Modified Organisms
SACU	Southern Africa Custom Union

ABSTRACT

A Comparative Study of Conventional and Organic Cotton Production among Small Holder Farmers in Chongwe District

Chilala Royen Hakooma
University of Zambia, 2008

Supervisor:
Mrs. R Lubinda

Recent comparative studies in Zambia on conventionally and organically grown cotton established higher profits for organic cotton grown on demonstration plots than conventional cotton grown by the small scale farmers in the area. However, gross margins should only be compared with figures from farms with similar characteristics. This study therefore was conducted to compare the two technologies under similar farm conditions. This report provides a basis on which farmers will make informed decisions whether to engage in organic or conventional cotton production.

A comparative study was conducted on organic and conventional cotton grown by smallholder farmers in Chongwe District for the 2005/06 farming season. The research compared the yields, the cost structure, limiting production factors and the profitability of the two technologies. Research data was obtained through administering a structured questionnaire to respondents who were all members of CHOPPA and unstructured interviews were conducted with key informants who were the project implementers. Secondary data on conventional cotton was acquired from CHOPPA and KATC.

The research established a higher profit for conventional than organic cotton. Conventional recorded a profit of ZMK 210, 6000 while organic cotton recorded a loss of ZMK 350, 904. The loss in organic cotton was attributed to low average yields of 140.8Kgs per hectare compared to 1024Kgs in conventional cotton. Organic cotton had higher production costs of ZMK 1,017,000 compared to ZMK 726, 000 per hectare for conventional cotton. The production costs were 40% higher in organic compared to conventional cotton. The level of knowledge on the technicalities of organic cotton production was established to be the most limiting factor to the organic cotton technology. The profitability of organic cotton is expected to improve with the increased level of knowledge of the organic farmer. The difference in the cost structure included the cost of labour which was higher in organic than conventional cotton, the cost of pest control which was higher by 51% in conventional compared to organic cotton and lastly the fertilizing costs which were higher in organic than in conventional cotton.

Based on this study, it was recommended that a research be carried out to observe performance of organic cotton over a long period of time. The project should establish strong linkages with other stakeholders to facilitate development of the organic farming technology. Lastly, the current organic cotton technology should be modified from basic to higher input organic production, which incorporates the use of organically certified pesticides in production. This will enable concurrent pest control.

CHAPTER I

INTRODUCTION

1.1 Background

Cotton is by far the most important cash crop grown by small holders in Zambia. Cotton production and processing is an important source of income at household level for many thousand of smallholder farmers as well as being a source of foreign exchange at national level. Zambia is a major producer of cotton in Southern Africa with privileges accessing four major markets: SACU, COMESA, FTA, EU and the United States (Ndulo and Mudenda, 2004). In 1980, Zambia earned a total of US $8 million from cotton lint export, accounting for 62.1 percent of total agricultural export. In the year 2000, the export earnings from cotton had increased to US $ 15 million accounting for 26.8 percent of total agricultural export (Fortucci, 2001). In 2004, export earnings reached US$100 million (Cotton Development Trust, 2004). It is estimated that 13% of people directly depend on the cotton industry for part of their livelihood (Cotton Development Trust, 2004). According to Cotton Development Trust (CDT), the number of cotton farmers increased from 50,000 in 1995 to 300,000 in 2004/05 farming season. The total production also rose from 42,000 metric tonnes (mt) in 1994/95 season to over 180,000 mt of seed cotton in 2004/05 farming season. Cotton production therefore plays a fundamental role in the economic development of this country just as it is for many other developing countries in the world.

In many countries therefore, strenuous efforts have been made to increase production, mainly by increasing yields through the intensive use of chemical inputs, irrigation and the use of higher-yielding varieties. Cotton grown with the aid of chemicals is referred to as conventional cotton. It occupies only 3% of the world's farmland and yet demands 25% of the world's chemical pesticides and fertilizers. Conventional cotton textile manufacturing involves the use of bleaches, formaldehyde and other chemical finishes. Improvements in cotton fiber output have generally been regarded as beneficial by those involved, including the farmers, but they have also involved costs, both environmental and social, which have not been reflected in cotton pricing and which have seriously affected people's livelihoods,

health and environment (Financial Times, 2005). Indeed, despite its economic importance, cotton production has become increasingly associated with severe negative environmental impacts which include reduced soil fertility, salinization, a loss of biodiversity, water pollution, adverse changes in water balance, and pesticide-related problems including resistance. Social costs include, for example, severe health problems related to the heavy use of acutely toxic pesticides especially in countries where regulatory systems are weak or unenforceable and safe use almost impossible. With children, these problems can persist well into their adult life (Financial times, 2005).

With the growing concerns for the environment and health considerations as illustrated above, there has been a quest globally to move away from the production of conventional cotton to organically produced cotton. By definition organic cotton growing involves no chemical pesticides, fertilizers or defoliants. Instead, organic solutions are applied by using compost manure, naturally derived minerals and crop rotation to keep the land fertile. Insect control involves the use of beneficial insects and natural pesticides certified for organic crops. Naturally colored cotton has been bred to be self-colored and therefore requiring no dyes. (Earthrunnings, 2003).

In Zambia, organic cotton growing is relatively a new concept. Kasisi Agricultural Training Centre (KATC) a farmer training centre for smallholder farmers in Zambia has been promoting the growing of organic cotton among other crops. This is done among other things to address the ever rising input costs thus lowering costs and increasing profits in the long run (KATC, 2007). Chongwe Organic Producers and Processors Association (CHOPPA) has been established to facilitate the production, packaging, distribution and marketing of organic products for domestic and export market. In the 2005/06 production season, CHOPPA mobilized over 90 farmers to grow at least a hectare of organic cotton (CHOPPA, 2007).

1.2 Problem Statement

A small scale farmer's concern is to maximize his returns in terms of profit from his investment. There is a general perception by both the promoters and the small scale farmers

in particular that organic cotton production would reduce production costs and hence increase profits in the long run. This perception has generally been due to the fact that organic cotton production rids the use of conventional pesticides, fertilizers, defoliants and herbicides. These are major sources of production costs in conventional cotton production in addition to labor. Organic cotton on the other hand generally yields lower per hectare compared to conventional cotton. (Swezey et al, 2006). This has an effect of increasing the average cost per unit of seed cotton. Organic cotton though having an advantage of excluding costs arising from pesticides, fertilizers, defoliants and herbicides, has been observed to be more labor intensive (Ho, 2002). This is due to labour intensive activities like preparation of compost manure, manure tea and integrated pest management.

In Zambia little has been done on organic cotton to establish its profitability. Desmarais of KATC demonstrated that cotton could be grown organically at yields up to more than twice the national average (Ho, 2005). He compared production costs and profitability of conventional cotton grown in the surrounding villages with organic cotton grown at the center. His results suggested that organic cotton was more profitable but had higher production costs. Gross margins, however, should only be compared with figures from farms with similar characteristics and production systems. With this reservation in mind, the comparisons can give a useful indication of the production and economic efficiency of an enterprise (Firth, 2002). Comparing the farmers mobilized by CHOPPA to grow organic cotton and others growing conventional cotton in the same locality would give a more realistic comparison.

Questions such as these need to be asked; (1) Would the elimination of insecticides, herbicides and fertilizers impact on the total cost of production, (2) Would the cost structure of each management strategy vary, and if so, how? (3) Would harvest parameters such as yield, and lint quality differ based on management strategy? (4) Would organically grown cotton be viable and competitive with conventional cotton?

1.3 Objectives

The research objectives are as presented below.

1.3.2 General Objective

The main aim of this research was to identify the most profitable technology between organic and conventional cotton for a small scale farmer in Chongwe area.

1.3.2 Specific Objectives

The specific objectives of the study included the following:

- To compare the cost structures per hectare of the two technologies.
- To compare the yields per hectare of the two technologies.
- To determine the most limiting production factor for each of the two technologies.
- Determine the profitability of organic cotton.

1.4 Rationale

There are two major issues of concern with regards to cotton production; the effect of the production process to the environment and the profitability of the crop. While there is need to protect the environment, there is also need to consider the profitability of an enterprise. Promoting the growing of organic cotton alone would not be sustainable as there needs to be an incentive of higher profit if farmers are to adopt this technology. Otherwise the environment would be protected, but the small scale farmers would grow poorer if the organic farming technology proves to be unprofitable. There is therefore, need to investigate the profitability of organic cotton so that the two issues are addressed side by side.

Labour is a very important input with regards to small scale farming. This is because various enterprises on a farm compete for this factor. A higher labour input for organic cotton for example, would have serious implications on the other enterprises like maize production. If this happens, it might have a negative effect on the national food security. Farmers need to be aware of this opportunity cost as they are encouraged to engage in organic cotton. With the world going back to organic agriculture, information has to be

searched so that producers make informed decisions on which direction to take that is, organic or conventional agriculture.

The data from the study provides information of high economic relevance. Cotton production in Zambia is characterized with high chemical application to control pests and diseases. Most of these chemical are imported from foreign countries. Economically, imports are a leakage and therefore reduce the national income. Organic cotton on the other hand uses on farm inputs and therefore, rids the importation of chemicals and fertilizers. This in it self would potentially increase national income since it would reduce imports. Further, if organic cotton proves to be profitable, this will increase the value of exports for Zambia consequently increasing national income. At household level, famers' incomes are expected to increase and hence improve the standards of living for the rural population.

1.5 Scope of the Study

The study was based on the small scale farmers of Chongwe district and therefore, its findings and discussions, conclusions and recommendations are based on the small scale farmers in Chongwe area. Any generalizations are limited to the small scale farmers with the same management level, soil type and the same climatic conditions.

Organic cotton is defined according to KATC, as farming without the use of any chemicals. Soil fertility is increased with organic matter and the control of pest is done through planting extra local plant species in the organic farming fields. Therefore, organic cotton is limited to the above definition for this study. According to this study, Conventional cotton is looked at as cotton grown with aid of chemicals. Specifically, it is limited to cotton grown under the Dunavant cotton arrangement, since most of the farmers in Chongwe area access conventional inputs from Dunavant cotton Ltd.

1.6 Structure of Report

This report is divided into five (5) chapters. The first chapter gives background information on organic and conventional cotton and further provides information on the problem

statement, the research objectives, scope of the study and the rationale of the study. The second chapter reviews relevant literature to the study on the background of organic farming, the definition of organic farming and the comparison of conventional and organic cotton with regards to studies conducted within and outside the country. The third chapter highlights the design and methodology that was used in the study. Included in this chapter is the information about the study area, types of data collected, size of the sample used, data collection and instruments used, the limitations of data collection and the analysis of the data. The fourth chapter is a discussion on the findings of the study with regards to the two technologies under scrutiny. The fifth and final chapter gives the conclusions and the recommendations of this study.

CHAPTER II

LITERATURE REVIEW

2.1 Introduction

In order to understand the two production methods, a brief history is given about the two technologies, key terminologies are defined and then literature is reviewed in order to have deep understanding of the existing knowledge relevant to the subject under review.

2.2 History

Organic agriculture is the oldest form of agriculture on earth. Farming without the use of petroleum-based chemicals (fertilizers and pesticides) was the sole option for farmers until post-World War II (WW II). The war brought with it technologies that were useful for agricultural production. For example, ammonium nitrate used for munitions during WW II evolved into ammonium nitrate fertilizer; organophosphate nerve gas production led to the development of powerful insecticides (Delate, 2000). These technical advances since WW II have resulted in significant economic benefits as well as environmental and social detriments. Organic agriculture seeks to utilize those advances which consistently yield benefits (new varieties of crops; precision agriculture technologies; more efficient machinery) while discarding those methods which have led to negative impacts on society and the environment, such as pesticide pollution and insect pest resistance. Instead of using synthetic fertilizers and pesticides, organic farmers utilize crop rotations, cover crops, and natural-based products to maintain or enhance soil fertility. These farmers rely on biological, cultural and physical methods to limit pest expansion and increase populations of beneficial insects on their farm. Because genetically-modified organisms (GMOs) constitute synthetic inputs and pose unknown risks, GMOs, such as herbicide-resistant seeds, plants, and product ingredients, like GM-lecithin, are disallowed in organic agriculture.

Consciously organic agriculture (as opposed to the agriculture of indigenous cultures, which always employs only organic means) began more or less simultaneously in Central

Europe and India. The British botanist Sir Albert Howard is often referred to as the father of modern organic agriculture. From 1905 to 1924, he worked as an agricultural adviser in Pusa, Belgal where he documented traditional Indian farming practices, and came to regard them as superior to his conventional agriculture science. His research and further development of these methods is recorded in his writings, notably, his 1940 book, The Agriculture Testament, which influenced many scientists and farmers of the day (Wikipedia free encyclopedia, 2007).

In Zambia, organic farming was formerly documented in the year 2000 upon inception of Organic Producers and Processors Association (OPPAZ). Before that, organic farming was practiced as sustainable agriculture mainly by big companies like Agriflora and also individual commercial farmers like Yolk Farm (GART, 2005). By 2005, organic cotton was not among the export crops for OPPAZ.

2.2 Definitions of Key Terms

This section provides definitions of the key concepts in this research. The key concepts includes the following; organic agriculture, organic cotton, conventional cotton, gross margin analysis and profits. The section also goes further to include the benefits of organic cotton.

2.2.1 Definition of Organic Agriculture

According to the Organic Cotton Production Manual for Zambia (2006), Organic farming is defined as a system of farming that works with nature as opposed to working against nature. This should involve using techniques to achieve good crop yields without harming either the environment or the people who live and work in it. According to the National Organic Standards Board (NOSB) (1997), organic agriculture is defined as an ecological production management system that promotes and enhances biodiversity, biological cycles, and soil biological activity. It is based on minimal use of off-farm inputs and on management practices that restore, maintain, or enhance ecological harmony. The primary goal of organic agriculture is to optimize the health and productivity of interdependent

communities of soil life, plants, animals and people (NOSB, 1997). The term "Organic" is defined by law, as opposed to the labels "natural" and "eco-friendly". In United States of America (USA) for example, the Organic Food Production Act (OFPA) was passed in 1990. The OFPA requires that anyone selling products as "organic" must follow a set of *prescribed practices that include avoidance of synthetic chemicals in crop and livestock* production, and in the manufacturing of processed products (Delate, 2000). Natural products on the contrary may employ organic methods in production of the foodstuff, but do not guarantee complete adherence to organic practices as defined by law.

By definition organic cotton growing involves no chemical pesticides, fertilizers or defoliants. Instead, organic solutions are met by using compost, manure, naturally derived minerals and crop rotation to keep land fertile. Insect control involves the use of beneficial insects and natural pesticides certified for organic crops. Naturally colored cotton has been bred to be self-colored and therefore requiring no dyes. (Earthrunnings, 2003).

2.2.2 Benefits of Organic Cotton

A question may be asked on the potential benefits of farming organically which would encourage farmers to start farming organically. The following are the benefits of growing organic cotton as articulated in the Organic cotton production Manual of Zambia.

- Organic farming is sustainable economically, socially and environmentally;
- It improves soil fertility;
- It improves soil structure ;
- It reduces input costs;
- The risks to the farmers' health from pesticides poisoning is reduced or eliminated;
- Yields should increase;
- Increases crop and income diversity and;
- Organic premiums may be available.

As cotton is a low value cash crop, reduced input costs and higher yields will be of obvious benefit to the farmer. Currently, there is an increasing demand for organic cotton

worldwide and if farmers start converting to organic methods now they will be able to benefit from the growth of this market.

2.2.3 Definition of Conventional Agriculture

Conventional farming can generally be defined as common or traditional agricultural practices featuring heavy reliance on chemical and energy inputs typical of large-scale, mechanized farms to alternative agriculture or sustainable agriculture practices. Mold-board ploughing to cover stubble, routine pesticide spraying, and use of synthetic fertilizers are examples of conventional practices that contrast to alternative practices such as no-till, integrated pest management, and use of animal and green manures.

Conventional cotton therefore refers to cotton grown with the aid of chemical, Conventional cotton textile manufacturing involves bleaches, formaldehyde and other chemical finishes

2.2.4 Definition of Profit

The economic definition of profit is the difference between revenue and the opportunity cost of all resources used to produce the items sold. In this research however, profit will be mainly compared in terms of gross margins, that is; total revenue minus variable cost. In a production process, profits can be maximized by; reducing cost holding revenue constant, increasing the revenue holding the cost constant or by increasing revenue and reducing the cost.

2.2.5 Definition of Gross Margin

A gross margin for an enterprise is its financial output minus its variable costs (Firth, 2002). The gross margin per hectare or per head for crops and livestock can be compared with standards (published averages of what might be typically possible in average conditions) obtained from other farms. Gross margins, however, should only be compared with figures from farms with similar characteristics and production systems (Firth, 2002).

With this reservation in mind, the comparison can give a useful indication of the production and economic efficiency of an enterprise. In organic systems gross margins are also useful for farm planning and for making comparisons of enterprises, on the same farm, between organic holdings, or between conventional and organic enterprises (Lampkin, 2001).

There are, however, some important limitations to the use of gross margins in organic systems. Firth (2002), noted that comparison of gross margins between enterprises with different, fixed cost structures can be misleading, particularly when conventional variable costs have been substituted by fixed costs in the organic context. For example weed control by herbicides replaced by mechanical weeding. He also noted that it is often inappropriate to consider the economics of a single enterprise, such as organic vegetables, outside the context of the whole farm rotation, which will often include fertility building crops. This phase of the rotation may be considered a part of the costs of achieving high returns for different organic crop such as potatoes or carrots. Also certain inputs applied on a rotational basis with residual effects on subsequent crops such as organic manures need to have their costs spread over the whole rotation. It is unrealistic to expect their costs to be carried by the individual enterprises to which they were first applied. The economics of any rotation is largely tied up with three types of relationships, between the different enterprises. They can be either complementary, competitive or supplementary (Barnard and Nix, 1979). Complementary enterprises assist one another, for example a break crop, such as peas, might rest the land, improve the structure and fertility of the soil. The second relationship is competitive, for example two crops in a rotation compete for the same nutrients. The final relationship is supplementary, where increased production of one crop or enterprise has no effect at all on the production of another e.g. making use of slack labor.

2.3 Review of Previous Research Reports

This section reviews the findings of other researches done to compare conventional and organic cotton with regards to the variables outlined in the objectives (costs, profits, limiting factors and yields). Specifically, the KATC results are compared with the results established from India and the USA.

2.3.1 Costs Structure per Hectare

McWilliams in his address at the 2007 Belt wide Cotton Conferences in New Orleans noted that elimination of some conventional inputs was expected to lower the cost of production per acre for organic cotton, but this would not necessarily lower cost of production per pound of lint (Industry Watch, 2007). He also noted that, organic weed control practices, such as hand-hoeing, flaming or even additional early tillage tend to increase costs of production in organic cotton. Raj et al (2004), in their study of organic verses conventional cotton established a lower cost of pest control in organic cotton (about US $ 5per acre, 5% of total production costs of organic cultivation) as opposed to conventional cotton (US $ 37 per acre, 30% of total production costs of conventional cultivation). They attributed the lower pest control costs in organic cotton to the fact that pest control in organic cotton was based on prevention rather than cure. There was no significant difference between the costs of fertilizers between organic and conventional farms. On the other hand, cost of ploughing (primary and secondary) was found to be significantly higher in organic farms. The report was however, silent of the cost of labour.

Swezey et al (2006) compared organic, conventional and Integrated Pest Management (IPM) cotton production systems in Northern San Joaquin Valley, California. Their results over a six year period reviewed that production costs per bale were on average 37% higher for organic than for conventional cotton. This cost differential was primarily due to greater hand-weeding costs in organic cotton compared to either IPM or conventional cotton. However, the costs of production per hectare were not statistically different, being only 5 and 3% higher for organic and IPM fields respectively, when compared with conventional fields ($P>0.05$). Operational differences included higher costs for labor (hand weeding crews and cultivation), custom applications (compost manure and sulfur) and harvest field power (increased harvest time and effort) in organic fields and higher materials costs (synthetic insecticides) in conventional fields (Swezey et al, 2006). KATC established higher costs of production in organic cotton. The total input cost in organic cotton was ZMK 235,617 compared to ZMK 178,250 in conventional cotton. The comparison was

done on a lima (0.25 hectares). He attributed the higher production costs in organic cotton to the labour intensive nature of the technology.

The different results recorded may be as a result of location differences. As McWilliams (2007) noted, location of production seem to have an impact on the cost structure of the two technologies, but unfortunately no authentic data are available to compare cost of production of organic cotton versus conventional production (Industry Watch, 2007).

2.3.2 Yields per Hectare

Desmarais (2005), of KATC demonstrated that organic cotton could be grown at yields twice than the national average of conventional cotton. Organic cotton at KATC demonstration plots yielded 1436kg/ha of seedcotton compared to the conventional cotton national averages of 600kg/ha according to the Zambian government and 653kg/ha according to the cotton company Dunavant. This comparison was based on the yields for the 2003/04 farming season. Raj et al (2004), found similar results in India. Organic cotton yielded on par at 232 Kg seed cotton /acre against conventional cotton at 105 Kg/acre. Desmarais organic cotton yields would be criticized for not being smallholder farmer based. Unlike KATC results, the research in India compared both technologies under village settings. These results however, are also questionable because they were collected during a very bad cotton season (Raj et at 2004). The results of these two reports seem to be in conflict with the results found in Northern San Joaquin Valley, California. Swezey et al, (2006) results indicated a higher yield of 6.7 bales per hectare for conventional cotton compared to 4.4 bales per hectare for organic cotton. McWilliams noted lower yields to be one of the expected challenges in the organic cotton farming.

2.3.3 Limiting Factors

In a case study carried out in Asia on the characteristics of organic production and markets, it was established that organic farming generally requires 30% more labour than conventional farming. Desmarais (2005) of KATC established a higher labour input in organic cotton compared to conventional cotton. Similar results are recorded by Swezey et

al (2006). In most rural areas however, labour availability is not a limiting factor. But in areas where this is a constraint, organic methods can be at a disadvantage since most farm households have labour opportunity costs. The labour component can be perceived as a way of adding value at the local level to a crop, rather than using purchased inputs for the job that accrue value elsewhere.

A research by the Ministry of Agriculture and Forestry to establish the limiting factors to organic industry in New Zealand, reviewed the following production factors to be constraints to the growth in the organic industry;

- Organic products have a higher cost of production often due to more costly technical solutions to pest, disease and weed management problems. As such growers are often reluctant to risk their financial resources especially with low understanding of the technical complexities involved in production;
- Like conventional farming, organic farming is constrained by the effects of vertebrate and invertebrate pests and weeds. These become limiting on organic farms where conventional control measures are not available;
- Lack of research data on real farm system performance. This leads to low level of scientific justification for methods used by organic farmers. Lack of research also makes it difficult for farmers to access information on organic production. Consequently, farmers are reluctant to engage in what they do not know;
- Inadequate or perceived inadequate financial returns from organic products needed to offset the lower level of performance. This is because it is not always possible to achieve premium prices due to low quality products. Consumers are reluctant to accept low quality products even if they are labeled organic.

2.3.4 Profitability

Organic farming has proved to be more profitable than conventional farming in most cases. The profitability of organic farming is most often attributed to the high market prices of organic products rather than production costs. Organic premiums range from 20% to 400% above conventional prices, depending on season and availability of product (Delate, 2000).

Raj et al, (2004) found organic cotton to be more profitable with a profit of approximately US $ 13/ acre compared to minus US$ 30 in conventional cotton. Desmarais (2005) also established a higher profit in organic cotton. The profit from organic cotton was ZMK 381,823 compared with ZMK 189 020 in conventional cotton.

Higher production costs, coupled with lower yields, establish an economic necessity for a price premium for organic cotton. From 1999 to 2004, there was a 78% reduction in California certified organic cotton hectares. This was attributed to the lower prices that did not offer any incentives for organic cotton growers. (Swezey et al, 2006).

CHAPTER III

RESEARCH METHODOLOGY

3.1 Introduction

This chapter outlines the methods and procedures used to achieve the stated goals. It gives information on the study sites, data collection and data analysis tools that were used in the study and lastly highlights the study limitations.

3.2 Area of Study

This research was conducted in Chongwe district which is located 31Km East of Lusaka. Chongwe is in Lusaka province. The respondents were small scale farmers. This area was selected because currently it is among the few areas in Zambia where organic farming particularly organic cotton has been introduced. This area also has many farmers that have been trained in organic farming methods by KATC, which is also located in the same district. When KATC developed the technologies on organic farming, CHOPPA an organization in the same area adapted the technologies to the small-scale farmers' production systems. In the 2005/06 growing season CHOPPA mobilized over 90 farmers to grow at least a hectare of organic cotton. With this information, the study was best suited for this area.

3.3 Research Design

A case study was used under non experimental research design. This was a study aimed at comparing the profitability of conventional and organic cotton.

3.4 Study Population and Sampling Procedure

The study population was composed of small scale farmers who grow organic cotton and these were members of CHOPPA. The farmers also grow other crops like maize which is a major crop and groundnuts. A sample of 53 organic cotton farmers out of a sampling frame

of 94 was randomly selected using simple random sampling. The sampling frame was obtained from CHOPPA.

3.5 Data Sources and Collection Techniques

Both secondary and primary data was collected. Primary data was collected from farmers using structured questionnaires and also unstructured interviews were conducted with project implementers. This improved the accuracy of the data collected as the literacy of the population under study was quite low. Data on the sample characteristics was collected from CHOPPA since they are major promoters of organic cotton, and also KATC being the technical specialists.

Since only organic cotton growers were interviewed, secondary data from CHOPPA and KATC was used for information on conventional cotton. Qualitative data such as factors limiting conventional cotton production was obtained from the organic cotton producers since most of them had knowledge on and/or had produced conventional cotton before.

The gross margin budget for conventional cotton was obtained from KATC and this was compared with that for organic cotton as established in the study. In most cases farmers failed to quantify some costs and revenues. In this case the standards established by KATC were used. For example, the produce from interplants is rarely marketed but usually consumed as it is harvested. As such, farmers failed to give estimates of revenues from the interplant crops as they did not account for it. For this reason, estimates from the KATC standard organic cotton budget were used. Information on prices and quantities of cotton and interplant seeds used in production was obtained from the individual farmers' loan statements obtained from CHOPPA (refer to appendix 4 for a typical loan statement issued by CHOPPA).

3.6 Data Analysis

The computer software Microsoft excels and statistical package for social sciences (SPSS) were used for data analysis. Descriptive statistics were generated through SPSS and

Microsoft excel was used to analyse quantitative data. The tool that was used to compare the profitability of the two technologies was gross margin analysis.

3.7 Limitations to Data Collection

There were a number of limitations in the collection of data for this research. Firstly, the resource constraints restricted the sample to only organic farmers deviating from the intended stratified sample of half conventional and half organic cotton farmers. The farmers are far spaced apart especially those contracted by CHOPPA to grow organic cotton. With limited resources, it was impossible to cover a larger sample. In addition the only people who had knowledge of the location of the organic cotton farmers were the project implementers themselves. This made it very difficult to carryout the research independently. This may also have potentially led to bias in the data collected as most farmers would not respond objectively in the presence of project implementers.

The research would also prove more meaningful if carried out over a number of farming seasons. Data from one farming seasons would not give a true representation of the facts. Different farming seasons are affected by different factors such as amount of rainfall, drought, and any other climatic factors. Other factors such as the soil types in different locations need to be assessed.

Lastly, one of the major limitations to data collection was the fact that the farmers could not give quantitative information. It was difficult to obtain such information as input costs as farmers failed to recall how much they had spent on these. This was made worse by the fact that most organic inputs are obtained within the farm setting. For example manure may have been collected from the farmer's kraal rather than buying. This made it difficult to cost such inputs accurately.

CHAPTER IV

RESEARCH FINDINGS AND DISCUSSION

4.1 Introduction

The chapter highlights the findings and discussion on the various aspects of the research. It starts with the description of the demographic features of the respondents under which sex distribution, age distribution and the education levels are discussed. It goes on to discuss the respondents agricultural data under which the size of farms, the land cultivated and the farming systems are discussed. The chapter proceeds with a discussion on the farmers participation in organic cotton production, their knowledge, reasons of growing organic cotton and the perceived advantages and disadvantages of growing organic cotton. The limiting factors to the production of organic cotton are discussed and lastly, a comparison of the costs and profits is made using the gross margin analysis.

4.2 Demographic Characteristics

This section details the demographic characteristics of the respondents. The demographic information to be highlighted include; the sex distribution, the age distribution and the distribution of the level of education.

4.2.1 Sex of Respondents

The sex distribution shows that 69.8% of the respondents were male and 30.2% were female. This clearly shows that more male than female were interviewed. This also reflects the low participation of women in rural projects. In the 2005/06 farming season, only about 21 women against 71 men took part in the organic farming project. This may be attributed to the labour intensive nature of the technology. However, this reason may not suffice because this was the first time the technology was being introduced to the small scale farmers and hence they may not have known anything about its labour intensive nature. One other possible explanation to male dominance in the project could be explained by the type of crop (whether food crop or cash crop) under consideration. It is believed and

actually observed that women usually focus on their families' food security and as such are more inclined or concerned with growing food crops like groundnuts, pumpkin (for pumpkin leaves), cowpeas and maize. Men on the other hand tend to focus more on the cash crops like cotton and sunflower which offer financial security.

Table 1: Sex Distribution of Respondents

Sex	Number	Percent
Male	37	69.8
Female	16	30.2
Total	**53**	**100.0**

Source: Own Survey Data, 2007

4.2.2 Age Distribution of Respondents

The age of respondents ranged from 31 to 49 years. Most of the respondents (39.6%) were aged between 46-50 years. Farmers between 31-35 years were 24.5% while those between 36-40 years were 26.4%. The sample had a mean age of 40.19 with standard deviation of 5.837. This means that most of the respondents were about 40 years of age. This indicates that there were fewer youths involved in the project. The likely explanation for this is the fact that younger people or youths prefer to get into formal employment or in other businesses were they are guaranteed of cash quickly. Farming has a connotation of being the 'old mans job' especially those that have retired from employment to settle in the rural areas. The research further reviewed that most farmers are involved in other non farming activities such as charcoal burning (27.5%), bricklaying (8.7%) and plumbing (6.9%). Most of them (56.9%) are involved in production of organic vegetables which are sold to supermarkets under CHOPPA. About 88.7% of the farmers have been farming throughout their lives despite them being involved in other non farming activities such as those mentioned above.

Table 2: Age Distribution of Respondents

Age group (Years)	Number	Percent
31-35	13	24.5
36-40	14	26.4
41-45	0	0
46-50	21	39.6
Total	48	90.6
Missing	5	9.4
Total	**53**	**100.0**

Source: Own Survey Data, 2007

4.2.3 Education Levels

According to the table below, the majority (64%) of the respondents had attended secondary school, 28.3% attended primary school and only 7.5% attained higher education mainly in certificate courses such as teaching and agriculture. It was noticed that CHOPPA had deliberately selected people with some level of education. This was perhaps to ease their work on an assumption that people with higher education would be able to understand the technicalities of organic farming more easily.

Table 3: Table Showing Level of Education of Respondents

Education Levels	Number	Percent
Attended Primary	15	28.3
Attended Secondary	34	64.2
Attended College/University	4	7.5
Total	**53**	**100.0**

Source: own Survey Data, 2007

4.3 Agricultural Data

This section provides background information pertaining to the respondents' farming activities. The farming background includes information on the crops cultivated, the size of the farms and the size of the farm actually cultivated.

4.3.1 Farm Size and Land Cultivated

All the farmers interviewed own farm land under traditional customarily law. From table 4 below, it can be noted that most of the farmers interviewed had farms of between 6-10 hectares (60.4%). About 22.6% of the farmers had farms between 1-5 hectares and 15.1%

had farms between 11-15 hectares. Only 1.9% of the farmers had farmers more than 16 hectares. The farmer with the biggest farm had 26 hectares of farm land and the one with smallest farm owned 2 hectares. The average farm size was 8.37 hectares with a standard deviation of 4.14 hectares.

Table 4: Respondents Farm Size

Farm Size (Hectares)	Number	Percent
1-5	12	22.6
6-10	32	60.4
11-15	8	15.1
Above 16	1	1.9
Total	**53**	**100.0**

Source: Own Survey Data, 2007

Most farmers (67.9%) cultivated only 2-4 hectares of the farm. Those who cultivated between 1-2 hectares were 9.4%, between 5-6 hectares were 7.5% and those who cultivated between 7 -8 hectares were 15.1%. The average land cultivated by each farmer was 4.3 hectares with a standard deviation of 1.39 hectares. The minimum land cultivated was 2 hectares while the maximum was 7 hectares.

Table 5: Land Cultivated by Respondents

Land Cultivated (Hectares)	Number	Percent
1-2	5	9.4
2-4	36	67.9
5-6	4	7.5
7-8	8	15.1
Total	**53**	**100.0**

Source: Own Survey Data, 2007

4.3.2 Farming System

The small scale farmers practice mixed farming that is, producing livestock and crops. The crops grown include maize which is the staple crop, beans, velvet beans and groundnuts. Of the farmers interviewed, 96.2% kept livestock such as cattle, chicken, goats and pigs. Only 3.8% of the farmers did not keep any livestock. Of the livestock kept, chickens and goats

are the most prominent. Farmers mostly own cattle just enough for use in ploughing and in some cases do not own any cattle. Table 5 shows that of the farmers interviewed, 28.3% did not own any oxen, 32.1% had cattle between 1-5, and 20.8% had 6-10 cattle, 15.1 % owned between 11 -15 herds of cattle while only 3.8% had cattle between 15-20. On average, each famer owns about 6 heads of cattle. From this information, it can be noted that most farmers keep cattle just enough for use as draught power.

Table 6: Cattle Owned by the Respondents

Number of Cattle	Number	Percent
0	15	28.3
1-5	17	32.1
6-10	11	20.8
11-15	8	15.1
15-20	2	3.8
Total	**53**	**100.0**

Source: Own Survey Data, 2007

The quantities of chickens owned by farmers are tabulated in table 6 below. The table shows that 9.4% of the farmers owned chickens between 0-10, 24.5% had chickens between 11-20, 20.8% between 21-31, 22.6 between 31-40, 1.9% between 41- 50 and 20.8% had chickens above 51 chickens.

Table 7: Number Chickens Owned by Respondents.

Number of chickens	Number	Percentage
0-10	5	9.4
11-20	13	24.5
21-30	11	20.8
31-40	12	22.6
41-50	1	1.9
Above 51	11	20.8
Total	**53**	**100.0**

Source: Own Survey Data, 2007

Livestock especially cattle and chickens are very important for organic farming because their droppings provide manure which is a major input in organic farming. Farmers who do not own livestock (cattle and Chickens) find organic farming more expensive as they have to buy manure from the neighboring farms. A "soup" made from fermented chicken

droppings is used as top dressing in organic cotton fields. This "soup" is made by fermenting a 50Kg half full of chicken droppings in 200lts of water for 14 days. The concentrated soup is then diluted 1 part to 3 parts water and then applied to the field. The soup is also called compost tea (refer to appendix 2 for details on the timing of application of the soup). The recommended application rate for the diluted soup is 800lts/ ha which is applied on a weekly basis from week 3 to week 15 from the date the crop is planted. It can therefore be observed that the number of chickens owned by most farmers does not provide adequate manure for organic production. Cattle manure is usually applied to the organic fields one month to two weeks before planting. The recommended application rate is 6-10ton/ha of manure (refer to appendix 2 for more information on timing and application rates of manure). According to Shaffer and Walls (2005), an 800kg beef animal provides 12.7 lb/day of manure (about 0.00635ton/day of feces and urine) in an unpaved feedlot. The annual accumulation rate of cattle manure in an unpaved feedlot is therefore 2.2ton/year/head. Taking the average herd size of 6 cattle in Chongwe area, each farmer would accumulate 13.2 tones/year of manure in an unpaved feedlot. However, farmers in this area do rarely keep cattle in feedlots. Instead, cattle is kept under extensive management were it is allowed free grazing. With this management system, the accumulation rate of manure is very low since cattle only spent a fraction of the day in confinement (usually just at night in the kraal). It is very unlikely for farmers in this area to accumulate enough manure to meet the recommended application rate of 6-10ton/ha for organic cotton production. Most farmers interviewed lamented on not having enough cattle to provide enough manure for the production requirements. It was for this reason that CHOPPA provided loans to farmers so that they could access the commodity from other farmers (especially conventional farmers) who had little or no use for it.

4.4 Participation in Growing Organic Cotton

This section contains information relating to the respondents knowledge about organic cotton, the amount of land they allocated to the production of organic cotton and their reasons for growing organic cotton.

4.4.1 Knowledge about Organic Cotton

All the respondents had the knowledge about organic cotton since all those interviewed were members of CHOPPA. The table below shows that 78% of respondents first heard about organic cotton from KATC, 17.3% from CHOPPA, 1.9% from friend and another 1.9% from OPPAZ. All of the respondents had been trained in organic cotton production by KATC and all of them produced cotton under organic technology in the 2005/06 season. This indicates that the respondents had some basic knowledge about the organic cotton technology prior to production. They had been educated on the potential advantages and perhaps disadvantages of the technology from the trainings they attended. Therefore, it would be safe to say that famers made well informed decisions concerning their participation in the project.

Table 8: Where Respondents First Heard about Organic Cotton

Where respondent heard first heard about Organic cotton	Number	Percent
OPPAZ	1	1.9
KATC	41	77.4
CHOPPA	9	17.0
Friends	1	1.9
No answer	1	1.9
Total	**53**	**100.0**

Source: Own Survey Data, 2007

4.4.2 Reasons for Growing Organic Cotton

Farmers had divergent views concerning the reasons for growing organic cotton. The majority (50.9%) thought organic cotton was cheaper to produce, 17% produced organic cotton because the technology uses readily available inputs (on-farm inputs), 26.4% thought conventional inputs were expensive and 3% just wanted to try out new methods of producing cotton. From the reasons given, it could be seen that farmers were optimistic about a technology that was to lower their production costs and consequently increase their profits. They believed organic cotton would increase their profit margins and improve their general livelihood.

Table 9: Table showing Farmers Reasons for Growing Organic Cotton

Reason for Growing Organic Cotton	Number	Percent
Availability of Inputs	9	17.0
Cheaper to Produce	27	50.9
Conventional Inputs are Expensive	14	26.4
Try Other Methods of Production	3	5.7
Total	**53**	**100.0**

Source: Own Survey Data, 2007

4.4.2 Perceived Advantages and Disadvantaged of Growing Organic Cotton

The advantages articulated by the respondents for growing organic cotton under CHOPPA are listed below in order of importance.

- The opportunity to access loans which include cash for paying hired labour, drums for making tea manure, cash to purchase manure and knap sack sprayers;
- Low input cost;
- The use of on-farm inputs which were readily available;
- Organic cotton technology is friendly to the farmers and also to the environment due to the fact that there is no use of toxic chemicals;
- Organic cotton is believed to weigh more per unit volume compared to conventional cotton and;
- Sustainable use of natural resources.

From the advantages articulated by the farmers, it was observed that most of the information that farmers were giving was not as experienced from growing organic cotton, but as given from the trainings farmers attended on organic cotton production. Most often, farmers gave technical information that could easily be traced to the information as given by the project implementers and as articulated in training manuals. From this, it could be said that the project implementers and KATC are making the much desired progress in as far as diffusing the technical information on organic cotton production is concerned. However, this was a demerit to the study because farmers failed to give true information on their experience during the production process. For example very obvious disadvantages

such as low yields experienced were never mentioned, maybe for fear of victimization. Instead they took the research questions as a platform to display what they had leant and not what they were experiencing. This did not give a true picture of the technology as experienced in the field.

One advantage that came out more pronounced was that of receiving cash loans to pay for hired labour, cash loans for manure purchase, drams and knapsack sprayers. Mr. Tembo the project coordinator acknowledged the fact that loans were a motivating factor for farmers continued participation in the project. Whether the famers used the loans (especially the cash loans) for the intended use is another factor to consider.

From the advantages gathered, the second, third, fifth and sixth advantages coincide with those mentioned in the Zambia Organic Cotton Production Manual.
The only disadvantage farmers mentioned concerning growing of organic cotton was that of the technology being labour intensive

4.5 Limiting Factors in Organic and Conventional Cotton Production

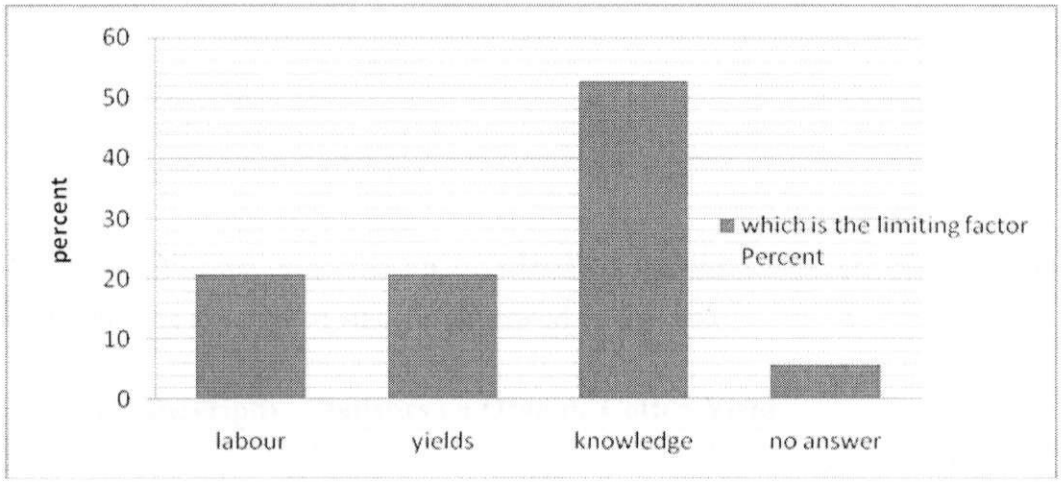
This section provides information on the factors limiting the production of organic and conventional cotton.

4.5.1 Factors Limiting Organic Cotton Production

The level of knowledge was diagnosed the most limiting factor to organic cotton production (52.8%) followed by labour and yields which recorded the same (20.8%). Farmers lamented that they were still lacking knowledge on the technicalities of organic cotton production. As a matter of fact, even the project implementers themselves attested to the fact that they were still in the process of learning the complexities of organic production. Labour was also limiting production of organic cotton. Most farmers had to obtain loans from CHOPPA to engage hired labour. It seems the assumption of zero opportunity cost for labour in Chongwe area did not hold. This may be explained by the fact that Chongwe is closer to Lusaka city and hence the alternative uses for labour may be

vast. People in the area can find alternative employment in the nearby city or engage in other activities that they may consider more productive than farming. Yields limited organic cotton production in that the volume of production and consequently the value of production was not able to break even. Most farmers dropped out of the project due to the very bad yields they experienced the previous season. About 26 famers dropped out of the project.

Figure 1: Bar Chart showing Limiting Factors to Organic Cotton



Source: Own Survey Data, 2007

The results are consistent with those established by the Ministry of Agriculture and Forestry in New Zealand, where knowledge was established as one of the limiting factors to the growth of the organic industry. The results are also consistent with the KATC where labour is established to be a limiting factor to organic cotton production.

4.5.2 Factors Limiting Conventional Cotton Production.

The most limiting factor to conventional cotton production was established to be the high cost of synthetic inputs. Of the farmers interviewed, 92.5% confirmed that the cost of synthetic inputs hindered them in participation in the production of conventional cotton. Most farmers complained that even with the reduced producer price for seed cotton, the

by the individual farmers. It may also be due to the differences in the type of soils for the different locations. Generally, the yields were discouragingly very low for most of the farmers.

The average yields for the small scale farmers growing conventional cotton was 1024kgs of seed cotton per hectare. A great disparity is observed when these yields are compared with those for the small scale farmers growing organic cotton. Conventional cotton had comparably higher yields than organic cotton. On the other hand the average yields at the KATC organic cotton experimental plots and trials around the villages were 1,314Kgs of seed cotton per hectare. A number of factors were attributed to the low yields experienced in the organic fields of the small scale farmers. The project implementers explained the following factors as the causes of the low yields:

- One (1) hectare was too big an area for a single farmer to manage especially that the farmers are also involved in the production of other crops. The effort went to maize production neglecting the production of cotton;
- Selection of farms was not properly done. There was no consideration of the differences in soil types in different locations;
- There was too much rain in that particular farming season. This affected the crop;
- The crop was attacked by bore worms and since organic farming relies on prevention and rather than cure, worms had a very big impact on the crop;
- Farmers were still learning the management of organic cotton.

In order to improve the performance of the crop the following season, the project put up the following mitigation measures.

- The hectares were reduced to that which was believed to be manageable by farmers. During the 2006/07 farming season, the farmer were allowed to cultivate only two(2) limas (about half a hectare) of organic cotton;
- Measures were put up to increase the management levels;
- Prevention was emphasized rather than cure in pest management.

Despite the mitigation measures, the yields for the 2007/08 season were described worse than those of the previous farming season. Though no figures were given yet, Mr. Tembo the coordinator simply described the yields as worse than those from the previous season. Potential explanations may be the drop out of some participants. A number of farmers who took part in the growing of organic cotton in 2005/06 farming season were not willing to continue with the technology in the following season. This was because they had recorded loses from the previous year and were reluctant to commit their resources in a technology they felt did not work. This meant that the project had to recruit new members which in turn meant introduction of less experienced farmers in the project. With the low yield experienced in the 2006/07 season, the trend is likely to continue.

It is important to note that the results established in this research are in conflict with those established at KATC and those established in India. The results are however consistent with those established in the six years comparison of organic and conventional cotton in USA. The results from USA would be considered the most reliable because they compared the technologies for a longer period of time unlike the results from in India or indeed this research which are only based on data from one season.

4.7 Gross Margin Analysis

This section highlights the gross margin budget for conventional cotton as constructed by KATC for a typical small scale farmer in Chongwe District. It also highlights the gross margin budget for organic cotton of a typical small scale farmer in Chongwe district. A discussion on the comparison of profit and the cost structure of the two is then given.

4.7.1 Comparison of Gross Margins between Organic and Conventional Cotton

Table 8 above shows the gross margin budgets for conventional and organic cotton at small scale farm level. The conventional cotton budget is as presented by KATC while the organic budget was derived from the average costs and revenues from individual organic cotton farms. The costs that could not be measured in the field were obtained from the standard budget prepared by KATC on organic cotton

Table 11: Gross Margin Budgets for Organic and Conventional Cotton

Item	Conventional cotton		Organic cotton	
	Quantity	Amount (K)	Quantity	Amount (K)
Revenue				
Cotton	1,024.0 kg	921 600	140.8kgs	164,736
Okra	10kg	15,000	12 kg	18 000
Cowpeas			40 kg	72 000
Maize			388kg	279,360
Sorghum			200kg	100 000
Sunflower			20kg	32 000
Total revenue		**936, 600**		**666,096**
Inputs				
Land Preparation				
Ripping		11000		11,000
Marking Lines		66,000		66,000
Planting:				
Cottonseed	12.0kg	21,000	10kg	17,500
Interplants Seeds				
Mustard			0.4kgs	24 000
Marigold			0.1kgs	1 000
Maize			2kgs	10 000
Sorghum			1kgs	1 500
Cowpeas			2kgs	8 000
Okra	0.5kg	20,000	0.5kgs	20 000
Sunflower			1kg	1 000
Sun hemp			5kgs	25 000
Planting Labour		33,000		40000
Hand Weeding		66,000		66,000
Crop Nutrition:				
Compost + teas				400,000
Scouting		128,000		128,000
Solubor		30,000		
Chemicals		120,000		
Spraying Labour		33,000		
Harvesting Labour		198,000		198,000
Total input cost		**726,000**		**1,017,000**
Gross margin		**210,600**		**(350,904)**

Source: Conventional Budget –ISIS (2005); Organic Cotton Budget-Own Data Survey, 2007

The budget shows that conventional cotton was more profitable at small scale farm level with a profit of ZMK 210,600 compared to organic cotton with a loss of ZMK 350, 904. Conventional cotton had a total input cost of ZMK 726,000 compared to organic cotton of ZMK 1, 017,000. At this particular time (2005/06 farming season) the average price of cotton on the market was about ZMK 900. During this year, farmers complained bitterly about the low prices of cotton that were offered by the buyers. The price was affected by the rapid appreciation of the Kwacha against the United States dollar. Organic cotton however, was promised a premium of 30% over the conventional price. Therefore, the price that was faced by the organic cotton growers was ZMK1170. CHOPPA however bought the cotton at a price of ZMK 1, 250 as a way of motivating the farmers to continue producing organic cotton.

It is important to note that the revenue section of the organic budget was more diverse than that of the conventional cotton. It included revenue form other interplant crops including maize, okra, cowpeas, sorghum, and sunflower. In comparison to that for conventional cotton, the only interplant was okra. The total contribution of the revenue from the interplants was ZMK 501,360 which represents 75.2% of the total revenue. This is quite a significant proportion of the revenue and may account for the disparity in the profitability of the two technologies. It confirms the advantage of income diversity as highlighted in the organic cotton production manual. In the case for conventional cotton, the revenue section only consisted of the sales from the seed cotton and okra. The contribution of okra was however insignificant.

However, farmers seldom recognize the revenue from the interplant crops. Most often, the produce from the interplants is directly consumed by the farmers and rarely marketed. For this reason, revenue from interplants does not accrue as cash to farmers. The other noticeable feature about the organic cotton budget is the cost of interplant seeds. The cost of interplant seeds was ZMK 90 500. This cost is expected to reduce or get eliminated with progress of the project because farmers will be able to use the seeds harvested from the previous season.

It was difficult to calculate the cost of labour. Farmers obtained loans for hired labour but it is not clear how the cash loans were used. Most often farmers used the loans for other activities that were not even related to the production activities. The cash loans for manure were however used for the intended purpose. Farmers who do not own cattle have to buy manure from other neighboring farms.

4.7.2 Comparison of Cost Structure per Hectare

The cost of production for organic cotton was 40% higher than that for conventional cotton. The input costs for the organic plots were higher due to the extra labour and costs of preparing composts and manure teas. In terms of pest control, the organic cotton had a lower cost of ZMK 137, 500. This cost includes the cost of interplants crops seeds and scouting. The total cost of pest management in conventional crop was ZMK 281, 000 (this includes the cost of spraying, the cost of chemicals, and scouting costs). This basically shows that pest control was higher for conventional cotton by 51% compared to that of organic. Pest control in organic fields relies on prevention of pest infestation rather than cure. It is important to note that keeping the crop in a health state all the time is also part of pest management. A health crop can with stand the effects of the pests. Fertilizing costs were also higher for organic cotton due to the higher cost of purchasing manure and making compost tea. In the case were a farmer owns enough livestock (cattle and chickens) to provide the recommended amounts of manure as highlighted in section 4.3.2, these cost are likely to reduce to labour costs only.

The results are consistent with the findings in India, where pest control was higher for conventional than organic cotton by 5%. The results are also in unison with those established in USA where organic cotton had 37% higher production cost per bale than conventional cotton. Futher, the results are also consistent with those for KATC where organic cotton had a higher production costs than conventional cotton.

CHAPTER V

CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter highlights the conclusions and recommendations from the study. It is important to note that the conclusions and recommendations are based on the farmers in Chongwe District. Any generalization should be restricted to farmers in Chongwe district who are operating at small-scale level.

5.2 Conclusion

This short study to compare the profitability of organic and conventional cotton was a worthwhile endeavor. It provides in-depth information on the current status of organic and conventional cotton technologies specifically with regards to their profitability. In particular, the organic cotton technology was explored and its potential as a source of income for the rural poor examined. The research established that at present, the organic cotton technology is less profitable than the conventional cotton technology.

A profit of ZMK 210,600 was established for the conventional technology and a loss of ZMK 350,904 was established for the organic cotton. The low yields highly lowered the revenue side of the organic cotton budget. An average yield of 140.8Kgs per hectare was established in organic fields. The cost of production for organic cotton was on average 40% higher than that of convention cotton. This futher increased the loss recorded for organic cotton.

The level of knowledge was established as the most limiting factor to the organic cotton technology. This is due to the fact that organic cotton is relatively a new technology and hence it is expected that the level of knowledge would be low. Labor was also established as a limiting factor to this technology. The cost structure reflects a higher nutritional labour input in organic fields compared to the organic fields. However, the fertilizing costs are lower for farmers who own livestock especially cattle.

The negative profit does not imply that the organic cotton technology is not viable. Rather it is an indication that more needs to be done to improve the profitability of the technology. It is also important to note that the levels of knowledge among the farmer are still low. As farmers continue to grow organic cotton, their knowledge and experience in the technology is bound to increase and hence the yields are bound to increase. Further, as the technology spreads in its use, it is possible that the biodiversity that is required for organic cotton production will increase with increase in beneficial insect population. It is also important to note that the cost incurred on the interplant seeds are bound not to be incurred in the long run because farmers will be able to replant the seeds from the previous season. Farmers had to purchase these from CHOPPA. In the long run, it is possible that the organic cotton technology will be more profitable than the conventional cotton technology.

The results reflect averages from only one growing season. However, this comparison is more realistic than that presented by KATC because it compares the technologies under the same conditions. That is to say the farmers are compared have similar social economic characteristics and therefore are bound to be affected by different factors in a similar way. This credits the results for this research.

5.3 Recommendations

From this research, the following recommendations would be given:

- Similar research should be carried out over a number of growing seasons. This is because different farming seasons are affected by different production factors. In this particular season under consideration, farmers complained that the crop was highly affected by drought. This may have affected the yields.
- The project should establish strong linkages with other stake holders in the cotton industry. With this concerted effort, the organic cotton technology is expected to increase profitability;

- The project implementers should try to adopt or incorporates the use of organically certified pesticides. The dependence on prevention rather than cure is not expected to control pest effectively. The current technology needs modification if it is to sustain the high demand in organic cotton currently experienced on the market.

REFERENCES

Barnard C. S and Nix J. S (1979), **Farm Planning and Control**, Cambridge University Press, Cambridge Firth C; Lennartsson M L (1999) Economics of organic fruit production in the UK, HDRA, Ryton, Coventry. Accessed on 12/07/2007 at 12:33hrs, available on http://books.google.co.zm/books?id=8ySkuaTd4LAC&pg=PA103&lpg=PA103&dq=bernard+and+nix+farm+planning+and+control&source=web&ots=5BuMoDv4SR&sig=FHdPEVCU92siz8b2OD9hxKjrHo4&hl=en#PPA21,M1

Chongwe Organic Producers and Processors Association (2007), **Summary on CHOPPA,** prepared for the 2007 field day, CHOPPA.

Cotton Development Trust (CDT) (2004), **Cotton Production Annual Report**, CDT

Delate K (2000), **History of organic Agriculture**, Iowa state University, USA, accessed on 6/06/2007 at 14:45hrs, available on, http://books.google.com/books?id=ytFoAcwl4sQC&pg=PA550&lpg=PA550&dq=kathleen+delate+organic+agriculture&source=web&ots=nNLVl3lsus&sig=R2BZBrWn9zeyD1e22YNULvY-ycc#PPA532,M1

Firth C (2002), **The Use of Gross and Net Margins in the Economic Analysis of Organic Farms,** Coventry, CV8 3LG UK, accessed on 12/10/2007- 15:34hrs, available on http://orgprints.org/8290/01/firth_margins_economic_analysis.pdf

Forcucci P, (2001) **The Contribution of Cotton to Economy and Food security in Developing Countries**, FAO, accessed on 23/07/2007 at 09:13hrs, available on, http://www.icac.org/meetings/cgtn_conf/documents/11_fortucci.pdf

Gross margins guide 2005 Western Australia**: Representative Gross Margins for CropAnd Livestock Enterprises of the Agricultural Regions of Western Australia** accessed on 20/08/07, available on http://agspsrv38.agric.wa.gov.au/pls/portal30/url/PAGE/IKMP_MAIN?p_start_url=http://agspsrv34.agric.wa.gov.au/jobs/index.htm

Golden Valley Research Trust (GART) (2005), **GART Year Book. GART,** Lusaka, Zambia.

Kasisi Agricultural Training Centre (2007), **Summary on KATC,** brochure prepared for the 2007 field Day, KATC.

Ho M (2005), **Br. Paul's Organic Cotton and Vegetable Farm,** Institute of Sciencein Society (ISIS),accessed on 5/05/2007 at 15:34hrs, available on http://www.i-sis.org.uk/BrPaulsOrganicFarm.php

Lampkin N (2001), **Organic Farm Management Handbook**,Organic Farming ResearchUnit, Institute of Rural Studies, University of Wales. Organic Advisory Service, Elm Farm Research Centre, Aberystwyth, Newbury. Accessed on 12/10/2007 at 16:03hrs, available on, http://orgprints.org/8290/02/lampkins_margins_economic_analysis.pdf

Industry Watch (2007), **Challenges of Organic Cotton Production,** USA, accessed on24/05/2007, at 14:55hrs, available on http://www.organicmonitor.com/na.htm#1

National Organic Standards Board (NOSB) (1997), **Recommendations for Organic Production,** NOSB, accessed of 24/05/2007 at 14:45hrs, available on, http://www.ams.usda.gov/nosb/accredcommRMR/recommedations/princ_prod hand.html

Ndulo M and Mudenda D, **Trade Policy Reforms and adjustment, Zambia Experiences**, accessed on 24/08/2007 at 10:11hrs, available on http://r0.unctad.org/ditc/tab/publications/nama/zambia_study.pdf

Philip M and KATC Staff (2006), **Organic cotton Production Manual for Zambia**, KATC, Lusaka, Zambia.

Financial times (2005), **Tanzania set to Produce First Organic Cotton this Year**, IPP Media, accessed on 25/ 07/2007 11:24hrs, available on http://www.ippmedia.com/ipp/financial/2005/08/17/47247.html

Raj .D. A, Sridhar K, Ambatipudi A, Lanting H, and Brenchandran S (2004), **Case Study on Organic Versus Conventional Cotton,** in Karimnagar, Andhira Pradesh, India, accessed on 24/05/2007 at 12:37hrs, available on, http://www.bugwood.org/arthropod2005/vol1/6c.pdf

Shaffer K. A and Walls F.R (2005), **Livestock Manure Production Rates and NutrientContent,** College of Agriculture and Life Sciences, NC State University. Accessed on 7/03/2008 at 14:43hrs, available on, http://www.lib.clemson.edu/agnic/pdfs/LIVESTOCKMANUREPRODUCTIONRATES ANDNUTRIENTCONTENT.pdf

Swezey S. L, Goldman P, Bryer J, and Nieto D (2006), **A Six Year Comparison of Organic, IPM and Conventional cotton**, Center for Agroecology and Sustainable Food Systems, University of California, Santa Cruz, CA 95064, USA, accessed on 15/04/07, available on http://journals.cambridge.org/download.php?file=%2FRAF%2FRAF22_01%2FS174217 0507001573a.pdf&code=4990e4f6148cc3211d84a553e6b92ef1

Wikipedia, the free encyclopedia (2007), **History of organic farming**, accessed on 4/5/07,available on http://en.wikipedia.org/wiki/History_of_organic_farming#column-one

www.earthrunnigs.com.

APPENDICES

Appendix 1: Questionnaire

A COMPARISON BETWEEN THE PROFITABILITY OF OGRGANIC AND COMVENTIONAL COTTON.

SECTION A: IDENTIFICATION INFORMATION

DISTRICT---------- CHIEFDOM name----------

CAMP name----------DATE----------

NAME OF THE FARMER----------

SECTION B. DEMOGRAPHIC DATA

1. Age as at last birthday----------

2. Sex

1) Male---------- ☐ 2)Female---------- ☐

3. What is your highest level of Education?

1) Attended Primary---------- ☐

2) Attended Secondary---------- ☐

3) Attended College / University---------- ☐

4) Never attended School ---------- ☐

5) Other, Specify ---------- ☐

4 what is the total number of your household? ---------- ☐

Complete the table below of your household status:

YEARS	CHILDREN		DEPENDANTS	
	MALE	FEMALE	MALE	FEMALE
Between 0 – 15				
Between 14 – 36				
Above 35				
TOTAL ON EACH SECTION				

SECTION C: AGRICULTURAL DATA

5. Have you been a farmer throughout your life?

1) Yes ---------- ☐ 2) No ---------- ☐

6. If no to question 7, what have you been doing before you started farming?

_____

7. What do you do apart from farming? _____

8. What is the size of your f_____(ha)

9. What size of your farm do you cultivate? _____(ha)

10. What crops do you grow on your farm?

Crops	Hectares
Maize	
Beans	
Groundnuts	
Cow peas	
Cotton	
others	
others	

11. Do you keep any life stock on your farm?

1) Yes---------- ☐ 2) No---------- ☐

12. If yes what animals do you keep?

Livestock	**Number**
Chickens	
Cattle	
Goats	
pigs	
others	

SECTION D: KNOWLEDGE ABOUT ORGANIC COTTON

13. Have you ever herd about organic cotton?

2) Yes---------- ☐ 2) No---------- ☐

14. If yes to Q 13, from whom?

1) OPPAZ ---------- ☐

2) KATC ---------- ☐

3) CHOOPA ---------- ☐

4) Friends ---------- ☐

5) Others, Specify ---------- ☐

15. Have you ever attended any training offered by KATC in organic cotton?

1) Yes---------- ☐ 2) No---------- ☐

16. Have you ever been involved in the growing of organic cotton?

1) Yes---------- ☐ 2) No---------- ☐

17. If yes to Q16, what prompted you to do so? Tick where appropriate.

1) high profit ---------- ☐

2) availability of inputs---------- ☐

3) cheaper to produce---------- ☐

4) Conventional inputs are expensive---------- ☐

5) Others specify_____ ☐

SECTION E: PRODUCTION COSTS FOR COVENTIONAL AND ORGANIC COTTON

18. Which technology did you use to produce cotton last season?

1) Organic---------- ☐ 2) Conventional---------- ☐

19. How much land did you allocate to the cotton you produced?

_____

20. What was the main source of your inputs? Tick where appropriate.

1) On-farm---------- ☐

2) CHOPPA---------- ☐

3) Dunavant---------- ☐

4) Buying from the shops ---------- ☐

5) Others specify_____ ☐

21. If you produced conventional cotton what were the labour requirements for the following activities.

	Family labour		Hired Labour		
Activity	**Number of People**	**Duration number of days**	**Number of People**	**Duration (Number of days)**	**Payment rate (Kwacha) per Person**
Land Preparation					
Planting					
Weeding					
Chemical Application					
Fertilizer application					
Harvesting					

22. If you produced organic cotton, what were the labour requirements for the following activities?

	Family labour		Hired Labour		
Activity	**Number of People**	**Duration number of days**	**Number of People**	**Duration (number of days)**	**Payment rate (Kwacha) per Person**
Land Preparation					
Planting					
Weeding					
Compost tea making					
Manure application					
Control of pests/ diseases					
Harvesting					

23. If you produced conventional cotton, how much did you apply and spend on the following inputs?

Input	Quantity	Cost ZMK
Solubor		
Herbicides		
Pesticides		

Fungicides		
Seed		
others		

24. If you produced organic cotton, how much did you apply and spend on the following inputs

Input	**Quantity**	**Cost ZMK**
Manure		
Inter plants seed		
Cotton seed		
Organic pesticides		
Others		
Others		

25. How would you compare the workforce between organic and conventional cotton?

Organic cotton	Conventional cotton	
High	Low	
Same	Same	
Low	High	

26. How would you compare the inputs quantities requirements for organic and conventional cotton per ha?

Organic cotton	Conventional cotton	
More	Less	
Same	Same	
Less	More	

27. In your view, what are the advantages and disadvantages of organic and conventional cotton?

Advantages of growing organic cotton	**Disadvantages of growing organic cotton**
Advantages of growing conventional cotton	**Disadvantages of growing conventional cotton**

28. Which one between the two technologies do you think is better?
1) organic cotton----------
2) conventional cotton----------

29. In your view, what do you think limits the production of organic cotton?

1) labour -- ----------
2) yields ----------
3) knowledge about organic cotton production----------
4) cost of production ----------
5) Others, Specify ----------

30. In your view, what do you think limits the production of conventional cotton?

1) labour -- ----------
2) yields ----------
3) land----------
4) cost of production ----------
5) Others, Specify ----------

SECTION F: YIELDS

31.What were your yields for the type of cotton you grew? Fill in the tale below about yields

Cotton type	Hectares grown	Yield	Market Sold	Cost/Kg of seed cotton
Organic				
Conventional				

THE END, THANK YOU AND GOD BLESS YOU.

Appendix 2: 0rganic Cotton Growing Calendar

Date	Growth Week	Growth Stage	Field Work	PESTS	ACTION	INTERPLANT RATE/HA
MID MAY TO MID AUGUST			Start making compost Remove any cotton plant from old fields. Make basins or lines early but apply compost or manure one month to two weeks before planting (6-10t/ha)	Remember – do not bury cotton residues. It is estimated that 75% of all insect pests spend part of their life in the soil.	Cut, heap and burn cotton stalks as a pest control measure	Farm-scaping – ensure permanent plantings for hedgerows are in place to attract beneficial insects. Important – ensure that you have nectar rich plants on your farm such as dill, coriander, mustard family and marigolds and other flowering plants all year round.
MID NOV TO MID DEC	1 to 3	0-2 cm	Planting – plant with first good rains or dry plant part of the field (15kg/ha of seed) Weeding this should be carried out as soon as the weeds are about 4cm high. Weed competition at this stage can affect yield so do not hesitate to start weeding.	Thrips Termites, Cutworms, Grasshoppers, Aphids	Thrips – practice conservation tillage to build organic matter, spot spray with neem extract Termites - apply ash or put trash along the lines to provide food for termites, mulch. Cutworms - drench with snake bean, papaya, tephrosia or pyrethrum leaf extracts, Grasshoppers – spot spray with papaya or neem extracts Aphids – spot spray with garlic, tephrosia or soap spray. General - set insect traps	Maize (traps aphids on tassels and bollworms)- 1kg at week 0 Sorghum (traps bollworms and aphids) – 0.5kg at week 0 Marigold (flowers attract most beneficial insects, also a repellent) -0.25kg on nursery 2 weeks before transplanting Okra (attracts cotton stainer) - 0.25kg at week 0 Sunflower (moths to lay eggs and attracts most beneficial insects) - 5kg in hedgerows and borders at week 0 Sunnhemp (flowers attract beneficial insects) – 3kg around borders at week 0 Mustard (traps aphids and attracts beneficial insects) - 0.1kg on nursery 2 weeks before transplanting Dill (attracts beneficial insects) -0.1kg on nursery a month before transplanting Coriander (attracts beneficial insects)-0.1kg on nursery a month before transplanting

MID DEC TO EARLY JAN	3 to 6	50 cm 6- leaf	Souping (liquid manure application) – drench with Chicken manure/ cattle manure / compost/ comfrey tea soaked in a 200lt drum .Diluted1:3 (approximately 800lt/ha This should be carried out weekly from week 3 to 6 of planting) Weeding should continue until cotton is big enough to compete favorably.	Jassids, Whitefly, Aphid, Elegant grasshopper Leaf rollers Looping caterpillars Spiny bollworms False coding month	Jassids – spot spray with garlic, Aphids – spot spray with garlic, Grasshoppers-spot spray with garlic or neem extracts. Spot spray with snake beans Hand pick and crush Hand pick, crush and remove affected bolls Set traps	Maize- 0.5kg last week of December Sorghum - 0.25kg 1st week January Cowpeas - 0.4kg 2nd week December Marigold - 0.1 kg on nursery 2 weeks before transplanting Okra - 0.125kg 1st week January Sunnhemp – 2kg in hedgerows 1st week January Mustard - 0.1kg on nursery 2 weeks before transplanting

JANUARY	6 to 9	70 cm First buds	Souping (liquid manure application) – drench with manure/compost/comfrey tea soaked in a 200lt drum. Dilute 1:3 (approximately 800lt/ha This should be carried out weekly from week 7 to 9). Top dressing- manure/compost can be used as a top dress if soils are very poor and rain is enough	Bollworms Aphid Jassids Whitefly Leaf rollers Grasshopper	Bollworms –hand pick crash and spray with mixture made with dead bollworms or spot spray with snake beans or neem extracts Aphids - spot spray with soft soap when levels are high Jassids - spot spray with soft soap when levels are high Whitefly – set traps or apply a botanical spray as a last resort Leaf rollers – apply a botanical spray as a last resort Grasshoppers - apply a botanical spray as a last resort	Mustard - 0.1kg on nursery 2 weeks before transplanting Marigold - 0.1 kg on nursery 2 weeks before transplanting Cowpeas - 0.4kg 1st week January Okra - 0.125kg 4th week January Sunflower – 0.25kg 4th week January Maize - 0.5kg 2nd week January Dill – 0.1 kg on nursery 2 weeks before transplanting Coriander –0.1 kg on nursery 2 weeks before transplanting
LATE JAN TO MID FEB	9 to 12	90 cm First Flowers	Souping (liquid manure application) - drench with /compost/comfrey tea soaked in a 200lt drum Dilute 1:3 (approximately 800lt/ha) This should be done weekly from week 10 to 12.	Bollworms Aphid Jassids Whitefly Red spider mite	Bollworms - hand pick crush and spray with mixture made with dead bollworms or spot spray with snake beans or neem extracts Aphids - spot spray with soft soap when levels are high Jassids - spot spray with soft soap when levels are high Whitefly – set traps or apply a botanical spray as a last resort Red- spider mite – spray with botanical sprays especially African marigold and garlic as last resort	Mustard - 0.1kg on nursery 2 weeks before transplanting Marigold - 0.1 kg on nursery 2 weeks before transplanting Cowpeas – 0.4kg 4th week January Sorghum - 0.25 2nd week February Okra – 0.25kg 4th week of January

MID FEB TO MID MARCH	**12 to 15**	120 cm Green balls	Souping (application of liquid manure) drench with compost/comfrey tea soaked in a 200lt drum Dilute 1:3 (approximately 800lt/ha) This should be carried out weekly from week 13 to 15 Application of liquid manure may have to stop if the cotton grows too thick to prevent easy access.	Red spider mite Cotton stainer Aphids Jassids Bollworms	Red- spider mite – spray with botanical sprays especially African marigold and garlic as last resort Handpick and crush Aphids - spot spray with soft soap when levels are high Jassids - spot spray with soft soap when levels are high Bollworms - hand pick crush and spray with mixture made with dead bollworms or spot spray with snake beans or neem extracts	Cowpeas - 0.4kg 4th week February Mustard - 0.1kg on nursery 2 weeks before transplanting Marigold - 0. 0.1kg on nursery 2 weeks before transplanting
MID MARCH TO JUNE	**15 +**	150 cm Open balls (first picking)	After completing harvesting all cotton plants should be cut down and removed from the field and burnt.	Red spider mites Cotton stainer Aphids Jassids	Cotton Stainer- Pick the cotton as soon as the bolls are ready. When 4-5 bolls per plant are open.	

Source: Organic cotton Production Manual for Zambia.

Appendix 3: Useful inter-plants

Inter-plants	Main Action	Secondary Action
Maize	Attracts bollworm	False coding moth
Sweet sorghum	Attracts bollworm	
Sunflower	Attracts beneficial insects, e.g., parasitic wasps	Attracts birds for controlling caterpillars and bees for pollination
Okra	Attracts cotton stainer	Same family as cotton so attracts many similar pests
Mustard	Attracts beneficial insects	Attracts flea beetles
Cowpeas	Attracts aphids	Attracts looping caterpillar adults to lay eggs, attracts ants
Sonchus species (Milk weed)	Attracts aphids	Lady bird beetles feed on aphids
Marigold	Repels aphids and nematodes	Flowers attract beneficial insects
Sesame	Attracts pink bollworm	
Coriander	Flowers attract beneficial insects	Aroma can act as a repellent
Dill	Flowers attract beneficial insects	Aroma can act as a repellent
Fennel	Flowers attract beneficial insects	Aroma can act as a repellent

Source: Organic cotton Production manual for Zambia

Appendix 4: Statement of Loan

STATEMENT FOR COTTON LOAN

No. CCP5

2005/2006 Season

From: Chongwe Organic Producers & Processors
P.O. BOX
30652
LUSAKA
Abraham

To: Zulu
Kasenga Organic Co-op

A.INCOME FROM COTTON SALES

DESCRIPTION	QUANTITY	SELLING PRICE	AMOUNT
Payment from seed sales			-
Cotton sales	41.2	1,250.00	**51,500.00**

B. INPUTS

DESCRIPTION	QUANTITY		Price	AMOUNT
Cotton seed	15	kg	1,750	26,250.00
Mustard	0	kg	60,000	-
Marigold	0	kg	10,000	-
Maize	0	kg	5,000	-
Sorghum	0	kg	1,500	TRUE
Cowpeas	0	kg	4,000	-
Okra	0.5	kg	40,000	20,000.00
Sunflower	0	kg	1,000	-
Sunnhemp	0	kg	5,000	-
Plastic drums	2	pcs	85,000	170,000.00
Metal drums	0	pcs	50,000	-
Sprayers (shared cost)	0		245,000	-
Manure for Compost loan	0	cash	-	100,000.00
1st Hired labour loan	0	cash	-	150,000.00
2nd Hired labour loan	0	cash	-	150,000.00
KelpaK	0	ltr	32,500	-
Principal				**616,250.00**
Interest				**74,612.50**
Total Loan				**690,862.50**

Balance due (A-B) **#REF!**

Prepared by: _____

Sign:

_____

There will be a charge of K6,000 per woolpak kept by the farmer

06-Mar-08

Source: CHOPPA, 2007