EVALUATION OF FARMERS PARTICIPATION IN OILSEEDS VALUE ADDITION AND IMPLICATION ON THEIR INCOME: A CASE OF SUNFLOWER IN KILOSA

BY

GULANA FADHILI ABDALLAH

A DISSERTATION SUBMITTED IN FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN AGRICULTURAL ECONOMICS OF SOKOINE UNIVERSITY OF AGRICULTURE. MOROGORO, TANZANIA.

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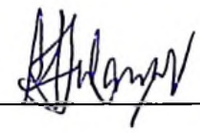
ABSTRACT

This study aimed at evaluating farmers participation in the value addition to oilseeds and its implication on their income with special emphasis on sunflower. The general objective was to increase production and income generation through value addition in the rural sunflower potential areas of Tanzania. Specifically the study aimed to: assess processing capacity and utilization, identify factors influencing farmer participation in value addition, describe marketing channels of farmer value added sunflower, describe oil millers' constraints and assess the change in value of sunflower produce due to processing. Structured questionnaires were used to collect primary data from purposefully selected 205 respondents: 100 participating, 100 non participating farmers and five oil millers from eight villages. Discussions and participatory observations methods were also used. The logit model was estimated using data from 200 farmers to test the hypothesis that socio-economic and institutional factors influence farmer participation in value addition. The results indicate that milling capacity is about 11 280 kg per day of which only about 32.3% is utilized at peak period and about 14.3% when sunflower is scarce. Processed sunflower increased in value by about 62.7% and most of the products were sold in the village. Education and price had significant positive influences while inadequate knowledge, low household income and poor market information had significant negative influence. In order to improve value addition there should be effective farmers involvement in the process of imparting knowledge to them. Reliable market information system countrywide which can effectively connects producers and buyers, electricity and rural road network need as well to be in place.

DECLARATION

I, Gulana Fadhili Abdallah, do hereby declare to the Senate of Sokoine University of Agriculture that this dissertation is my own original work and has not been submitted for a degree award in any other University.



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25. 08. 2011

Date

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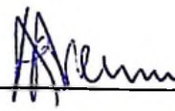

Dr. Anna A. Temu

(Supervisor)

25 . 08 . 2011

Date

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I am indebted to a great number of people (far too many to mention individually) who have directly and indirectly helped the outcome of this thesis.

I Thank the Almighty Allah for keeping me and my family mentally and physically fit, and remain steadily well focused on the objective of completing the course.

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I also wish to thank Kilosa district council officials for allowing me to conduct the study in the area.

Since I finally decided what should comprise this thesis, I remain personally responsible for any errors and shortcomings there in.

DEDICATION

I dedicate this to my beloved daughters and son; Salma, Salha and Salim to inspire them the spirit of learning hard.

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LIST OF ABBREVIATIONS

ACP	African, Caribbean and Pacific
AMSDP	Agricultural Marketing System Department Programme
ARI	Agricultural Research Institute
ASU	Agricultural Statistics Unit
BIS	Business Information Service
CTA	Technical Centre for Agricultural and Rural Cooperation
DGP	Gross Domestic Product
EWCU	Early Warning and Crop Monitoring Unit
FAO	Food and Agriculture Organization
FEG	Farmer Extension Group
FPVA	Farmer Participation in Value Addition
FRG	Farmer Research Group
GAPEX	General Agricultural Export Company
IDA	International Development Association
IFAD	International Fund for Agricultural Development
LDC	Least Developed Countries
MATI	Ministry of Agriculture Training Institute
MIS	Market Information Service
MKUKUTA	*Mkakati wa Kukuza Uchumi na Kupunguza Umasikini Tanazania*
NAPB	National Agricultural Produce Board
NBS	National Bureau of Statistics
NMC	National Milling Cooperation

NSGRP	National Strategy for Growth and Poverty Reduction
SA	Sustainable Agriculture
SIDO	Small Industry Development Organization
SNAL	Sokoine National Agricultural Library
SPSS	Statistical Package for Social Science
SUA	Sokoine University of Agriculture
TBS	Tanzania Bureau of Standard
TRA	Tanzania Revenue Authority
Tshs	Tanzania Shillings
TTC	Teachers Training College
URT	United Republic of Tanzania
US$	United State Dollar
WTO	World Trade Organization

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background information

The least developed countries (LDCs), have continued to trade in agricultural products with limited value addition thus receiving low market prices (URT, 2003b; FAO, 2007a). Increase in export of raw agricultural products increases import of the similar processed goods thus imposing adverse effects in agriculture, fuelling unemployment due to reduced number of persons who could otherwise be employed in the prospering agriculture and agro-processing industries and ultimately lowering national and individual farmers' income. In 2002, for example, Tanzania net import of edible oil was 50%. This implies that farmers in the country lost their domestic market opportunity by 50%, as result they have, over years, been complaining of lacking reliable market not only for oilseeds products but also for many other cash crops.

Agricultural policy focuses on value addition at national and farmer levels as an alternative source for farmer income generation and rural development (URT, 2000; Kashuliza *et al.*, 2002; FAO, 2003b). It is reported that adding value to their produce farmers will be able to increase farm income than when sold raw (IFAD, 2008; Boland *et al.*, 2001; Cleland and Bruno, 1996). Ekman and Anderson (1998) define the farmer level processing as activities of adding value on agricultural produce by farmers before selling them. Manyele and Kahemela (2009) report that vegetable processing industry involves the extraction and processing of oils and fats from

vegetable sources like oilseeds, fruits and nuts. Most used oilseeds include sunflower, soybean, groundnuts, coconuts, palm, cottonseed, olive, rapeseeds and many others.

The total oil mills capacity at national level has dropped to about 200 000 tonnes from 424 000 tonnes per annum (Jayne and Minde, 2002). Total present capacity of sunflower oil mills in the study area was about 11 280 kg equivalent to 143 bags of about 70 kg per day. The capacity utilization was only 32.3% at peak period and only 14.3% at period of scarce raw sunflower. Domestic demand for edible oil in Tanzania is estimated at 60 000 tonnes per annum, a half of this is supplied by domestic producers who operate well under capacity (Jayne and Minde, 2002). Despite this opportunity to farmers and national as a whole, resent observations indicate that some farmers have been striving to add value to sunflower produce while others have been selling it unprocessed due number of constraints which are socio-economic and institutional specific in the study area and perhaps other rural areas of Tanzania. FAO (2008) stresses that there should be significant and systematic efforts to diverse constraints of farmers to enable them increase farm productivity. Over 5 years from 2005 to 2009 Kilosa district council production plan focused on the acreage cultivated and the resultant yield, it however, didn't comprise of any element of value addition to oilseeds particularly sunflower in the district. At this juncture there was no comprehensive up-to-date information about value addition to sunflower at individual farmer and district levels.

1.2 Problem statement

Farmers in Tanzania as in other (LDCs) are still receiving lower prices from sales raw agricultural produce (FAO, 2005a). Value addition to oilseeds, particularly, sunflower processing is negligible in rural areas of Tanzania. In the past up to 1986 all operations including collection of oil seeds from farmers to the millers for value addition and then to the ports for export were carried out by state parastatals namely the National Agricultural Produce Board (NAPB) and then the General Agricultural Export Company (GAPEX). After 1986 GAPEX was replaced by cooperatives which were in turn replaced by private traders in 1989 leading to disorganized oilseeds markets and poor prices (URT, 1995b).

Currently, an agro-processing at farmer and national levels is emphasized in order that farmers can benefit more from crops they produce (World Bank, 1996; Power, 1997; Kashuliza *et al.*, 2002; MAFS, 2002; URT, 2002a; URT, 2003b). Value addition to agricultural produces at farm level increases profit to farmers (Boland *et al.*, 2001; Cleland and Bruno, 1996) and that about 80% of sunflower's value in India comes from its oil. According to FAO (1999, 2003a) success in farmer level agro-processing requires conducive agricultural policy, supported by research and extension institutions that are responsive to locally articulated needs. The report on perspective on agricultural transformation a view from Africa by Jayne and Minde (2002) indicates that domestic demand for edible oil in Tanzania is estimated at 60 000 tonnes per annum, a half of this is supplied by domestic producers who operate well under capacity. The edible oil supplied in the markets of Tanzania is dominated by cotton and sunflower oil; this is a vital opportunity for farmers. Kilosa district has

agricultural produce can promote production, income generation and contribute to poverty reduction. This concurs with the National Strategy for Growth and Poverty Reduction (NSGRP) Cluster 1 and 2 (URT, 2005b; 2006a; 2007). It also concurs with the World Bank analysis of data from India whose results indicate that growth in rural areas and in the agriculture sector had much greater impact on reducing poverty than did urban and industrial growth (FAO, 2005b). Basing on the objectives of this study the gathered findings enrich the current knowledge bank and can be applied in the study area and other areas with similar agro-ecological zones and socio-economic activities.

1.4 Objectives of the study

The general objective of the study is to increase sunflower production and farmer income generation through value addition in the rural sunflower potential areas of Tanzania. Specifically the study aimed to:

(a) Assess available processing capacity and utilization in the study area.

(b) Identify factors influencing farmer participation in value addition to sunflower.

(c) Describe marketing of farmer value added sunflower in Tanzania.

(d) Describe constraints faced by oil millers in the value addition business.

(e) Assess the change in value of sunflower produce due to processing.

1.5 Research hypothesis

(a) Capacity utilization of oil mills is low in the study area,

(b) Socio-economic and institutional factors significantly influence farmer participation in value addition to sunflower in the study area,

(c) Agro-processing increases the value of farm produce.

(d) Market information is a constraint in marketing farmer value added products

(e) Oil millers are constrained by technical and power supply problem

1.6 Research questions

(a) What is the processing capacity of oil mills in the study area?

(b) What is the processing capacity utilization of the oil mill in the study area?

(c) Is there markets for farmer value added sunflower products? How does it operate?

(d) Can farmer value addition to farm produce increase farmers' income?

(e) What are the constraints facing sunflower farmers and oil millers in the study area?

(f) What are the possible interventions for improving farmer participation in the value addition to sunflower produce in the production areas of Tanzania?

1.7 Conceptual framework

Firms always seek to maximize profit through cost minimization and/or adding quality/quantity basing on their available resources. A profit maximizing firm has to minimize its cost for a given output or to maximize output from a given total cost (Koutsoyiannis, 1985; Varian, 1996; Dwivedi, 2008). This is further elaborated by Meena *et al.* (2001) that a primary goal of any farmer is to increase income. This is achieved through increased productivity of resources, especially land, labour and capital. Farmer income goals are, however, modified by food preferences and risk aversion. It is obvious that a farmer who produces and adds value to the produce

before selling is likely to earn more profit than a farmer who does not. A part from selling at higher prices, value added agricultural produce can be stored longer with minimum storage and transport costs. Value addition to sunflower produce is, however, partly subject to availability of capital, relevant skills, technologies and markets for the value added sunflower products, thus influencing producers' choice whether or not to participate in this particular business. In this case where farmers face two choices, dependent (response) variable is technically categorical assuming values of either 1 for the choice of participating or 0 for otherwise (Gujarati, 1995). Explanatory variables included quantitative and qualitative data covering socio-economic and institutional data as shown in the conceptual framework (Fig. 1).

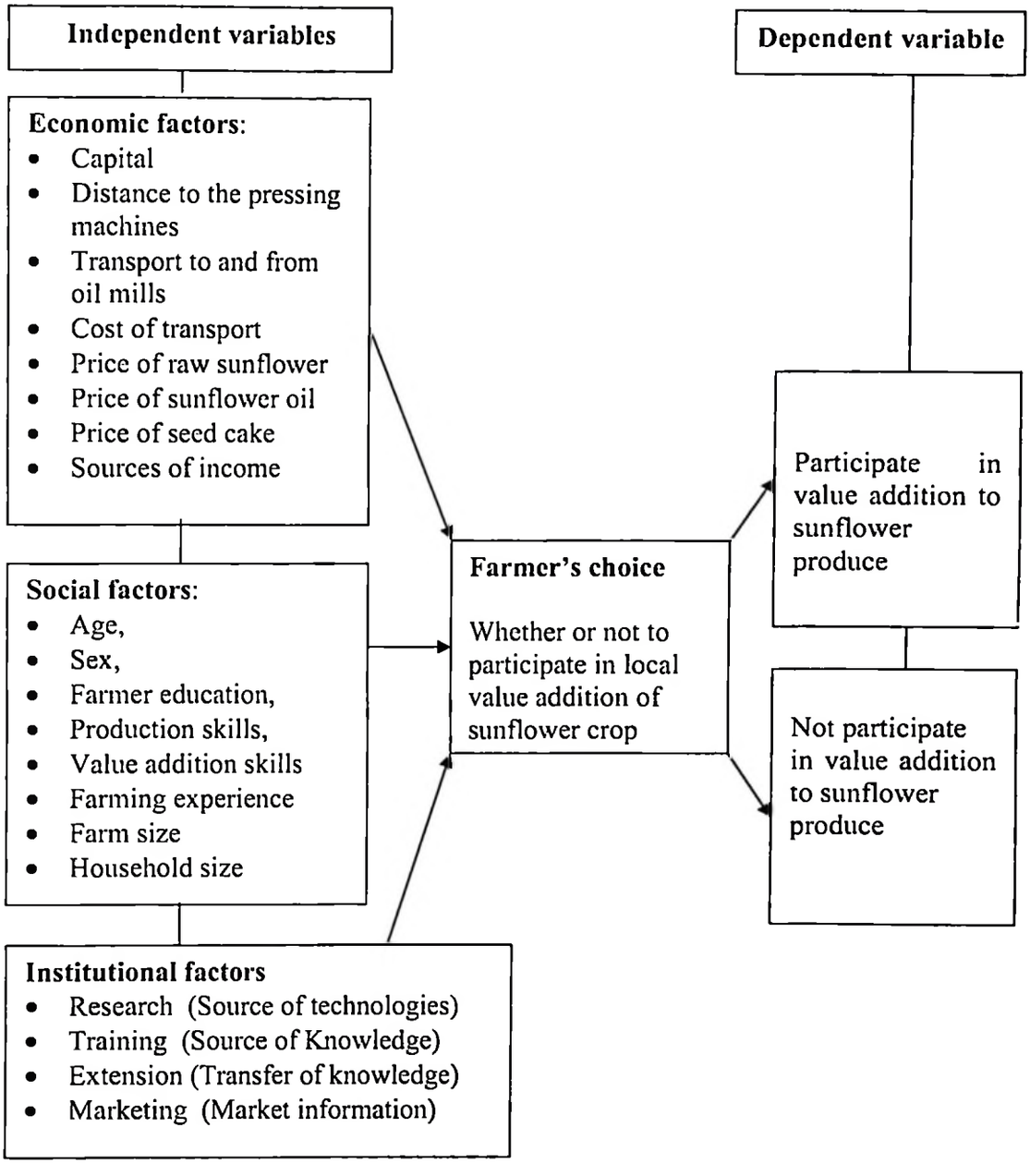


Figure 1: Conceptual framework of the research

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Overview

The study aimed to evaluate farmer participation in value addition to oilseeds with special emphasis on sunflower crop and its implication on farmers' income. This section covers review on: production, value addition, marketing and constraints in the World; oilseeds in Tanzania its importance and production trends; Sunflower production trend in Kilosa; available processing capacity and utilization particularly in the study area of Kilosa district and Tanzania in general with emphasis on the concept of mill capacity and utilization, the available oil mills capacity and utilization, the trend of value addition to oilseeds particularly sunflower and trends of export and import of edible oil. It also covers the factors influencing farmer participation in value addition to sunflower with emphasis on farmer characteristics, economic and institutional factors; marketing channels of farmer value added sunflower in the market area of Tanzania, and constraints which face oil millers.

2.2 Production, value addition, marketing and constraints in the World

2.2.1 Production

Oilseeds which include soybeans, cotton, groundnuts, sunflower, rapeseeds, palm kernels and copra are grown worldwide as a food and cash crops (FAO, 1995, 1999; Maliyamkono and Mason, 2006; IFAD, 2008). Oilseeds production in India increased from 21.7 million tonnes in 1992/93 to 25.5 million tonnes in 1997/98. Sunflower ranks fourth in the world after soybeans, oil palm and rapeseed

(Raemaerkers, 2001). In the review of basic food policies during the period of 2001-02, FAO (2008, 2003b) reports that in 2001, international market for oilseeds and derived products were over supplied relative to demand, which resulted in above average stocks and downward pressure on prices. In certain countries, increased support was provided to help producers.

In 2002, by contrast, production growth declined, and global stocks were drawn down leading to a partial recovery in international prices and less policy support. As to global consumption of and trade in oilseed products, growth rate during the entire period of 2001-02 fell below the level recorded in previous years. FAO further reports that over the period, national policies continued to be driven by one or more of the following objectives: promotion of exports, import substitution, farm income support, stimulation of production, and boosting value added production. Selection of specific policy instruments and their actual design was, however, to the large extent determined by the countries' individual Uruguay Round commitments and by on-going discussion on further trade and agricultural policy reforms within the WTO.

Despite the trend towards trade liberalization in numerous countries, oilseeds production continued to be influenced by production support policies. While some countries continued to rely on price support programmes to protect farmers' incomes, the number of countries that shifted to direct forms of income support for oil crop producers has further increased; in addition, to stimulate oilseeds production and increase the sector productivity, various indirect forms of support such as input subsidization were also used. In other countries, however, producer's price support

for oilseeds continued to be applied with a view to protect farmers' income and provide sufficient supplies for domestic markets. In general, in countries where support prices were applied, these were increased in nominal terms but did not keep pace with inflation. Yet, in many cases, for instance in Brazil, India, Pakistan and the Republic of Korea, farmers preferred to sell their oilseeds in the open markets, as state administered prices tended to be below domestic market prices.

2.2.2 Value addition and marketing

Agro-processing which ensures canning at the time of harvests does not only add value to the agricultural produce but also reduces the post harvest losses and encourages growers to expand acreage and production and realize easily the need to strive for quality in order to secure the consumer markets. Value addition puts agricultural produce in various forms which in one way or another satisfy consumers' choices, for instance it may put the final products in various tastes, textures, structures, colour and sizes. Furthermore, value addition removes unwanted parts of the produce thus reduces bulkiness and ensures better handling of the products during transport, storage and marketing which result in reduced cost but better sales and profit margins. Agro-processing industries for oilseeds in Asia and Africa are increasing with higher economic returns (IFAD, 2008). About 80% of sunflower's value in India comes from its oil (Cleland and Bruno, 1996; Boland *et al.*, 2001). In Philippines – one of the main exporters of edible oil to Tanzania, value added products in agriculture, fisheries and forestry increased from 294 922 to 470 341 million Pesos from 1992 to 1996. Export of oil and fat in Taiwan increased from US $ 128 705 in 1994 to US $ 190 750 thousand in 1997.

2.2.3 Constraints

Value addition activities and marketing, however, requires reliable infrastructure such as electricity, efficient mills, good road network, good storage facilities and relevant knowledge to mention some. These are still the major constraints in the rural areas of Tanzania in particular and the least developed countries in general where majority people dwell and their hope of livelihoods hinges largely on small scale rain fed agriculture (Jayne and Minde, 2002; Mtei, 2004). Value addition food industries are also faced by scarce raw materials and harsh competition in the domestic markets (Nawa *et al.*, 1998).

2.3 Oilseeds in Tanzania

Oilseeds are the third most important group after cereals and traditional export crops in Tanzania, produced almost in all regions particularly, Shinyanga, Dodoma, Singida, Morogoro and Mtwara all together producing over three-quarters of the total oil seeds (URT, 2002b). Sunflower is potential in Dodoma, Singida and Morogoro in Tanzania. Kilosa district leads in sunflower production in Morogoro region (URT, 2002b). Fig. 2 indicates that sunflower production picked up from about 60 000 tonnes in 1986/87 and reached maximum of about 85 000 tonnes in 1988/89 production season after which it gradually declined 75 000 tonnes in 1991/92.

Ground nuts, however, showed an opposite trend that when sunflower was increasing it was decreasing and increased sharply when sunflower was gradually decreasing. Through the period groundnuts production ranked the highest of all oilseeds and almost five times higher than sunflower in 1986 and seven times in 1991/92 (URT,

2006b). For example, when sunflower production was about 60 000 tonnes in 1986/87 and 75 000 tonnes in 1991/92 groundnuts production was about 260 000 and 350 000 tonnes respectively. During the period between 1986 and 1989 cotton production was more than doubled but returned to the same low level by 1990/91 (Fig. 2).

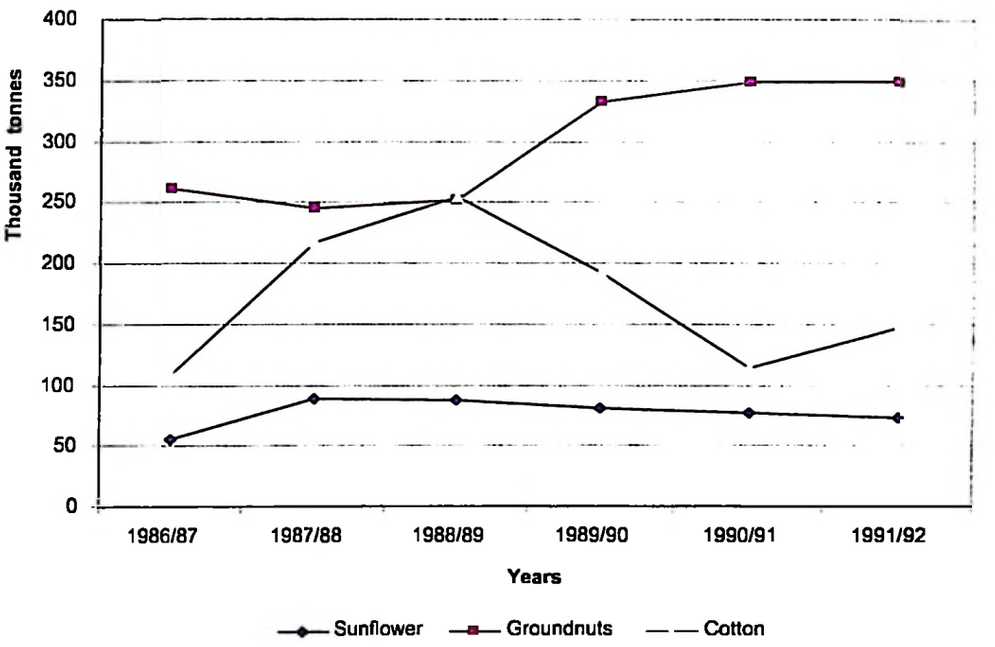


Figure 2: Oilseeds production trends in Tanzania from 1986/87 – 1991/92 (thousand tonnes)

Source: Jayne and Minde (2002)

This trend was largely influenced by marketing system of handling oilseeds from farmer and eventually to port ready for export. When the system ceased to function properly, oilseeds markets were disorganized, leading to poor prices and declining production in the country (URT, 1995b).

In the recent years some regions of Tanzania have become potential in sunflower production, for instance, both acreage under sunflower and production trends in Singida region increased as well as an increase in output per acre between 1999 and 2004 (Fig. 3). Sunflower production increased almost two folds about 27 000 tonnes in 1999/00 to about 55 000 tonnes in 2003/04 production season. Such increase was attributed to the fact that sunflower crop is increasingly considered a paramount important source of income in the region for multiple reasons including climatic factors-the semi arid land which favours drought tolerant crops including sunflower itself, soil condition and infrastructural factor such as good number of oil mills and good infrastructure linking the region to the Western, Northern and Eastern of Tanzania markets. In addition to that farmer capacity building in terms of production and processing skills is increasingly carried out through research, extension and training services in the region.

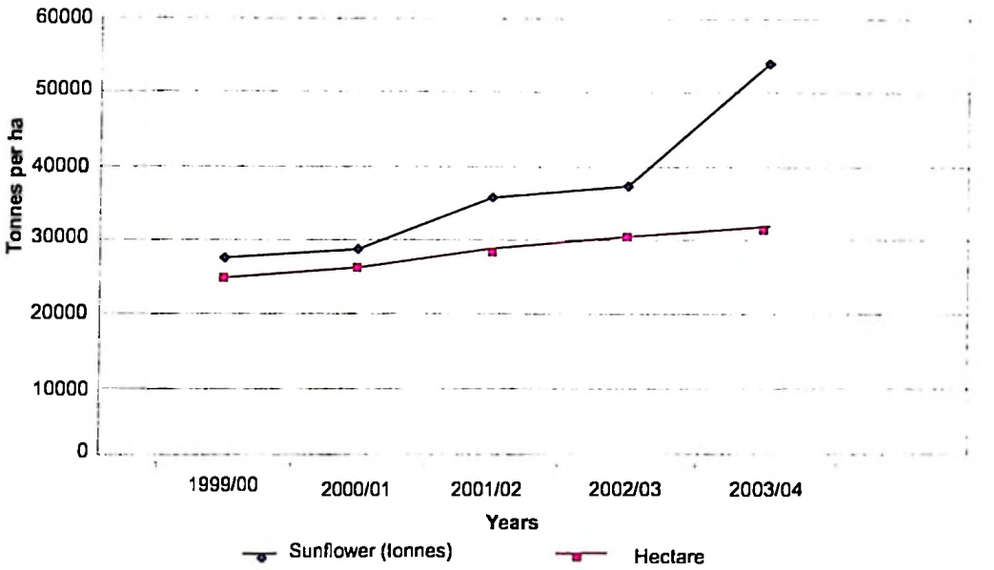


Figure 3: Acreage under sunflower (ha) and production (tonnes) 1999/00 – 2003/04 in Singida

Source: United Republic of Tanzania (URT) (2005b)

2.4 Sunflower production in Kilosa

From 1995/96 to 1999/00 annual average production trends in Morogoro was 1681 tonnes, Kilosa produced 75% of the total tonnage of sunflower in the region in 1998/99 (URT, 2002b). The recent production records indicate that sunflower production trend increased from 1998/99 – 2007/08. During this period production has almost doubled from 1750 tonnes in 1998/99 to 3500 tonnes in 2007/08 season. During this period, however, cotton and groundnuts production at first increased but ended with a decreasing trend. Simsim production showed a sharp increase from 1500 tonnes in 2005/06 season to 4600 tonnes in 2007/08 (Fig. 4). The trends were due to increased in prices in the areas which stimulated more production. During this

period simsim gain popularity as a result its demand increased sharply in 2005/06 production season and scored the highest level of production in 2007/08. Agronomic consideration indicates that, simsim is cheaper to produce than sunflower and cotton which is it's an added advantage.

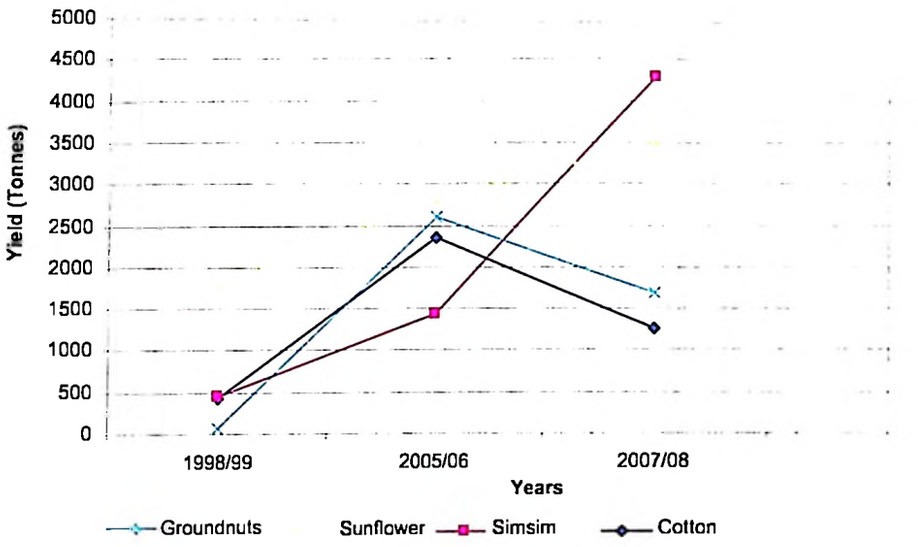


Figure 4: Production trends of smallholders oilseeds (tonnes) 1998/99-2007/08 in Kilosa District

Source: Kilosa District Council (2010).

Currently Sunflower and simsim crops are leading in production in the district, followed by groundnuts while cotton is the last in the list. Such increase was attributed to the fact that sunflower crop is increasingly considered as one of important sources of income in the district for reasons including climatic factors; the semi arid land which favours drought tolerant crops including sunflower and probably knowledge, which is disseminated through research, extension and training services.

2.5 Oil mills capacity and utilization in Tanzania

2.5.1 The concept of mills capacity

The rated or maximum capacity of the firm/mill is an engineering variable and is technically determined. Most mill manufacturers define capacity output in terms of quantity milled per unit of time. However, in Tanzania as in many other developing countries the work-day or work-week is not as standardized as in industrialized countries due to number of factors. For instance, lightning may make a night shift practically impossible for rural mills. Moreover, the rated capacity of the mills is a theoretical rate rather than feasible in the actual work situation. The same mills may, therefore, vary in their processing capacities depending on how they were locally manoeuvred (Bagachwa, 1991).

It is reported that in the urban cases, millers had stretched the manufacturer's ratings by increasing speed and feed rate, consequently, because the rated capacity is not uniquely determined it is found more useful to define the full capacity as an economic variable representing the desired level of output for a given mill. In other words, it is the rated or maximum annual capacity adjusted to the normal local conditions in the productive environment surrounding the miller (Bagachwa, 1991).

2.5.2 The concept of mills capacity utilization

The concept of capacity utilization is broadly related to the way in which fixed capital is used jointly with other factors inputs. The importance of capacity utilization lies not only in its relation to the choice of technology but also in broader issues of resource allocation and use. Although it is important to recognize

technological constraints imposed by the nature of production process on capacity utilization it is also worth noting that its influence ultimately depends on the interaction of other supply such as inputs, energy, wages, etc. and demand bottlenecks. Indeed, Bagachwa (1991) puts it clear that input supply factors have been found to be the principle determinants of individual capacity utilization in a number of manufacturing firms in Tanzania.

Msambichaka *et al.* (1995) report that some recent studies observed that the capacity utilization in the manufacturing sub-sector in Tanzania had risen to 75% by 1975 but drastically fell to only 25% ten years later in 1985. During the crises period in particular and to the sever shortage of imported inputs capacity utilization averaged between 20 to 30% only. The ERP I reforms and particularly those that enabled the importation of spare part and other inputs in the sub-sector managed to improve capacity utilization rates to between 30 and 40%. The recovery trend continued in ERP II where capacity utilization increased 38.7, 38.5 and 48.0% in 1991, 1992 and 1993 respectively. The ERP target was expected to reach 6-% in 1999.

2.5.3 The available oil mills capacity and utilization in Tanzania

Edible oil mills industry is being restructured under the International Development Association (IDA) supported by Industrial Restructuring and Trade Adjustment Credit. There are 42 mills with a total installed capacity of 424 000 tonnes per annum, currently however; the available capacity is estimated to be 200 000 tonnes per annum. Local oil millers are not able to compete within their margin possibly because of their higher fixed costs, unreliable electricity and low production of raw

materials consequently supply to the mills fluctuates considerably leading to underutilization mill capacity (Jayne and Minde, 2002).

The case of underutilization of mills capacity is also reported in grain mills varying between months of the year, as mill operators report that normally capacity utilization tends to rise during the first two months of after harvest season and gradually declines thereafter. Supporting the observation, 65% of millers pointed out irregularities in the supply of grains as the major source of capital idleness since the total volume of grain to be milled is made up of large number of small quantities thus production is lost because the mill is idle after one customer's grain is processed and before the grain of the next is fed into the mill (Bagachwa, 1991; Jayne and Minde, 2002). The same case is observed in the oil mills where the supply of raw sunflower to the oil mills is done by small scale farmers. It is clear also that most of the mills operate during the day only due to lack proper lightning during the night and adequate public transport and power interruption was, therefore, mentioned as another factor causing capacity utilization to be lower than desired. For instance, estimate by NMC branch officials at Mzizima and Pugu road mills revealed that 12 to 18% of total person hours might have been lost due to power interruptions and machinery breakdown.

2.6 The trends of value addition on oilseeds in Tanzania

Value addition on sunflower showed an increasing trend from 1986/87 and reached maximum in 1988/89 when value added sunflower amounted to about 1600 tonnes. By this time value of ground nuts and cotton amounted to 8000 tonnes and about

3700 tonnes respectively. From this year, sunflower and cotton production decreased while ground nuts increased up to 1991/92 (Fig. 5).

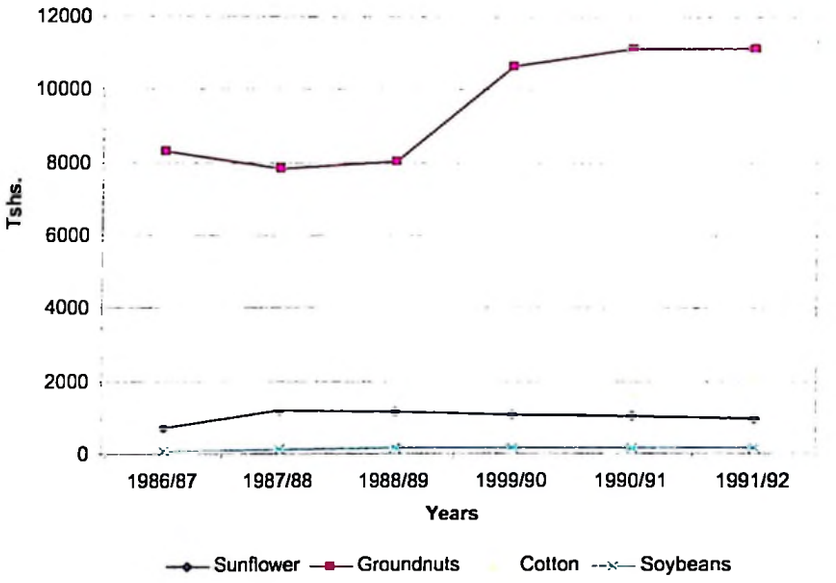


Figure 5: Trends of value addition to oilseeds in Tanzania 1986/87 – 1991/92 fixed 1990 price (millions Tshs)

Source: Jayne and Minde (2002)

2.7 Trends of export and import of edible oil in Tanzania from 1997/98 – 2000/01

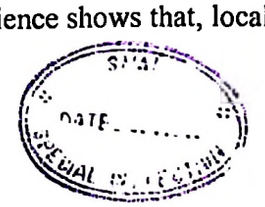
Edible oil import was far higher than export during the period from 1997/98 - 2000/01. Comparatively, export was really negligible and import fluctuated over the period being higher in 1998 and 2000 while it was lower in 1999 and 2001. Export was almost nil in 1999 and 2001 with relatively negligible fluctuation. In 1998, for example, oil import was 56 710 794 kg while export was 681 271 kg with the net oil import of 56 029 523 kg. The import of 2001 amounted to 25 272 410 kg while

export was 216 580 kg with the net oil import of 25 055 830 kg. On average, oil import during this period was about 60 times the export (TRA, 2001). Oil import was increasing year after year from 1998 and the country was almost net importer in 2001. This implies that domestically produced edible oils were progressively substituted by oil imports in the domestic markets over the period and its impact was the progressively decline in production and farmer income derived from oilseeds.

2.8 Effects of farmer characteristics on participation in value addition

2.8.1 Age of the farmer

Age refers to number years since one's birth (Nawe *et al.*, 2007). The age of the farmer has effect on planning and farming with view that older farmers are more risk averse than younger farmers, in such situation, therefore, younger farmers are more likely to adopt innovations. Meena *et al.* (2002) and Diederen *et al.* (2003) and point out that young and middle aged adults farmers volunteer to open the door for the subsequent farmer adopters than the over middle aged ones. The former category is made up of aggressive and energetic people who are eager to know and build up experience. Over middle aged adults tend to be conservative because they are much more risk averse to embark on new practices and they give more value their past experience. Mashimba (2007) in the study on evaluation of on farm processing of cassava reports that most aged farmers; men and women had reduced processing and marketing ability. However, age may play a negative role against one type of innovation but become positive in others, implying that given alternative innovations according to the farmer's age which meet the same challenge participation level can improve. Experience shows that, local technology employed in palm oil extraction in



Kigoma region for more than 50 years has been crashing the palm fruits (in local language known as *ingazi*), using a wooden device (in Kiswahili language known as *kinu*). In the process of palm oil extraction, a maximum of three strong women stand around this device each in turn vehemently pounding into the device using a round piece of wood to crash the boiled palm fruits. Then specifically women use their hands to squeeze the crashed pulp of fruits in order to extract oil. Obviously this is a tedious job selectively carried out by strong farmers.

Of resent, about two decades ago another, at least an improved technology was introduced. A piece of iron drum/barrel equipped with a branched wooden shaft is used whereby two to four middle aged persons hold firmly the handles of the shaft and move around the firmly and vertically fixed piece of iron drum. In doing so they rotate the shaft which then crashes the boiled palm fruits. In the process of crashing, crude palm oil drains and collects itself into containers fixed somewhere underneath the drum then refined by boiling and sieving. Once again, this work requires strong men particularly middle aged persons which, in fact reflect the age of the farmer. When user friend technologies are introduced say, an electric powered palm oil mill, as the case with sunflower oil and grain mills, the concept of age in this business would probably cancel out.

2.8.2 Sex of the farmer

Sex referred to as male or female, tends also to define types of socio-economic activities carried out in the particular society. In Africa, for example, males are still taking the lead in most profitable ventures. This may partly be due to relevant knowledge access asymmetry-favouring males than females, gender inequality in land tenure and wealth distribution. In addition most home activities such as family care lean to females.

Experience from Burkina Faso as reported by Sawadogo *et al.* (2002) indicates that women must often walk long distances of about 10 – 20 km in order to collect enough fuel woods for the home. Malcolm and Roy (2001) report that females at Orissa India cultivate small vegetable gardens or keep a few goats but they have so little land that any significant agriculture is impractical. There few opportunities for wage labour and most of the women are not encouraged to go out of the village in case. They earn five or ten rupees from their crafts, usually working with their whole families. According to the United Nations statistics; women perform 67% of the world's working hours; women earn 10% of the world's income; women are the two-thirds of the world's illiterates and women own less than 1% of the world's property (Meena *et al.*, 2002).

2.8.3 Education of the farmer

Education can be categorized as informal and formal the former being acquired from parents, relatives, friends etc. The later form of education is systematically acquired through widely recognized institutions at different levels. Formal levels of education

so far in place in Tanzania are: pre-primary, primary and secondary followed by professional levels. In Tanzania as in other developing countries informally educated persons (those who have never gone to school) and formally educated persons still exist at varying proportions depending on the places and culture of their origin. Majority of people with informal education and primary education dwell in the rural areas (Mohamed, 2009).

Education enables farmers to take up new technologies, access credits, communicate effectively, etc. (Mohamed, 2009) with least problems and educated farmers in this case, therefore, are in the better position of passing over the message to other farmers as the needs arise. This is because of high scope of understanding and doing. Educated farmer may also have a wide exposure through travelling and coming into contact with several resource people and centres. Diffusion of technologies among illiterate farmers on the other hand, may not be effected with the desired rate (Meena *et al.*, 2001; Asfaw and Admassie, 2004). Education, therefore, can be seen to have a positive correlation with adoption. In other innovation practices such as soil conservation in Tanzania, however, education was not seen a significant determinant of adoption (Mohamed, 2009). Nevertheless, it is positively correlated to adoption up to certain level beyond which it becomes negative. Furthermore, adoption can be influenced by extension services and not necessarily education, implying that a farmer with elementary education such as primary school education supported by effective extension services is likely to adopt innovation.

2.8.4 Farmer wealth

Farmer's wealth refers to socio-economic status of the farmer. Studies indicate that the higher a person's socio-economic level the more likely he/she is to adopt and diffuse improved practices. No doubt the farmers in the higher socio-economic groups are easier to work with as they may have more formal schooling and communication with them is easier. These people tend to ask for the help while those persons at the other end of the scale have to be sought out, informed about available services and persuaded to use them (Meena *et al.*, 2001).

2.9 Effects of farm resources on farmer participation in value addition

2.9.1 Capital

Capital is an essential requirement which imposes obstacle especially in small scale farming which is faced by stiff incredibility for credit support in the rural areas of Tanzania. Meena *et al.* (2001) report that farmer's stock of capital in some areas consists of equipment and animals used for the farm works. He further emphasized that, major capital items owned by the farmer and used in production of the target crop are very essential since farmers who own these items might be quite different both in intensity and timing of practices in which these capital items are employed from those farmers who have to depend on rented equipment. Experience indicates that in the production process, needs for cash, machinery, labour and other inputs take the higher priorities depending on the stage of production. Missing one of these in the right time marks beginning of or add to failure in production.

Small scale farmers in the rural areas depend on fewer in most cases one source of income such as sales from meagre crops harvests. Faced by multiple family obligations such a farmer remains with only little money for the next farming season. Jayne and Minde (2002) in their findings about perspective on agricultural transformation - a view from Africa report that lack of monetary income in the semi-subsistence agricultural economy clearly limits the emergence of new manufacturing and services activities. TARP II SUA Project (2005) reports that ownership of assets is important element in livelihood since they are used in absorbing shocks and as capital items in pursuing livelihood activities.

Giving experience from Tanzania, Rutatora *et al.* (2004) point out that peasants earn so low incomes that they cannot meet the basic needs of individual or the household. The crop booms in the 1950s and 1960s indicates that if there are strong institutions to support the peasants economy, for example, in marketing, processing, credit (Foltz, 2004; Kuzilwa, 2005) and supply of farm inputs, peasants will be highly motivated and they can increase output and social institutions. Some of the weak structure and institutions in Tanzania are markets, technology and land tenure which are the barrier to rural development. However, currently the government is working on the new law which will enable peasants to use their land as collateral to raise capital.

2.9.2 Farm size and labour

Peasant farms in Tanzania are very small ranging from one to two acres and quite often the land is not held in one continuous plot. Thus much is needed in land consolidation and registration of new but large peasant farms in the areas where there is still some unoccupied (Rutatora *et al.*, 2004). Farm size has influence on farmer adoption of new farm practices/technology. The percentage of farmers adopting new practices and the rate of adoption of such practices tends to increase with the size of the farm. It is highly probable that farmers on the large farms exert effort than the others to obtain the assistance of extension agents and specialists. They are in the position to spare spaces for practicing new innovations. Farmer with small scale farm may not volunteer to practice new technologies in order to avoid risks and uncertainties that may arise. Looking into the case at another angle, however, farm size imposes influences on adoption; for instance, small farms are suitable for labour intensive technologies since they relatively use more family labour which has a low alternative cost. Availability and the quality of labour have major impact on farmers' practices because they tend to determine the nature and kind of technology to be adopted by and disseminated among farmers. In many areas labour resources can be supplemented by hiring machinery, depending on the availability and cost of machinery services in order to attend critical operations (Meena *et al.*, 2001).

Cost resulting from farm operations is too high for most of small scale farmers to afford, in such situation they fail to follow recommendation of agricultural practices no matter how much skilful the farmer is. Temu (2005) reports that prices and transactions cost have impact on input usage, therefore, technologies mostly adopted

were those which had less cost (URT, 2006b). Experience from some areas of Kilosa district indicates that, land preparation alone which may include tilling, harrowing, herbicide and its application required about Tshs. 88 000 per acre in 2009. Sunflower seed and planting work required about Tshs. 22 000 giving a total cost, for land preparation and planting alone, of about Tshs. 100 000 per acre. The cost could go beyond that where planting did not coincide with optimal rainfall and necessitated re-preparation of land, repurchase of seed and replanting.

In the high uncertainty of rainfall, rain fed agriculture cannot perform well; therefore, while costs of production remain high the outputs drop significantly and cause losses. Price varies due location, time and market supply and demand. Prices closer to towns or high ways are usually higher than prices of the same products in the remote places. This situation is aggravated by condition of infrastructures such as roads, electricity and transport.

2.10 Effects of institutions on farmers participation in value addition to sunflower

2.10.1 Research and training services

Research is more concerned with developing recommendations and general guidelines which the farmer can adjust to their own circumstances. Knowledge of farmer circumstances is important for identifying priorities to be attached to various research objectives. If the research innovations are verified by farmers under, say, Farmer Extension Group (FEG) and /or Farmer Research Group (ERG) and made

public to other farmers and extension agents, chance of spreading innovation at a reasonable rate are great (Meena *et al.*, 2001).

FAO (2008) stresses that broad-based agricultural growth, requires significant and systematic efforts to diverse constraints of smallholders. Such efforts will enable small holders to increase farm productivity and meet new, more stringent demands regarding food safety and quality. Concurring with Abdoulage and Sanders (2005), Stewart *et al.* (2005) and Bamire and Mangong (2004), FAO (2008) further stresses that access to regular stream of technologies adapted to specific conditions contribute to increasing productivity, particularly in the context of limited land resources, and thus it is important for small scale producers. In the arid zone, for example, investment in improved technology and drought tolerant crops helps to reduce price and income variability by mitigating the impact of drought. Low levels of publicly funded agricultural research and development have severely impeded small farmers' access to productivity-enhancing technologies. Only a few smallholder farmers participate in contractual arrangement with buyers such as agricultural commodity value chains or out growers' schemes that facilitate access to improved, seeds, inputs and mechanization.

Experience from Sudan as reported by Pantuliano (2010) indicates that agricultural practices and skills are still rudimentary and people lack the knowledge and technology to make farming more productive. Experience from Thailand on farmers' capacity building for sustainable agriculture (SA) indicates that following strategies employed proved to be effective:-

(a) The farmer centre development - where farmers used as the centre of development by creating the opportunities, atmosphere and supporting factors for them in order to develop themselves at their full capacity including morality, capability and human security.

(b) Participation of the farmers – where farmers (the owners of the problems) play a major role in decision-making and managing their own affairs, while the others, such as governmental and non governmental organizations, private sectors, etc. play supportive roles by providing some guidance, comments, advice, information, field studies, training, etc. in order to help them make right decision. This participation creates a synergy of all human resources.

(c) Learning through action – the interactive learning process which includes rounding up people, brain storming, working together, summarizing the lesson learned and accepting the outcome together. This learning process helps very much the adjustment of the value, attitude, and the way of thinking and working processes of the participants not only the farmer but also the other involved.

(d) Networking of the farmer group – creates a horizontal relationship thus all farmer group members become friends easily, resulting in better interactive learning and managing process hence better communication, information flow, technology transfer, etc.

(c) Focus on self reliance – by wisely mobilizing social capital, local wisdom and natural resources for sustainable rural development.

(f) Action research by farmers – the research is conducted by the farmers with the advice from the relevant researchers in order to develop the site-specific knowledge and site-appropriate technology for SA, while new findings and experience derived from the field experiments are exchanged through interactive learning process among the farmers and relevant researchers (Rutatora *et al.*, 2004).

2.10.2 Extension services

Extension agents work closer with farmers and have direct contact with a larger number of farmers, thus high possibility of faster spread of innovations. Through extension agents it is possible to assess what recommendations have been adopted and which have been rejected by farmers and why and thus help in understanding important circumstances influencing farmers' use of new technologies. The task of extension service is, therefore, not to make decisions for farmers but to help them be in the position to improve their own decision making on the use of innovations.

Tiruhungwa *et al.* (2003) write that poverty may be explained as the state of lacking information, knowledge, and organisational skills. Poverty alleviation as a process must, therefore involve the mind of the individuals. The peoples' perception of the world, their own situation and the environment must change from dependent to self-reliant individuals. For the poor people to be able to change their own life they must

be able to change their mental pictures of the resources and capability around them so that they can initiate development and change as internally motivated process rather than decide for them. Self realization and self discovery on ones potential weakness and strength is an important starting point for the process of empowerment.

It is obvious that farmers who is closer or access the sources of technologies are likely to observe, learn and if they suite them they are more likely to adopt earlier than farmer who are far. In the study on linking small scale farmers to market - a case of Arumeru district, Kulindwa (2008) found out that getting information through extension contact has considerable influence on increasing the probability of agricultural products and that households visited by extension officers have higher probability of participating in agricultural by 24 times of those who were not visited. It is obvious, therefore, that farmers who are knowledgeable in a technology are more likely to adopt than those who are not.

2.10.3 Adoption of research developed technologies

Reij *et al.* (2002) report that, the transfer of technology model continues to dominate in most countries in Africa. This model implies that scientists generate new or improved technologies which are then transferred by extension agents to farmers. The study found that many of the technologies generated and promoted in this way are too expensive for the hundreds of millions of small-scale farmers who cannot afford to invest in the package of required inputs, such as introduced seed, fertilizer and pesticides. Moreover, these packages are often standardized and promoted countrywide, without regarding to agro ecological differences, and poorly suited to

the diverse and variable conditions of smallholders. As a result, most of these farmers have been reluctant to adopt the technologies offered by conventional research and extension.

Technologies which add unbearable costs are likely to be neglected by the farmers/users as Nikita *et al.* (2009) report that, demand for compost in Kumasi Ghana was estimated at about 11 000 tonnes per year based on the assumption that subsidies were provided. But without subsidies the actual demand was only 940 tonnes. It was eventually concluded that organic wastes and night soils were not an economically viable without some kind of subsidy.

Kirway *et al.* (2003) also report that in the last few decades researchers developed technologies which were relevant only for a limited number of farmers, consequently the adoption and impact of research-developed technologies at farmer level has been limited. The report further indicates that one of the reasons has been the level of farmer involvement in the agricultural research. Farmer involvement improves researchers understanding of farmer conditions and vice versa thus complements solely scientific and informal approaches.

TARP II SUA Project (2005) in her report on adoption of technology – the assessment of the effects of the projects one year after completion, insists on the need for researchers to view farmers as partners and collaborators who, if their role is considered in the project design, they can be instrument in spreading technologies to

non contact farmers and knowledge of constraints that limit adoption rate can assist design of future projects.

2.10.4 Marketing institutions

2.10.4.1 Historical aspect

At independence in 1961 Tanzania introduced an agricultural sector characterized by a large, semi-subsistence smallholder sector and small number of plantations and estates of export crops. The export crops were controlled by colonial authorities and Asian traders played an important role in crop marketing, resulting in some social tension. The cooperatives had grown quickly in 1950s partly in an attempt to circumvent the Asian traders' network. In 1962 the new government implemented the agricultural product control and marketing Act which established a three-tie single channel marketing system for maize, wheat, oilseeds and cashew nuts. Primary cooperative societies sold the scheduled crops to single cooperative unions which sold them to the National Agricultural Produce Board (NAPB). After unsuccessful attempt to set prices at several levels of the marketing chain the NAPB starting fixing in-store prices, allowing producers prices to vary according with cooperative costs, this led to parallel markets.

In 1967 the Arusha Declaration announced development strategy based on the principles of Socialism and self-reliance, and egalitarianism. Following this many private businesses were nationalized, including plantations, estates, importers/exporters, and food processors. The major milling corporations were nationalized and merged to form the National Milling Corporation (NMC). In 1973

the NAPB was abolished and its functions assumed by the NMC. Reacting to problems of financial management, high marketing costs, and late payment to farmers, the government dismantled the cooperatives and the three-tied marketing system in 1976 and the villages took the role of primary societies. This complicated the tasks of the NMC and the adverse effects on many sectors were stronger especially in 1980s when per capita production of export crops had fallen by 50% from their peak in 1970 (Bagachwa, 1991).

As from 1976 to 1986 the General Agricultural Export Company (GAPEX) took over the roles involving all operations from the farm gate to the domestic millers or the port ready for export. After 10 years of its operation, GAPEX was replaced by cooperatives which operated for about three years up to 1988/89 after which the cooperatives were replaced by private traders leading to disorganized oilseeds markets, poor prices and declining production. Currently, as reported by Jayne and Minde (2002), private traders, oil millers and co-operative unions are free to purchase oil seeds directly from farmers.

According to Barret (2007) and FAO (2008) an access to functioning markets for both staples and high value commodities is a key prerequisite for agricultural development and improved productivity. Market access differ among developing regions, with sub-Saharan Africa having the lowest access, particularly smallholders. In many developing countries, smallholder's participation is often constrained by: poor infrastructure and transport, inadequate and poorly enforced grades and standards; and poor farmer organization for bulky marketing. As an emphasis on

observing the quality standards on value addition, Bendantunguka (2010) argues fruit and vegetable processors to penetrate international markets with safe, clean and good quality products. The quality of sunflower oil depends on the condition of raw sunflower (Madadi, 1998) and the extent of refining procedure reached (Adebisi and Ajala, 2007). Latham (2004) reports that one of the solutions to increase productivity rests on both developing the local markets and raising prices of food crops which can be done through proper food processing. The report adds that 50% of population in Zambia for example, is now urbanized lead to new demand for processed food crops. One way to add value to food products is to transform them in ways which are more usable by urban dwellers.

2.10.4.2 Market channels

A market channel as defined by FAO (1997) is an institutional through which goods and services are marketed. Channels give place and time utilities to consumers and in order to provide these and other services, channels charge a margin. FAO (1997) further explains that channels are an integrative part of the marketer's activities and such are very important. They also give a very vital information flow to the exporters. The degree of control one has over the channel depends on the channel type which is employed. Whilst for developing countries, channels are almost given, this is not always the case, and as exporting becomes more and more necessary, it is not always the case. In deciding on the channel design the following have to be considered carefully:

- Market needs and preference
- The cost of channel service provision

- Incentives for channel members and methods of payment
- The size of the end market to be served
- Product characteristic required, complexity of product, price, perishability and packaging
- Middlemen characteristics – whether they will push products or be passive
- Market-end concentration and organization
- Appropriate contractual agreements
- Degree of control

Some important types of channel members relevant to agricultural marketing are: *Brokers* – They do not take title to the goods traded but link suppliers and the consumers. Brokers have many advantages and they can be less costly overall for suppliers and consumers. They are commonly found in international markets and especially agricultural markets.

Personalised trading net works – Build up relationships between a buyer and a seller, in which overtime as confidence grows, unwritten and informal understandings develops. These relationships reduce information, bargaining, monitoring and enforcement costs.

Associations, voluntary chains and cooperatives – They can be made up of producers, wholesalers, retailers, exporters and processors who agree to act collectively to further their individual or joint interests.

Contracting – Represents an intermediate institutional arrangement between spot market trading and vertical integration. Marketing and production contracts allow the degree of continuity over a season, cycle or other periods of time, without the instantaneous of sport trading. The two main types of contracts are:

(a) Forward markets contract – These involve commitments by buyer and sellers to sell and purchase a particular commodity over a stated period of time, usually with specification of weight, volume, standards and value.

(b) Forward resource/management contract – These arrangements combine forward market sale and purchase commitments with stipulations regarding the transfer and use of specific resources and/or management functions. Both types of contacts reduce the risks on both the buyers' and the sellers' side.

Integration – Vertical integration involves the combination of two or more separate marketing or production components under common ownership or management. It can involve investment "forward" or "backward" in existing activities or investment in interlinked activities. Integration horizontally means the linking of marketing or production separable at the same level in the system, for examples a group of retailers.

Government – The government can take a leading role in the distribution of goods and services via state owned marketing boards. It may provide an infrastructure which the private sector just cannot afford, for example, roads, utilities, training and extension. Government has the sovereign authority the regulatory frame work within which commodity or agricultural export systems can be developed and so on (FAO, 1996, 1997).

According to Timmer *et al.* (1983) market channels for one or different commodities in the regions indicates the link connecting one price series with another knowing where and when crops are sold, their storage, transport destinations, buyers and the ultimate users. They are important in understanding which firm or dealers are engaged and they can be used to describe not only the movement of commodity but also information flows and the location of storage and processing facilities in the channel. The identified market channel patterns may help in identifying opportunities and constraints faced by producer, traders and/or consumers.

2.10.4.3 The current market channel for sunflower

For the case of sunflower in Tanzania the marketing channels comprises of producers, storages, processors, transporters, intermediary traders and consumers/final users. Some sunflower producers decide to add value themselves to the produce instead of selling it raw while others due constraints sometimes beyond their control do not. The sunflower oil is sold to the final consumers in the villages and intermediary traders who collect and sell in large quantity to retailers and /or the final consumers in towns. They usually reach town market by roads using hired transport services which in most cases available by chance. Sunflower seedcake is also collected by intermediary traders and transported to town for livestock feeds processing. Raw sunflower moves to large scale millers in towns through intermediary traders who under take large scale value addition to the produce and the final products are distributed to the final consumers/users through wholesalers and retailers. However, URT (2009) report indicates that market access is one of

hurdles that smallholders have to overcome. The problem is multi-faceted; producers are commonly faced with poor infrastructure to reach markets, barriers in penetrating markets due to limited resources, lack of marketing information and few support mechanisms.

2.10.4.4 Market information

Market information is referred to as data on prices, qualities and quantities exchanged dully processed and made available to the market participants, reflecting the current conditions on supply, demand, price trend movement and any other information pertaining to trade. Access to market information, therefore, assists a farmer in making decision on the type of crops, the quantity and quality to produce and the time which maximizes revenue (ICT-Update, 2010).

Although agriculture is a vital source of revenue in ACP countries, agriculture and rural development receive scant coverage of the media (CTA-Spore, 2009a). It is obvious that producers who keep truck of market prices stand to make more money. ICTs, particularly mobile phones, e-mail and the internet, are radically changing the way farmers sell their products in some ACP counties. The linking local learners (LLL) initiative link all those involved in the supply chain – farmers, buyers, transporters, traders and retailers and it encourage them to learn from each other. Uganda Rural Information System, which uses ICTs to distribute information on agricultural commodity markets, has developed a Train-Trainers System so that farmers can make the best use of the service.

In the Northern Ghana, the Eastern Corridor Agricultural Market Information Centre use mobile phone to transmit market information to 24 community based farmer-cooperatives. The leaders organize meetings with their members to interpret market prices for the benefit of illiterates and discuss what action to take (CTA-Spore, 2009a). Small-scale farmers in many ACP countries have inadequate access to markets. Their lack of access to information market data leads to inefficiencies, both on the farm and in the marketplace and therefore, makes the large difference in what is produced and what is demanded by consumers. This in turn results in shortage or surplus of produce in the market, creating instability in price of agricultural foods and consequently farmers' incomes. Farmers need to know what the market demands in order to determine what, when and how much to produce. They need access to information about prices, trends in the markets, and quality standards in order to capitalize on market opportunities, increase incomes and enhance food security (ICT-Update, 2010).

TradeNet, the innovative agricultural market information service in Africa allows producers and traders access prices and offers via their cell phone. The scheme launched by Ghana software firm Busy Lab, with support from CTA and other organizations reflect the soaring use of mobile telephone in Africa, currently put at 60% of the population, up from 10% in 1999. Subscribers to the TradeNet service sign up for free SMS alerts. Producers wanting to sell a commodity can post an offer, while those interested in buying request prices, which are provided in real time from contacts in 380 African markets. Potential sellers and buyers receive instant alert as soon anyone else on the network submit an offer that matches (CTA Spores, 2007).

Market Information Service (MIS) in Tanzania is under the ministry of industry and trade. Other agents involved in provision of market information include: Business Information Service (BIS) and Agricultural Marketing System Department Programme (AMSDP). Currently, the collection and dissemination of agricultural information is focused on data collection, analysis and dissemination for planning purpose at the national level. Agricultural Statistics Unit (ASU) and Early Warning and Crop Monitoring Unit (EWCU) both under the ministry of agriculture, food and cooperatives and National Bureau of Statistics (NBS) undertake also various production surveys mostly for that purpose. URT (2006b) reporting on crop marketing problems writes that market access problem accounts for 75% followed by market information problem in rural area of Tanzania.

2.11 Constraints faced by oil millers in Tanzania

2.11.1 Oil imports

Domestic oil millers have found increasingly difficult to procure oil seeds at prices lower enough to compete with imported refined oil. In other words, domestic oil millers are not protected enough against excessive edible oil imports as compared with other African countries. The Kenyan oil millers, for example, are protected by higher tariffs of about 60% on refined oil imports. In Tanzania crude oil is subjected to no duty and refined oil incurs a duty of only 20%. The main exporters include Indonesia, Malaysia and Philippines (Jayne and Minde, 2002). The situation gives the way for imported subsidized edible oil to flood in the domestic markets thus drastically reducing the possibilities for domestic small scale farmers to market the their edible oil even within their country. Tanzania import of edible oil was 46% and

50% in 1998 and 2001 respectively, implying that domestic farmers lost their domestic market opportunity by 46 % and 50% in those years (TRA, 2001).

2.11.2 Highest tariffs for electricity

Electricity supply as part of the infrastructure is essential for commercial and modern agriculture, unfortunately however, Tanzania is reputed to have the highest tariffs for electricity in the Sub-Saharan Africa and therefore discourages not only pumping water for irrigation, but also any technological advance on the farm including agro-processing. High tariffs for electricity make Tanzania products uncompetitive in East Africa and SADC countries. In addition to the highest tariffs, supply is not reliable in some regions of the country being most serious in the rural areas. In such situation local millers are not able to compete within their margin possibly because of their higher fixed costs, partly due to power interruptions, a consequence of underutilized capacity (Jayne and Minde, 2002). According to URT (2009) report, electrification is still low and unreliable in Tanzania. The national grid which is the mainstay of power transmission in the country is still having limited coverage thus most of households particularly in the rural areas do not access it as presented in Table 1.

Table 1: Percentage of households connected to the electricity grid in 2001 and 2007

Year	Dar Es Salaam	Other urban areas	Rural areas	Mainland Tanzania
2000/01	58.9	29.7	2.0	10.0
2006/07	50.8	25.9	2.5	12.1

Source: United Republic of Tanzania (URT) (2009)

2.11.3 Taxes on agriculture

Taxes on agriculture are other factors that inhibited agriculture over the years. The study carried out by a committee under the prime minister's office lists 55 different taxes, levies, fees and license fees, animal fees, land fees, land rents and forced contributions which the farmer has to pay. Comparing with other countries the committee found out only 4 such imposts in South Africa, 7 in Zambia and 25 in Morocco. In order to encourage agriculture, most governments which impose taxes on produce plough back such revenues in to the specific sub-sector by way of financing research and provision of extension services. In Kenya, for instance, 95.7% of coffee derived revenue goes back into the industry in this manner, Uganda 92.1%, Costa Rica 100% and Guatemala 97% but a mere 37.2% in Tanzania (Mtei, 2004).

The World Bank (1997) urges that adjustment programs should pursue agricultural reforms that reduce the taxation of farmers, facilitate their access to inputs and ensure the timeliness of payment to them. It further argues that agriculture is still taxed too highly and there is government intervention in crop marketing and input

distribution. It is, therefore, particularly important to eliminate marketing costs arising from unnecessary regulations. Taxation and/or restriction of agricultural produces to penetrate markets, however, have been serious in cercals and traditional crops but this has not been reported in oilseeds particularly sunflower crop.

2.11.4 Rural infrastructure

Poor transport network do retard seriously the diffusion of innovation related to it. If innovation improves will increase the marketable surplus substantially, the need for haulage increases dramatically. Without good roads, therefore, such haulage is expensive and is likely to reduce the rate of diffusion of the new packages of practices. Poor infrastructure also impedes the effective visits to remote areas and hence dissemination of messages, follow-up and getting feed back as need arises are highly obstructed. World Bank (1997) argues that farmers are likely to respond more rapidly to improved investment incentives if rural infrastructure is good, property rights are secure, public and private institutions are strong, appropriate technologies are available and if input factor and product markets work well. FAO (2007b) reports that environment within which farming operates is affected by; among others, the development of infrastructure and access to markets. This is further explained by FAO (2008) that rural roads and storage facilities are essential public goods that reduce marketing costs and expand economic opportunities to all households

Of recent the government of Tanzania has given a due consideration on improving road network including primary, regional and national roads in different parts of the country. As reported by URT (2009) that condition of the primary roads network (trunk and regional roads) has been gradually improving. The percentage of trunk and regional roads in good and fair conditions has been increased from 51% (good 14%; fair 37%) in 2000 to 85% (good 48% and fair 37%) in 2007. These are roads under jurisdiction of TANROADS. Available data from 2007 on district, feeders and improved unclassified roads which are under the jurisdiction of local government authorities indicate that 55.2% of this net work is in good and fair condition. The current results show that almost half (44.8%) of this network remains in poor condition.

2.12 Summary and research gap

Oilseeds are grown worldwide as a food and cash crops (FAO, 1999; Maliyamkono and Mason, 2006; IFAD, 2008). In Tanzania the crops are the third most important after cereals and traditional export crops produced almost in all regions. Sunflower which is one of the important oilseeds is highly grown in Dodoma, Singida and Morogoro. Kilosa leads in sunflower production in Morogoro region (URT, 2002b).

Over the period of 2001-02, national agricultural policies in the developing countries focused on promotion of export and /or import substitution, farm income support, stimulation of production and boosting value added production FAO (2003c). So far, however, the extent of boosting value added production especially sunflower at farmer level was not known. Kilosa district council crop production plan including

oilseeds over 5 years from 2005 to 2009, for example, focused on the acreage cultivated and the resultant yield, but didn't comprise of any element of value addition in the district, although the activity is practiced by some farmers. Back in 2001, for example, Tanzania import of edible oil was 50% (TRA, 2001) mainly from Indonesia, Malaysia and Philippines (Jayne and Minde, 2002). So far import of edible oils is still overwhelmingly large! To what extent does this affect sunflower farmers in the rural areas? Bendantunguka (2010) argues processors to observe the quality standards on value addition such as safe, clean and good quality products in order to penetrate international markets. But are sunflower farmers well knowledgeable about production, processing and marketing? Boland *et al.* (2001) reports that about 80% of sunflower's value in India come from its oil, supporting this IFAD (2008) reports that agro-processing gives higher economic returns.

Despite all this, resent observations indicate that sunflower farmers in the sunflower potential rural areas of Tanzania were still choosing whether or not to participation in the value addition to sunflower which they produce. Probably the reasons for their choices were basic, but what are the reasons? FAO (2008) stresses that there should be significant and systematic efforts to diverse constraints of smallholders to enable them increase farm productivity and meet new, more stringent demands regarding food safety and quality. It, further, stresses that smallholders' constraints are not all unique; but some are agro-ecological and individual smallholder specific which require through studies and thereafter, addressed accordingly. This was the essence of this study.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Introduction

This section gives description of the procedure used in conducting this study including the description of the study area with emphasis on location; population, climate and economic activities. Furthermore, rationale for selecting Kilosa District as the study area is also covered under this section. Research design and sampling procedure as well as data collection and analytical tools, and challenges encountered during the survey are also covered.

3.2 Description of the study area

3.2.1 Location and Population

Kilosa is one of the six districts in Morogoro region located 300 kilometres West of Dar es Salaam and found in the North of Morogoro between 6° and 8° South and between 36° and 37° East. It is bordered by Mvomero district in the East, Kilombero and Iringa districts in the South and Mpwapa and Kongwa districts in the West and Kiteto in the North (Fig. 6). It has a total area of 1 400 000 hectares which is 20% of the total area of Morogoro region and includes an arable land of around 530 000 hectares, grazing land of around 480 000 hectares and the remaining covers national park, forests and wasted land. The district comprises of nine divisions including Nongwe, Gairo, Magole, Kimamba, Kilosa, Masanze, Ulaya, Kidete and Mikumi. These divisions comprise of 37 wards, 161 villages and 1040 neighbourhoods. The district has a population amounting to 476 493 and an average of 2960 per village.

The main ethnic groups are Kaguru, Sagara, Vidunda, Gogo and Maasai while the small ethnic groups include Ngoni, Rundi, makonde, Hehe and Pogoro.

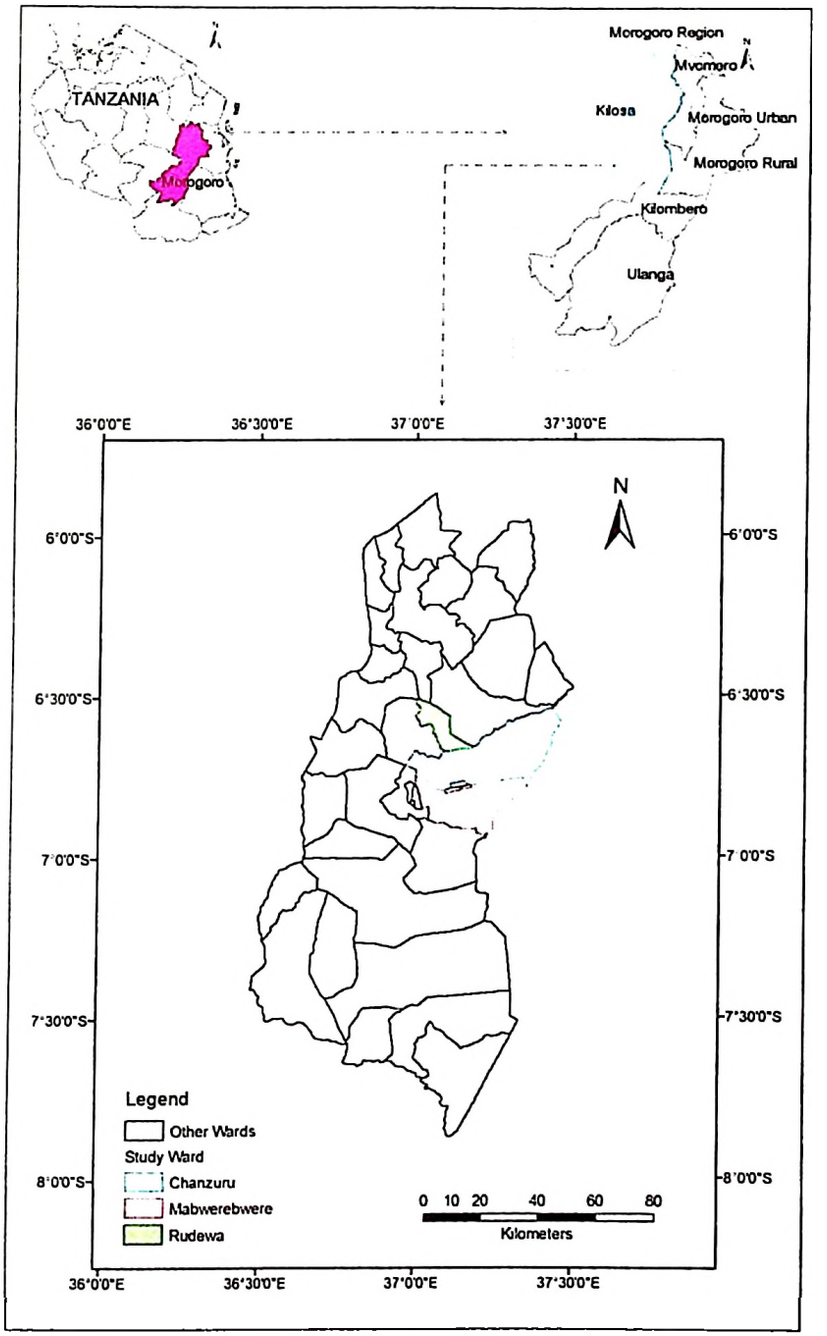


Figure 6: Map of Kilosa District showing the study area
Source: United Republic of Tanzania (URT) (2009)

3.3 Rationale for selecting Kilosa District as the study area

Kilosa leads in sunflower production in Morogoro region, contributed 75% of the total tonnage in 1998/99. The district is progressively prone to scarce rains which can be tolerated by sunflower (URT, 2002b). In addition to that sunflower is one of the major cash crops particularly in Kilosa and Morogoro Region in general. The study covered eight villages within two Divisions as follows: - Kimamba Division included Rudewa-Batini, Rudewa-Mbuyuni, Rudewa-Gongoni, Peapea, Madoto, Chanzuru and Ilonga-Msalabani villages. Masanze Division which include Kondoa village. Farmers in these two Divisions have been participating in the cultivation and value addition to sunflower crop for longer period than in other Divisions probably due to availability of research, training and relatively more effective extension services. In addition to that majority of oil press machine, following accessibility to electricity and main road network are concentrated in these Divisions particularly Kimamba.

3.4 Research design and sampling procedure

The research employed a cross-sectional study design and a purposeful sampling procedure. This technique was used because the response variable is categorical involving participating and non participating farmers in the local processing/value addition of sunflower crop in the study area. A sampling frame for participating farmers was obtained from record of the farmers who brought raw sunflower to the oil press centres and a sampling frame for non participating farmers was obtained from a list of all farmers who cultivate sunflower in each village. A sampling frame for oil press centres (millers) was obtained after a preliminary survey of the selected divisions in study area.

3.4.1 The sample size

Determining sample size is a very important practice because samples that are too large may waste time, resources and money, while sample sizes that are too small may lead to inaccurate results (Liwa, 2008). The study employed a purposeful sampling technique for drawing samples from both participating and non participating farmers in local value addition of sunflower crop as well as oil miller.

Frankfort-Nachmias and Nachmias (1996) and Kothari (2004) cited by Mpamila (2007) have indicated that social science researchers subjectively select purposeful (judgment samples) in an attempt to obtain a sample that appears to be representative of the population. In this case a chance that a particular sampling unit will be selected for the sample depends on the subjective judgment of the researcher. The underlying assumption is that the selected sample continues to be representative of their respective entire population. The overall sample size drawn from eight villages was 205 units including 100 participating farmers, 100 non participating farmers in the value addition of sunflower produce and five sunflower oil millers who provide oil press services to farmers in the study area.

Equal allocation of participating and non participating farmers in the eight villages was determined by:

$N_i = N/n_i$ .....(i)

Where: N_i = Number of sampling unit in each village,

N = Total number of sampling unit (farmers) from eight villages,

n_i = Number of villages.

The number of sampling unit in each village (N_i), therefore, was

$N_i = 200/8 = 25$.

That means a total of 25 sunflower farmers including both participating and non participating in value addition were drawn from each village.

3.4.2 Pre-testing

District and Village officials and owners of the oil press centres (millers) were visited in order to introduce the study objectives and obtained brief useful information on how to conduct a pre-testing exercise. A total of 20 farmers (10 from each category) and all rural sunflower oil millers were interviewed to establish reliability of the questionnaires. Some details in the questionnaire were changed according to the common understanding of farmers, for instance some units of measurement, start up and operating capital and time series data.

3.5 Data collection and analysis

3.5.1 Data collection

Primary data on socio-economic and institutional factors were collected from participating and non participating farmers in local value addition of sunflower produce as well as from owners of sunflower oil press centres using structured questionnaire, through scheduled interview and observations. Secondary data were gathered through literature review and various relevant reports available in Kilosa district council, agricultural research institute (ARI)–Ilonga, Ministry of agriculture training institute (MATI)-Ilonga, Ministry of agriculture, food and cooperative and Sokoine national agricultural library (SNAL).

3.5.2 Data analysis

Both quantitative and qualitative primary data were analysed using statistical package for social science (SPSS) computer programme to execute descriptive statistical results related to hypothesis (a), (c), (d) and (e). While STATA computer programme was used to estimate the logit model. The model was used to test the research hypothesis (b) that: socio-economic and institutional factors influence farmer participation in value addition to sunflower produce in the rural areas. The logit model was used because:

(a) Dependent variable in the study is categorical and binary with value yes and no representing participating and non participating farmers respectively.

(b) As with other statistical techniques, the model can also be used to explain the relationships between independent variables which are continuous, binary or categorical to the dependent variable (Mwigane, 1996; Dehaan *et al.*, 2006, 2007).

The model tests the probability of the farmer participation or non participation in value addition to sunflower produce in the rural areas, i.e. P(FPVA=1) if participate or 1-P(FPVA= 0) otherwise. The probability of farmer participation in value addition (FPVA) is given as:

$$FPVA = \alpha + \sum(\beta_K X_K + \beta_K D_K) + \varepsilon \quad \text{.....(ii)}$$

Where:

FPVA = Vector of probabilities that a farmer would choose to participate in local value addition on sunflower produce (i.e. Yes = 1, if participating and No = 0, otherwise).

X_K and D_K =Vector of quantitative and qualitative explanatory variables respectively:

Educat (X_K) Farmer education level (years of schooling),

Househs (X_K) Households size (number of members),

Distance (X_K) Distance to the sunflower oil mill (km),

Age (D_K) Age group of farmers: age 3(>50) = 1, age 1 (<30) = 0) and age 2 (30 – 50) = control,

Sex (D_K) Sex of the farmer (male = 1, female = 0),

Sourckno (D_K) Sources of farming skills (formal = 1, otherwise = 0)

Poorknow (D_K) Poor knowledge on sunflower processing (yes = 1, otherwise = 0),

Poorminf (D_K) Poor access to market information (yes =1, otherwise= 0),

Pricetre (D_K) Price trend (1= Increase, Otherwise = 0)

Sourcinc (D_K) Sources of income of farmers (crops only = low income, crops and non crops = high income (1= crops only, otherwise = 0)

Note: D_K = Dummy variable

β_K = Regression coefficients indicating importance of X_K and D_K

k = Number of explanatory variables included in the model

α =Constant term and ε=Error term

3.6 Challenges during research period

The research encountered some limitations including delayed funds for conducting research which forced reallocation of available personal meagre funds to fill the gape in order to meet the challenge and ensure that research go ahead as planned. The challenge included also lack of individual farmer recorded information on value addition activities in such situation it was necessary to base largely on retrospective information. The data collection coincided with floods tragedy occurred in Kilosa district rendering many homes closer to Mkondoa river basin displaced. The victim farmers were so disturbed-shifting their family and properties to the new temporary settlements, collecting relief aids, meeting with district and national officials, etc, that they had little time for interview and since it was a scheduled interview, data collection period was extended so as to cover all respondents.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 Introduction

This chapter covers broadly the report, discussion and interpretation aspects of the study results first from descriptive statistical analysis on the available processing capacity and utilization; factors influencing farmer participation in the value addition to sunflower produce with special emphasis on the characteristics of the sample surveyed farmers, availability of land and distribution among farm and off farm activities, capital and sources of farmer's income, sources of labour, distance to the sunflower oil mills and transport. The emphasis is also on harvests and processing of sunflower, marketing of farmer processed sunflower in the market area of Tanzania, and constraints faced by sunflower oil millers. Second and last covers the report, discussion and interpretation of the result based on the logit and probit models estimates. Since the logit and probit estimates are similar with exception of magnitudes, the logit model estimates are selected for reporting, discussion and interpretation.

4.2 Available sunflower oil mills capacity and utilization in the study area

Currently the study area has six sunflower oil mills of which five are privately owned by individual business persons and one is owned by Agricultural training institute (MATI) - Ilonga. Five of these mills are located at Rudewa Gongoni village (1), Kimamba Village (1) and Ilonga village (3) in Kimamba division. Sunflower oil mills started operations between 2004 and 2008 after the small industry development

organization (SIDO) had stopped its operations in the area. As explained above, the oil mills are almost concentrated in the same area serving more than 33 scattered villages each having an average of 2960 people majority of which are farmers. Installation of mills almost in the same area is probably attributed mainly to availability of electricity, main roads connecting the district to Morogoro and other important towns, and presence of agricultural institutions.

According to the manufacturer's 6YL- 95 oil press ZX-10 operation manual, machines of Chinese original, have the capacity which ranges from 21 600 to 24 000 kg with an average of 22 800 kg per day and can deliver oil output of 28 – 35 litres per 100 kg of raw sunflower which is equal to oil output of 20 – 25 litres per 70 kg of raw sunflower. The study analysis shows that one bag of raw sunflower in the study area was packed at an average weight of 70 kg which produced 20 to 25 litres of oil.

The present capacity of the sunflower oil mills in the study area ranged from 1260 to 3360 kg equivalent to 18 – 48 bags of 70 kg per day (12 hours). The total present processing capacity in the area was 11 280 kg (143 bags). The study revealed also that although there were few sunflower oil mills in the area only 32.27% of the total present processing capacity was utilized at peak period and only 14.27% is utilized at period of scarce raw sunflower (Table 2).

Table 2: Distribution of sunflower oil mills by village, capacity and utilization in the study area in 2010

Oil mill	Location (Village)	Present capacity kg/day	Utilized capacity at peak kg/day	Utilized capacity at trough kg/day
1	R/Gongoni	1 260 (18)	560 (8)	350 (5)
2	Ilonga	2 040 (29)	560 (8)	210 (3)
3	Manzese	3 360 (48)	840 (12)	420 (6)
4	Kimamba	1 260 (18)	420 (6)	210 (3)
5	Ilonga	3 360 (48)	1 260 (18)	420 (6)
Total		**11 280 (143)**	**3 640 (44)**	**1 610 (23)**
Percentage			32.27%	14.27%

Note: Figures in the parentheses are number of bags of raw sunflower of 70 kg each milled in a day (12 hours).

Under utilization of the present capacity is attributed to many factors including little quantity of sunflower produced, for instance the harvests per farmer in the year 2008/09 ranged between 1 and 20 bags with a mean of 6.5 bags. This statistics on harvests, however, reflects the land size allocated to sunflower in that year which, to some farmers it was as low as 0.5 acres and the maximum of only 5 acres with the mean acreage and standard deviation of 1.3 and 0.6478 respectively. Other factors include the long distance and poor transport to the sunflower oil mills. These factors influenced farmer participation in value addition of sunflower produce.

The study results indicate also that 3 out of 5 oil mills equivalent to 60% use both hired and family labour. In most cases the supervisor position is held by a family member. The results indicate also that, four out of five sunflower oil mill enterprises

employed female supervisors and all enterprises employed male machine operators, each position occupied by one person giving a total of two employees per enterprise. This implies that in this business women are more trusted than men to hold a supervisory position. On the other hand, however, men are considered to be more capable of doing tough jobs than women. In order to utilise the economies of scale, however, most of mill enterprises combine up to three different mill machines (for maize, paddy and sunflower) under one supervisor but one operator per mill machine.

4.3 Constraints faced by sunflower oil millers

The study identified constraints faced by sunflower oil mills in the study areas which included the breakdown of oil press machine, frequent power cuts, high running cost and scarce sunflower. The owners of the oil mills ranked the frequent breakdown as problem number one followed by frequent electricity cuts and high running cost and lastly scarcity of raw sunflower. They also ranked some complaints from their customers on oil press services whereby the first was delayed services when the machine operator waits for accumulation of sunflower up to certain quantity. The second ranked complaint was low oil output per bag of raw sunflower in some oil press machines. Following this problem some customers shifted to other relatively more efficient machines. The third complaint was inconsistent work time table which occurred due to breakdown of machine, absence of machine operator, etc.

4.4 Factors influencing farmer participation in value addition to sunflower

The factors include farmers' social and economic characteristics and institutional factors. The social factors are: age of the farmer, sex, level of education, household size, skills and experience in sunflower processing and resources endowment. Economic factors are: prices of both raw and processed sunflower, incurred cost, farmer capital and sources of income. Institutional factors include contributions rendered by research, training, extension and marketing services as assessed by farmers in the study area.

4.4.1 Characteristics of surveyed farmers

4.4.1.1 Age of a farmer

Table 3 presents a distribution of sample surveyed sunflower farmers by their age in the study area. The ages are presented into three groups; below 30 years, 30 – 50 years and above 50 years for convenience of identifying the most active age group in the sunflower farming community. The study indicates that the overall age mean of sunflower farmers was 43 with a standard deviation of 11.744 reflecting an active working age. The study results in Table 3 indicate that most of sunflower farmers (74% of participating and 64% of non participating farmers in value addition) giving an average of 69%; were aged between 30 and 50 years old. Age has implication on the role and responsibilities in the society, for instance, farmers of age below 30 years have little family responsibilities. Oldest farmers are no longer able to effectively hold family responsibilities and in most cases they depend on the family to which they belong. Both age groups in this case participate little in the family's economic activities such as farming, mining, etc.

Table 3: Distribution of sample surveyed farmers by age in the study area in 2010

Age group	Percent		Total	Average percentage of farmers
	Non participating farmers	Participating farmer		
Below 30	9	11	20	10.0
30 – 50	64	74	138	69.0
Above 50	27	15	62	21.0
Total	**100**	**100**	**200**	**100.0**

It is obvious that most aged farmers; men and women have reduced processing and marketing ability. However, age may play a negative role against one type of innovation but become positive in others, implying that given alternative innovations according to the farmer's age which meet the same challenge, participation level can improve. There is a difference, however, between non participating and participating farmers within this range of age. The actively working age group comprises of more farmers who participate in value addition of the crop than the non participating farmers. This implies that within the most actively working age group more farmers were positive to value addition, and hopefully if other factors could become supportive participation level would rise.

4.4.1.2 Sex

Table 4 presents distribution of sex of the sample surveyed farmers in the study area. Sex is referred to as male or female, and tends to define types of socio-economic activities carried out in the particular society. The study results indicate

that most of sunflower farmers (70% of participating and 68% of non participating farmers) with an average of 69% were males. It also indicates that 70% of farmers who chose to participate in the value addition were males.

Table 4: Distribution of sample surveyed farmers by sex in the study area in 2010

Sex	Percent		Total	Average percentage of farmers
	Non participating farmers	Participating farmer		
Males	68	70	138	69.0
Females	32	30	62	31.0
Total	**100**	**100**	**200**	**100.0**

The reason for poor participation of female farmers in sunflower production and value addition may partly be due to relevant knowledge access asymmetry-favouring males than females and most home activities such as family care leaned to females. Comparatively, female farmers have less contact hours by extension officers; have little chance for attending short courses, seminar, study tours on improved agricultural practices organized by research and training institutes and little chance of accessing market information. In addition, they are still having little chance for attending agricultural shows through which they can learn from other business persons. Generally, female farmers seem to have little exposure to agribusiness.

4.4.1.3 Education

Table 5 presents a distribution of sample surveyed farmers by their levels of education. The levels of education are in three groups; informal, primary and secondary and above because all three levels are available in the study area although primary level overwhelmingly dominates. The study results indicate that most of sunflower farmers (83% of participating and 87% of non participating farmers) with an average of 85% had a primary education while 2.5% and 12.5% had informal and secondary education and above respectively. This is because majority of the villagers had primary education and since majority have limited capital and they are not employed in the formal sectors, crop farming was the best source of their food and income. The few with secondary education and above participated less in the farming probably because the category is employed in the formal sectors thus had little time for involving in sunflower farming or were also engaged in other farming activities such as livestock keeping.

Table 5: Distribution of sample surveyed farmers by their levels of education in the study area in 2010

Education level	Percent		Total	Average percentage of farmers
	Non participating farmers	Participating farmer		
Informal	0	5	5	2.5
Primary	87	83	170	85.0
Secondary And above	13	12	25	12.5
Total	**100**	**100**	**200**	**100.0**

The result implies also that majority of the villagers in the study area had primary and that they depended on crop farming as a source of food and income, on this grounds therefore, the first target group which should be supported in sunflower production and value addition is the primary school leavers. This type of group, however, can learn best through participatory approach.

4.4.1.4 Household size

Table 6 presents a distribution of sample surveyed farmers by household size.

The household size is divided into three groups for convenience of identifying the range of household size and associated effects in sunflower farming community. The results indicate that most of sunflower farmers (67% of participating and 61% of non participating farmers) with an average of 64% in the study area comprised of 5–9 members. The overall mean of the households is about 6 members and standard deviation of 2.191 per household. Other farmers' households in the area, that is, 32.5% and 3.5% had household members below 5 and above 9 respectively. Household size may have influence on participation in particular economic activities, for instance large sized households may give food production, say cereals, a first priority in order to guarantee household food security. Small sized households, on the other hand may give cash crop or off farm activities the first priority and decide to buy food. A medium sized household may probably easily organize itself in order to attain the set goals. This, however, is possible if it comprises members who able and ready to work hard.

Table 6: Distribution of sample surveyed farmers by household size in the study area in 2010

Household size	Percent		Total	Average percentage of farmers
	Non participating farmers	Participating farmer		
Below 5	35	30	65	32.5
5 – 9	61	67	128	64.0
Above 9	4	3	7	3.5
Total	**100**	**100**	**200**	**100.0**

Comparing the two categories of participating and non participating farmers the former had more of medium sized households with members ranging from 5 – 9 and ability to use more of hired and family labour. Generally, however, most of farmers interviewed used family labour reflecting the typical characteristics of small scale farming particularly in the least developed countries.

4.4.1.5 Farming knowledge

Table 7 presents a distribution of farmers by their farming knowledge. Respondent were required to yes if had adequate farming knowledge and No otherwise. The study results in the table indicate that on average, 85% of the farmers had inadequate sunflower processing knowledge. This was more serious among non participating farmers in the value addition since 95% of them admitted to have inadequate knowledge on sunflower processing. Comparatively, 75% of participating farmers in the value addition had no adequate knowledge. Majority of interviewed farmers said that inadequate knowledge was due to poor access to relevant sources of knowledge – the research and training institutes, and extension services. The argument is true

especially for the villages such as Rudewa gongoni, Rudewa batini, Rudewa mbuyuni, Rudewa peapea, Madoto and Kondoa which are far away from the institutes. It is also true for new sunflowers farmers who have recently decided to produce the crop for the purpose of value addition. Other few farmers were lack to acquire farming knowledge on sunflower especially those who are closer to the institutes.

Table 7: Distribution of sample surveyed farmers by their farming knowledge in the study area in 2010

Adequate farming knowledge	Percent			Average percentage of farmers
	Non participating farmers	Participating farmer	Total	
Yes	5	25	30	15.0
No	95	75	170	85.0
Total	**100**	**100**	**200**	**100.0**

The results in Table 7 imply that there is still a need for relevant and adequate knowledge on sunflower production and value addition for majority of farmers in the study area. This will partly influence farmer participation in sunflower farming activities. It is indispensable fact that farmers who are knowledgeable of the technology are expected to adopt faster than those who are not. In the process of imparting knowledge, however, farmers (the owners of the problems) should play a major role in decision-making and implementing their decisions, while the others, such as governmental and non governmental organizations, private sectors, etc. play supportive roles. This allows the learning through action – the interactive learning

process which includes: brain storming, working together and accepting the outcome together.

4.4.1.6 Sources of knowledge

Table 8 presents a distribution of sample surveyed sunflower farmers by the sources of their farming knowledge. The sources include: ARI-Ilonga, MATI-Ilonga and extension services in the study area. The study results indicate that on average, 57.5% of sunflower farmers obtained the farming knowledge from formal institutes while the rest 42.5% obtained the knowledge informally from their parents, relatives, friends, neighbours and some of them just guessing. Among informal institutions ARI-Ilonga contributed most (34.0%) in imparting sunflower knowledge followed by extension (15.5%) and lastly MATI-Ilonga (8.0%). However, the results indicate that MATI Ilonga contributed most in imparting value addition skills to farmers. Apart from training farmers, MATI-Ilonga is there basically for training extension officers who in turn work closely with farmers.

Table 8: Distribution of a sample surveyed farmers by the sources of farming knowledge in the study area in 2010

Sources of knowledge	Percent		Total	Average percentage of farmers
	Non participating farmers	Participating farmer		
Informal	56	29	85	42.5
Extension services	20	11	31	15.5
MATI Ilonga	13	3	16	8.0
ARI Ilonga	11	57	68	34.0
Total	**100**	**100**	**200**	**100.0**

This does not, however, imply that these farmers were adequately knowledgeable or acquired full knowledge, they rather got parts of knowledge depending on the sponsorship and time available to the farmer, and thus they still need more knowledge. Coping from non reliable sources of knowledge leads to production of poor quality sunflower oil and thus lose of potential customers.

4.4.1.7 Production experience

Table 9 presents a distribution of a sample surveyed sunflower farmers by experience in production. The study results indicate that most of the farmers (42%) had experience lower than 5 years while only 20% had experience above 10 years. This implies that the number of sunflower farmers has increased in the resent years.

Comparatively, the study results indicate that non participating farmers in value addition had longer experience in sunflower production but lacked value addition (processing) experience. Longer experience may have positive or negative effects on adoption of new ideas since a farmer is likely to be led by adequate observations in the past. This is true because the concept of value addition in the study area was introduced fewer years ago compared to its cultivation. Since they are used to production than to value addition probably this might be one the reasons for some farmers to persisting in production only rather than production and/or value addition.

Table 9: Distribution of a sample surveyed farmers by production experience in the study area in 2010

Production experience	Percent		Total	Average percentage of farmers
	Non participating farmers	Participating farmer		
Below 5	28	56	84	42.0
5 – 10	45	31	76	38.0
Above 10	27	13	40	20.0
Total	**100**	**100**	**200**	**100.0**

On the other hand, the results indicate that most (56%) of participating farmers in value addition of sunflower had shortest experience (lower than 5 years) in sunflower production. It seemed as if, however, the number of farmers who were opting for value addition was increasing, this may call for another study to invest the trend of farmer participation towards value addition to the crop.

4.4.1.7 Value addition experience

Table 10 presents a distribution of a sample surveyed sunflower farmers by their experience in the value of sunflower crop. The study results indicate that non participating farmers in value addition had no experience in value addition. Most (65%) of participating farmers in value addition had experience of lower than 5 years, while only 3% had experience of above 10 years. This implies that sunflower value addition activities are still immature and so they still need a strong support. According to the participating farmers in value addition, they had started sunflower production aiming at selling its value added products.

Table 10: Distribution of a sample surveyed sunflower farmers by value addition experience in the study area in 2010

Years	Percent		Total	Average percentage of farmers
	Non participating farmers	Participating farmer		
Below 5	Nil	65	65	32.5
5 – 10	Nil	32	32	16.0
Above 10	Nil	3	3	1.5
Total		**100**	**200**	**100.0**

The study results indicate that longer experienced farmers in both production and value addition of sunflower produce were found at Ilonga, Chanzuru and Kondoa villages and it is the area where sunflower is relatively highly produced, the area which attracted relatively many sunflower oil millers and where value addition is high. In the other villages under the study area, farmers were generally less experienced thus relatively low production and had only two sunflower oil mills. Following these results the truth still hold probably that farmers experience in sunflower production and value addition had the positive influence.

4.4.2 Availability of land and distribution among farm and off farm activities

Fig. 7 presents a distribution of sample surveyed farmers by total land accessed. An accessed total land was used for sunflower and other crops farming. The study results indicate that 63% of sunflower farmers in the areas were able to access a total land of less than 5 acres in 2008/2009 and others were able to access 1 to 2 acres within this range. The Fig. 7 indicates also that only 3% of sunflower farmers were able to

access a total land of above 10 acres, most of them being participating farmers in the value addition. It was revealed through the study that this little size of land accessed by farmers included own and hired land. The owned farms were obtained either through heritage from parents, purchased from farm the owners or distributed by village officials through legal procedures. The owned farms could be managed and utilized to the best level. The hired farms, however, were so conditional that had to be returned any time as desired by the owner. Farmers were complaining of non guaranteed local hiring arrangement that sometimes once the hired farms gave a good yield the owner of the farm terminated the contract and demanded his/her farm back. The same case might happen to social interests between the two parties or when someone wants to hire the same farm at higher price. In such situation, therefore, farmer could not manage the hired farms nor implement long plan.

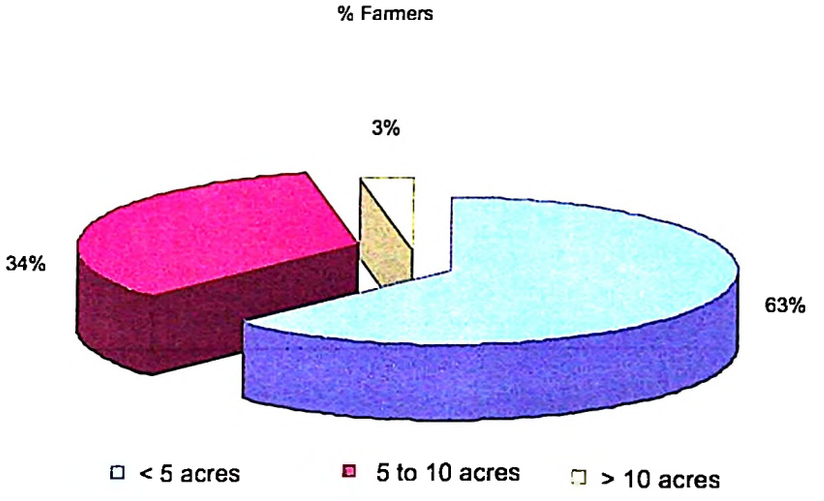


Figure 7: Distribution of sample survey farmers by land access (acres) in the study area in 2008/09

The study shows that non participating farmers in the value addition were more constrained by land scarcity than the other category. Such extent of land availability to farmer was a great constraint or obstacle towards improved quantity of sunflower processing as it depends on the quantity harvested in the area. Due to severe inaccessibility to land, a little percent of farmers were generally able to allocate only a maximum of 20, 10 and 5 acres to maize, paddy and sunflower respectively in 2008/09 with an average 1..8 acres (maize), 1 acre (paddy) and 1.3 acres (Sunflower). As a result sunflower harvests were accordingly low which probably discouraged some farmers and thus decided not to undergo value addition. Maize crop was given the first priority in allocation of available land presumably because maize was the major part of the house hold food menus in the study area. Sunflower crop was given second priority because it is cash and food crop which required relatively low inputs and it is becoming important source of farmer's revenue in the semi-arid areas.

4.4.3 Capital and sources of farmer's income

Table 11 presents a sample distribution of a sample surveyed farmers by capital and sources of income. Sources of income varied from farmer to farmer, however, for the convenience study they were divided into three groups: sales of crops only, crops and non crop outputs and crops, loans and wages. The study results indicate that capital was the most serious constraints which hindered sunflower farming in the area being more severe among non participating farmers in value addition. The study results indicate that 100% and 97% of non participating and participating farmers in value addition were respectively constrained by low/limited capital.

Table 11: Distribution of a sample surveyed sunflower farmers by their capital constraint and sources of income in 2008/09

Variables	Non participating farmers	Percent Participating farmers	Total	Average
Capital constraint				
Yes	100	97	197	98.5
No	0	3	3	1.5
Total	**100**	**100**	**200**	**100.0**
Sources of income				
Crops only	65	41	106	53.0
Crops and non crops outputs	32	55	87	43.5
Crops, Loans, Wages	3	4	7	3.5
Total	**100**	**100**	**200**	**100.0**

The cash capital was necessary for renting farms, land preparation, purchase of quality seed, crop husbandry, harvesting, transport from farm, storage, value addition and marketing. Most farmers operated at substandard level due to limited capital which led to poor farming practices due to lack of cash capital and low yields.

Sources of income varied among farmers including sales of crops, non crop products, wages and loans. The results show that 65% of non participating farmers raised their income from sales of crops only, as explained earlier most of farmers spend most of their cash reserve in funding possible farm operations and at the time of harvests they have little cash. Some farmers because of being in badly need of cash they dare to sell crops while in the field at relatively low prices. Obviously, this situation could have partly contributed to non participation in value addition.

From the study it was revealed also that 55% of participating farmers in value addition had more than one sources of income including sales of crops and non crop outputs. The non crop outputs included carpentry, building houses, farm rents, house rents and livestock. Due to having multiple sources of income these farmer probably had extra cash which enabled them to harvest, store sell when price higher or add value on the produce and sell at the highest price. Farmers with more sources of income are more innovative than those depending mainly on income from the farm. Another group of interviewed farmers, apart from sales of crops, they were as well receiving wages and loans, putting them in the better position of incurring extra cost for value addition in order to make good profit.

4.4.4 Distance to the oil press centres and transport

Fig. 8 presents a distribution of sample surveyed farmers by distance between farmer's home and oil mills. The distance between sunflower farmers and oil mills varied greatly, however, they were conveniently divided into three groups: blow 5 kilometres, 5 – 10 and above 10 kilometres. As it was noted earlier, most of oil mills are concentrated in the same area due to availability of electricity, accessibility to main roads and level of sunflower production. The mean distance between farmer's home and the sunflower oil mills was about 7 kilometres; there were others, however, who stayed as far as 19 kilometres away. Long distance was mentioned by many farmers (60%) as a constraint which hampered farmer participation in the value addition activities to sunflower.

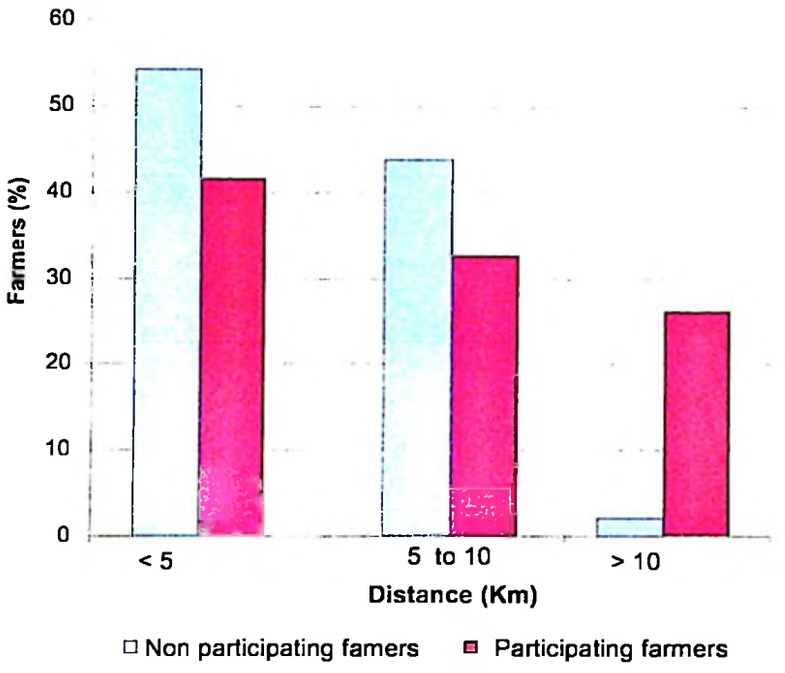


Figure 8: Distribution of sample surveyed farmers by distance to the oil

By the time of harvesting majority of farmers had exhausted their available cash by funding farm operations. At this juncture they had to meet their household obligation by selling farm produce. Besides, as farmer stayed in the long distant area the transport cost increased while the selling price in the village markets were the same as or even lower than the prices at markets closer to the main road or oil press centres. One man who brought one bag of raw sunflower to the oil mill expressed that he had been using a bicycle transport from home located in Ulaya division which is the third from Kilosa division along Mikumi-Dumila road where oil mill is available just for the sake of processing the produce. Under such farmer's circumstances one would opt to sell raw sunflower to those middlemen who collected produce from individual farmers.

Poor transport to the oil mills was also a constraint towards value addition activities in the area. As explained earlier there were only six sunflower oil mills serving more than 33 scattered villages and unfortunately enough three of them were located in the same village. The study results in Fig. 9 indicate that most of respondents were constrained by poor transport, the types of transport which were readily available included bicycles, motorcycles and animals. The study revealed also that 96% of participating farmers in value addition of sunflower produce used bicycle to transport raw sunflower to oil press centres for oil extraction; unfortunately enough, one bicycle could carry only one bag per trip.

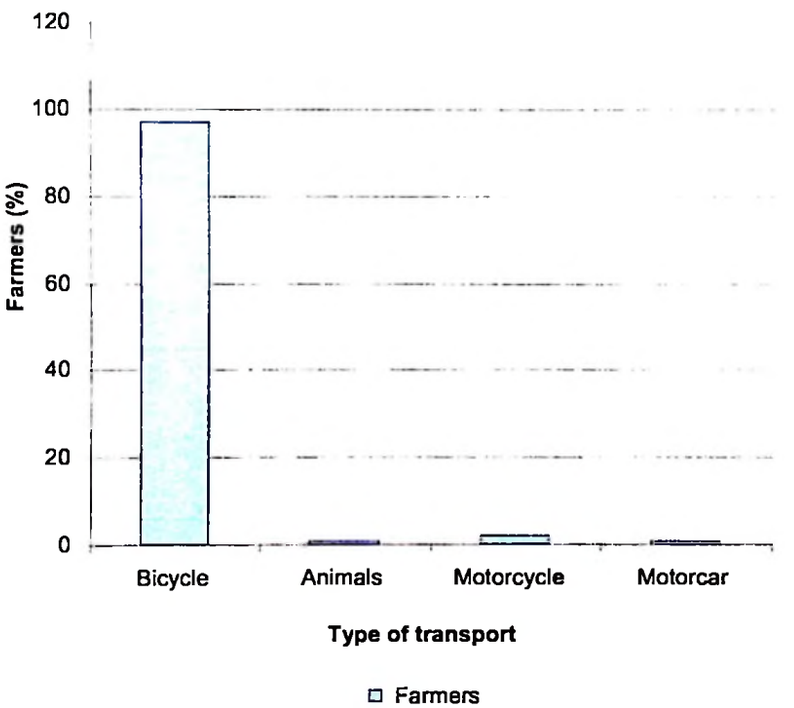


Figure 9: Distribution of sample surveyed farmers by type of transport used to the oil mills in 2008/09

Bicycle transport was mostly used because it was readily available and affordable by the majority of farmer, besides, it was the means of transport which could reach difficult parts of the area. This type of transport is mostly used because it is available and affordable by the farmer as well reaching difficult parts of the villages, it is however a poor means of transport.

Although this transport was readily available and affordable it was a poor type of transport in many aspects including poor carriage capacity, time consuming, it needed a farmer who was powerful enough to ride it all the way to and from the distant oil press centres etc. Fewer farmers-2%, 1% and 1% could use motorcycle, motor car and animal transports respectively, although motorcycle transport was quicker than other types of transports available in area, it was however, too expensive for most of farmers to afford. Cost of transport by bicycles varied according to distance moved and number of bicycles available in villages, most of farmers paid Tshs. 2000 per bag of an average weight of 70 kilogram. The mean cost of transporting a bag was Tshs 1551 but in other distant places the cost reached the maximum Tshs 3000.

4.4.5 Sources of labour

Table 12 presents a distribution of sample surveyed sunflower farmers by source of labour in the study area. The main groups of sources of labour used by the farmers included family labour, hired labour, and family and hired labour. The temporally hired labour was scarce and expensive especially during the peak periods of farming

activities. Scarcity and expenses of hired labour varied from place to place, being serious, however, in the places closer to high salaried people and multiple sources of income such as ARI-Ilonga, MATI-Ilonga, TTC-Ilonga and secondary schools.

Table 12: Distribution of a sample surveyed sunflower farmers by their sources of labour in 2008/09

Sources of labour	Non participating farmers	Percent Participating farmers	Total	Average
Hired labour	12	23	35	17.5
Family labour	46	23	69	34.5
Hired and family labour	42	54	96	48.0
Total	**100**	**100**	**200**	**100.0**

The study indicates that 54% of participating farmers in value addition were able to use both family and hired. This implies that this group of farmers due to having multiple sources income as proved and explained earlier they obviously had extra cash to hire extra labour, in addition as was seen from previous statistics of the study results, it was this group whose most of households were medium sized and had members with good working ages. Other 23% of participating farmers in the value addition employed hire labour only in their farms reflecting either their relatively financial abilities to hire labour or lack of working family labour. On the other hand, 42% non participating farmers used both hired and family labour and only 12% were able to use hired labour. This implies that this group of farmers did not participate in the value addition of sunflower produce probably due to serious capital/income problem.

Sunflower oil mills were owned by institute and individual business persons. One out of six oil mills available in area was owned by MATI-Ilonga launched mainly as one of facilities for equipping extension officers and farmers with skills on value addition of oil seeds and cereal crops and partly to provide services to nearby farmers. Most of participating farmers in the value addition of sunflower produce used privately owned machines, while only few used institute oil mill. This was probably because the privately owned centres were many and closer to most of farmers and/or more efficient. Some of oil mills are less efficient especially in producing oil, this situation forced farmers to move a long distance to more efficient one, for instance some farmers had to move about 19 kilometres to more efficient oil mills in the study area.

4.4.6 Harvests and processing of sunflower

4.4.6.1 Quantity harvested

Fig. 10 presents a distribution of sample surveyed sunflower farmers by quantity of sunflower harvested in the study area. The quantities sunflower harvested varied greatly among farmers due number factors including farm sizes, capital, and management practices. For the convenience the quantities harvested were divided into three groups: below 5 bags, 5-10 bags and above 10 bags of about 70 kilograms. Under optimal farm management one acre can give 10 to 16 bags of sunflower, but majority of farmer cannot reach that level due to number of factors which impede farm management including climatic, economic and farmer characteristics. Following the farm management impediment encountered by farmers in the surveyed

area in 2008/09 the study results shows that interviewees were able to harvest an average of five bags per acre.

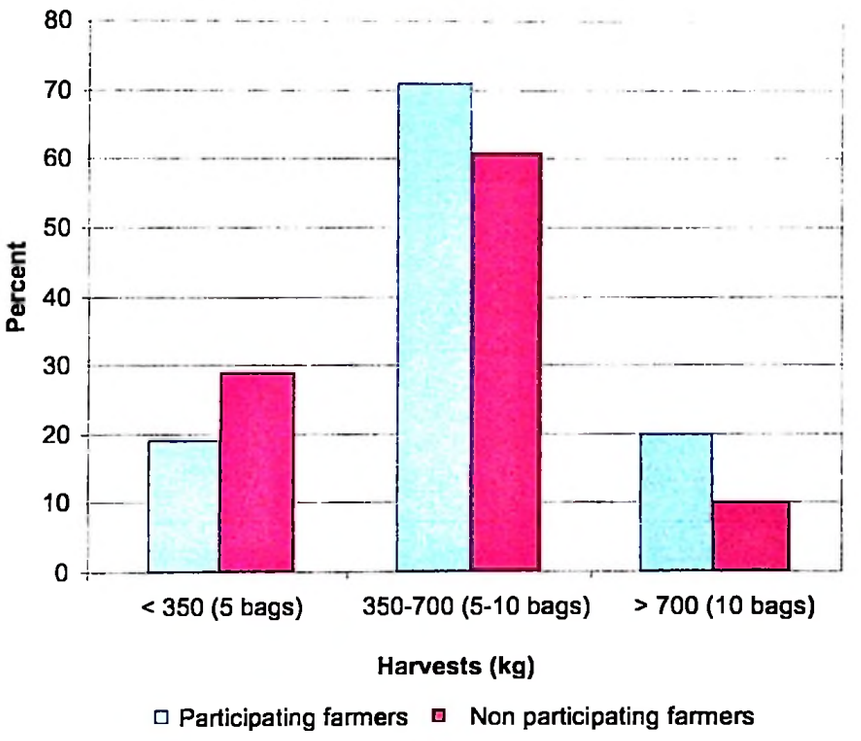


Figure 10: Distribution of farmers by quantity of sunflower harvested by farmers in 2008/09

The study results further indicates that depending on the size of land cultivated (regardless of the yield per acre) most of farmers (66%) were able to harvest total bags of sunflower ranging from 5 – 10 with the mean of 6.6 bags per farmer. Other farmers (20%), however, managed to harvest above 10 bags up to a maximum of 28 bags per farmer. Comparatively it was revealed through the study that participating farmers in value addition on the crop in question were better off in terms of the

number of farmers (71%) who harvested 5 – 10 bags than were the non participating farmers (61%). The difference in quantities of sunflower harvest between the two categories might be due to difference in resources endowment between them. Poor harvests may have effects on farmers' decision on whether to store and add value or sell it as immediately as they are approached by middlemen. It was revealed through the study that some farmers, apart from producing, they also purchased raw sunflower in order to have as reasonable quantity as possible for value addition.

4.4.6.2 Quantity processed

Fig. 11 presents a distribution of sample surveyed sunflower farmers by quantity of sunflower processed in the study area. The quantities sunflower processed varied greatly among farmers according to quantities of sunflower harvested for the convenience the quantities processed were divided into three groups: below 5 bags, 5-10 bags and above 10 bags. The minimum and maximum quantities of value added sunflower per farmer were 1 and 30 bags respectively, with the mean and standard deviation of 7.5 bags and 4.6766. The study indicates that 66% participating farmers in the value addition processed 5 – 10 bags of sunflower in 2008/09 while 17% processed below 5 and above 10 bags. Such differences in the quantity of value added sunflower was probably attributed to variation in farm sizes which farmers allocated to sunflower and some farm management practices such as timing of season, thorough land preparation, use of quality seeds to mention some; which affected yield per unit area.

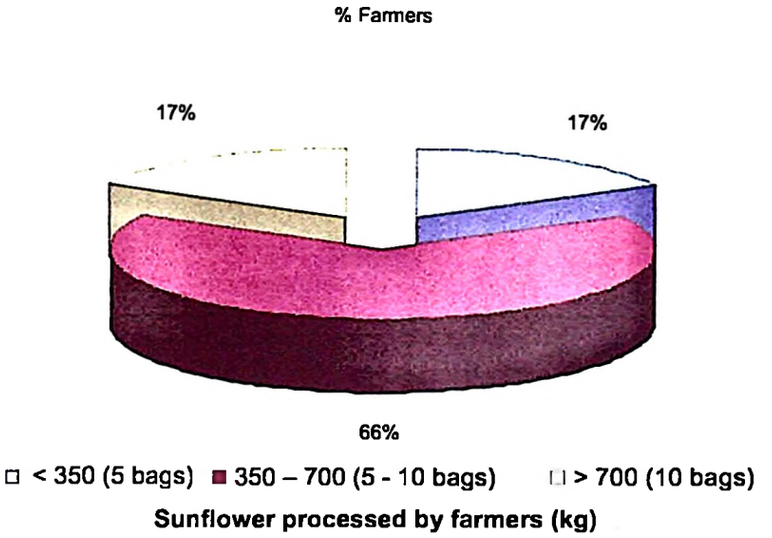


Figure 11: Distribution of farmers by quantity of sunflower processed by farmers in 2008/09

Value addition activities was done continuously throughout the year, the levels of value addition, however, varied considerably within a year. Most of participating farmer in the value addition processed sunflower between July and September. This is the period when sunflower is well dried being able to produce more oil and price is a bit high. Other, however, could not wait for such length of time as they needed some cash to meet their households obligations circumstances they therefore, processed sunflower earlier between May and June. A few number farmers were able to store sunflower longer targeting higher prices from October on.

4.4.6.1 Quantity and quality of sunflower oil

Processed sunflower produces mainly edible oil and seedcake, the former product being for human consumption while the later is used in its state or further processed as livestock feeds. Data available at ARI-Ilonga which is the headquarter of the Eastern Zone Research Institutes indicate that sunflower oil content is 34 – 48% of the total weight depending on the varieties of sunflower. Quantity of sunflower oil produced per bag varies also depending on many other factors including the condition of raw sunflower attributed to its maturity when harvested, post harvest handling such as drying, winnowing and storage, and efficiency of the oil press machine (mill). The data further indicate that among sunflower varieties; the record variety contains the highest percentage of oil. During this study in 2009/10 it was learned through participatory observation at MAT-Ilonga oil mill that the variety contained 31.66 – 35.09% pure oil and 63.33 – 66.66% seedcake and the remaining percentage comprised of impurities. Something to note here is that the decline in oil content is presumably attributed to; apart from factors mention earlier in this section, the decreasing purity of the variety itself.

It is indispensable fact that quality of sunflower oil is paramount important as far as consumer satisfaction is concerned. The quality of sunflower oil depends on the condition of raw sunflower as mentioned earlier in the above section and the extent of refining procedure reached. It was observed that although most of farmers were not able to follow all recommendations, there were about four main steps of refining crude oil of sunflower in the study areas, these are:

Decantation – The crude oil was left for three days in order for particles and unwanted material to settle below oil after which the oil was separated and packed for sell. When processing procedure stops at this extent, normally the oil produced contains some percentage of water, has poor aroma and taste and if not used up immediately it undergoes rancid. This type of farmer processed sunflower oil product is not labelled and usually sold at relatively cheaper price. The product is available in the streets supplied by street vendors, at the main bus stands, at main institute campus and market places of Tanzania.

Boiling – This stage is necessary and aims at removing water through evaporation, improving aroma, improving colour and taste, and increase storability. This stage needed skilled farmers since boiling below standards or excessively could lead to poor quality oil. Not only that, this stage requires keenness of mind and knowledge because balancing ingredients – crude sunflower oil with clean water and salt which are necessary media to ensure safe boiling of the oil takes place here. Furthermore, the farmer need to know the indicator when boiling stage is ready. When boiled is not adequate, oil will still contain some amount of water and when boiled excessively the will burn thus aroma, colour and taste will change to the unbearable status. Such type of oil is also available on sell in different places of Tanzania.

Cooling and sieving – Boiled oil was left to cool in the safe as they are dangerous when hot and was left to cool uncovered in order to avoid condensation of water vapour which otherwise could drop back in to the oil. When it attain optimum cooling pure oil floats above some material like grease then easily separated and

stored in the clean large container ready for packing in different sizes as desired. The quality of sunflower oil product at this stage is excellent, sold at the highest prices possible and normally readily available during agricultural show and other trade fairs.

Packing and labelling - Was the final stage which apart from increasing value it also assisted in handling of the final product during transport, storage and at showroom/selling. Well packed and labelled sunflower product attract customers more thus may increasing sales rate. Long period observation indicates that most of locally value added sunflower oil product available in the markets particularly in the rural areas was poorly processed. This was probably due to lack of processing skills, avoidance of added costs. Customers had been complaining of poor quality of locally processed sunflower oil thus reduced importance of the products. The solutions to increase productivity hinges on both developing the local markets and raising prices of food crops which can be done through proper food processing. One way to add value to food products is to transform them in ways which are more usable by customers.

4.5 Marketing of sunflower in Kilosa

Sunflower as a cash and food crop is partly consumed by farming households and remaining portion is sold in order to raise a farmer's income in Kilosa district. Farmers sell sunflower either in a raw or value added state in the rural market areas of the district reflecting the typical situation in other rural areas of Tanzania. A large quantity of sunflower is marketed in a raw state to the oil millers in towns while most

of farmer value added sunflower is marketed in the rural areas. Most of farmer value added sunflower products particularly, sunflower oil were sold in the village markets but few in the district and regional markets. Limitations of farmer participation in the value addition of sunflower include among others, farmers' inability to access markets for sunflower oil and seed cake which is aggravated by poor accessibility to market information.

4.5.1 Marketing channels for sunflower in Kilosa

Fig. 12 presents market channels from sunflower farmers to the final consumer or users. The main products of sunflower channelled are raw sunflower, sunflower oil and seedcake. Farmers have the choice of either adding value to sunflower before marketing or sell it in a raw state. If the farmer adopts later choice he/she sells the produce to local intermediary traders who usually collect raw sunflower from individual farmers either through village market, temporary own established collection centre where the farmer brings and sells the produce at prior agreed prices or the trader passes from one sunflower farmer household to another and buys at negotiable or market prices. Intermediary traders sell raw sunflower in a bulk to regional traders who either collect the produce from intermediary traders' centres or buy it from the regional markets. Regional traders can decide to process or sell raw sunflower to regional processors who add value which results in two sunflower products namely sunflower oil and sunflower seed cake. The former product reaches the final consumers through wholesalers and retailers. The later product is moves to the regional feeds processors who then produce animal feeds which reach livestock keepers through wholesalers and retailers. It was also learned from the study that

85% of the farmer sold their sunflower oil in the village while 10 and 1 percent sold the oil in Morogoro and Kilosa towns respectively. The later product-sunflower seed cake was sold to the owners of oil millers mostly in the rural areas.

It was observed during the stud that buying and selling of seed cake operated in the manner that owners of sunflower oil press centres (oil millers) reduced oil press cost from Tshs. 80 down to Tshs 50 per kg of raw sunflower, the difference between the two costs being compensated by all seedcake left by the farmer to the owner of the oil press centre. That is, the cost of processing 1kg of raw sunflower is Tshs 80 if the farmer take away his/her seedcake but Tshs 50 if he/she leaves seed cake to oil millers. In other words farmer sells seed cake to the owner of sunflower oil press centres at Tshs 30 per kg while later on the owner of oil press centres sold at Tshs. 80 to 100 per kilogram. It was revealed from the study that 94% of farmer processors sold sunflower seed cake in the village, while 5 and 1% of the farmers sold it in the nearby village and Kilosa town respectively. The oil millers then sold the seed cake to small scale livestock keepers in small quantities and the bulk of it to the regional feeds processors who produced livestock feeds and sold to the livestock keepers. This statistics implies that majority of farmers could access only rural markets for their raw sunflower, oil and seed cake; in this case sellers were far more than buyers hence uncompetitive prices.

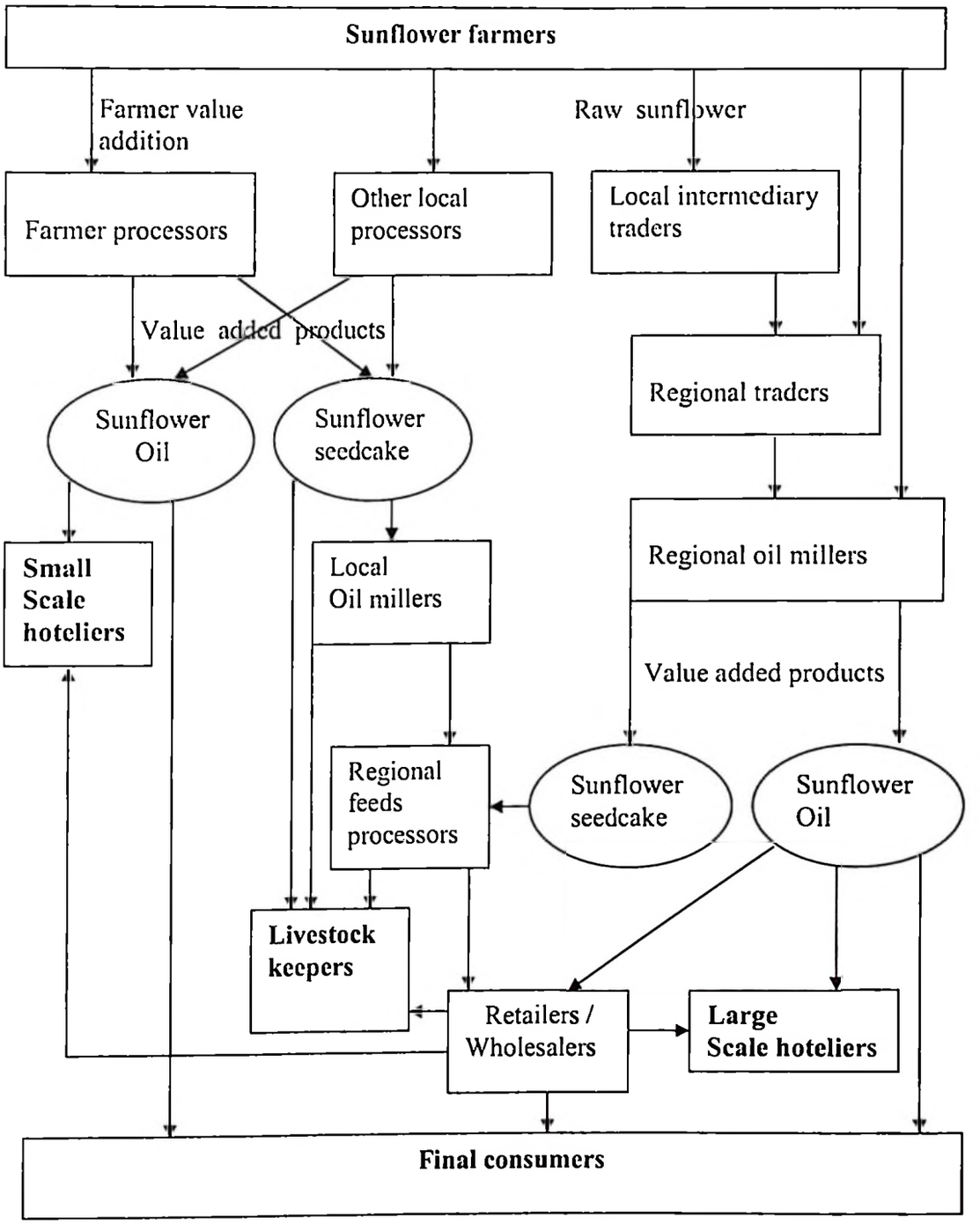


Figure 12: Sunflower marketing channels in Tanzania

4.5.2 Customers for sunflower products in Kilosa district

Fig. 13 presents a distribution of sample surveyed sunflower farmers by their customers in the study area. The main customers of sunflower products included oil millers, local traders, small scale hoteliers and final consumers. The study results indicate that the marketing channels of sunflower in Kilosa district include the farmer who produced sunflower. Farmers sell raw sunflower either directly to local processors including farmers and non farmers or local intermediary traders of raw sunflower. The study results indicate that 88% of farmers sold raw sunflower directly to local processors it in the village, while the remaining percent sold to local intermediary traders of raw sunflower. It also indicates that 63% of customers of raw sunflower were located in the village, 26% in the nearby villages while 10 and 1% were located in Kilosa and Morogoro towns respectively.

Farmer processors then added value to the produce which resulted in to sunflower oil and sunflower seed cake. The former product was sold to final consumers, hoteliers and local traders. The study indicates that 73% of participating farmers in value addition sold sunflower oil to the final consumers. Other 24 and 3% of them sold the product to small scale hoteliers and local traders respectively.

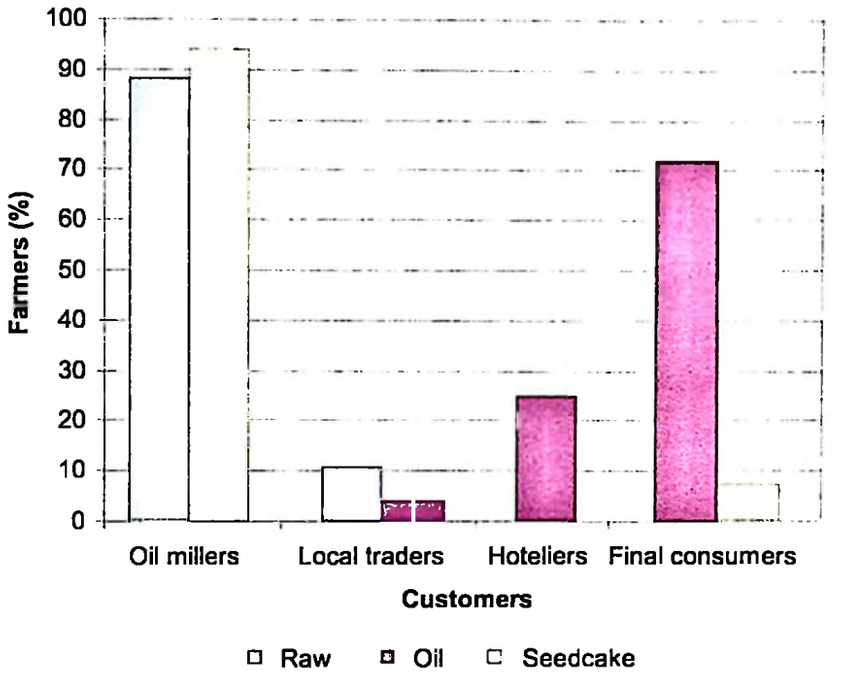


Figure 13: Distribution of farmers by customers of sunflower products 2008/09

4.5.3 Demand for sunflower in the study area

Table 13 presents prices of sunflower oil per litre and the total value of per bag of processed and raw sunflower in the study area. Demand for farmer processed sunflower oil was higher than other edible oils in the area and perhaps in other market areas of Tanzania. Most of farmer processed sunflower oil is sold in the rural markets and at market prices. Prices for both raw sunflower and oil showed an increasing trend over four years from 2006 to 2009. Sunflower oil price per litre increased over the period from around Tshs. 1200 in 2006 to 2500 in 2009. The mean price per litre of sunflower oil in 2009 was, however, Tshs. 2000 with a standard deviation of 250.66, while one bag of raw sunflower (about 70 kg) was Tshs

30 000 with a standard deviation of 13 427.58. In 2009 the price for sunflower varied also according to location with the highest price in town. Statistics presented in Table 13 indicates that in the study area varied from Tshs. 1500 to Tshs. 2500 per litre of sunflower. The total value of one bag of raw sunflower varied from Tshs. 15 000 to Tshs. 35 000 while the value of one bag of processed sunflower ranged from Tshs. 36 150 to Tshs. 61 900. The difference in mean values between the two (raw and processed sunflower) is Tshs. 18 800 which is a mean increase of 62.7%. This implies that farmers who added value to sunflower they produced were likely to increase the value of one bag of sunflower by 62.7% on average in the study area. In India it is reported by Cleland and Bruno (1996) and Boland *et al.* (2001) that 80% of value of sunflower is derived from it oil.

Table 13: Value of one bag of sunflower (70kg) in raw and processed states 2008/09

	Values of one bag of sunflower (70 kg)				
Variables	Price of oil Tshs/Litre	Oil	Seed cake	Total (Tshs/bag) processed	Total (Tshs/bag) Raw
Minimum	1,500	34,500	1,650	36,150	15,000
Maximum	2,500	57,500	4,400	61,900	35,000
Mean	2,000	46,000	2,800	48,800	30,000
Mean increase				18,800	
Mean percentage				62.7%	

Extra costs incurred by farmers in the process of value addition are presented in Table 14. They were attributed to transportation of raw sunflower to the oil mills and back home. Others include: oil extraction cost and refining process. Packaging,

labelling and marketing were difficult to establish because they were not common in the rural areas. Most farmers and retailers packed sunflower oil in the used containers, especially a half and one litre of used water containers. In this case therefore, labelling was not important. Since majority of farmers accessed rural markets and particularly their village markets, marketing costs were not established. The costs of transport varied considerably over the study area due to varied distances to the oil mill. Some farmers were as far as 19 kilometres away from oil mill while other were so close that they had no need to pay for transport especially when retuning home.

Table 14: Cost of value addition per bag of sunflower (70kg transported by bicycle) 2008/09

No.	Variable	Minimum	Maximum	Mean
1	Transport to oil mill	1 000.00	3 000.00	1 550.00
2	Transport from oil mill	0.00	1 000.00	0.0
3	Oil extraction	5 600.00	5 600.00	5 600.00
4	Refining process	500.00	500.00	500.00
5	Packaging	-	-	-
6	Labelling	-	-	-
7	Marketing cost	-	-	-
	Total	**6 100.00**	**10 100.00**	**8 150.00**

It is indicated that in 2009 the transport costs per bag of raw sunflower varied from Tshs. 1000 to 3000, while oil extraction cost remained constant over the study area. The refining process cost involves materials which cost the same in the study including salt, fuel woods or charcoal and clean water. The extent of refining

process, however, differs among farmer processors; some just leave some unwanted materials to settle and then take the upper part of the crude oil thus, refining cost become negligible. Table 14 indicates that the cost of processing one bag of sunflower ranged from Tshs 6100 to 10 150 with the mean of Tshs. 8150 and thus giving an additional mean profit of Tshs. 10 650. This implies that for one bag of value added sunflower a farmer got an extra of Tshs. 10 650 on average.

4.6 Factors influencing farmer participation in the value addition

In order to determine significant factors that influence farmer participation in value addition to sunflower produce in the study area, The Limited Dependent Model was used. This model comprises of logit and probit models. The dependent (response) variable is farmer participation in value addition to sunflower produce carrying a value of 1(FPVA = 1) and explanatory part includes quantitative and qualitative variables.

4.6.1 Independent variables and their priori expectations of direction of influence

Independent variables are grouped as quantitative and qualitative variables. The former includes: Farmers' education level, household size and distance to oil mill. The later includes farmers' age group, sex, poor knowledge, sources of knowledge and farmers' income, poor market information and price trend. These variables and their priori expectations of direction of influence are presented in detail in Table 15.

Table 15: Variables and their priori expectations of direction of influence

Variable	Expected sign
Age category: If > 50 years = 1, if < 30 = 0, (Control age = 30 – 50).	-ve
Sex of the farmer Male = 1, Female = 0	+ve
Level of education of the farmers (years)	+ve
The household size (number of house members).	-ve
Poor knowledge on sunflower processing: If constrained = 1, Otherwise 0.	-ve
Sources of knowledge: If formal sources = 1, Otherwise 0.	+ve
Sources of income of the farmer: If sales of crops only = 1, Otherwise = 0.	-ve
Distance to the sunflower oil mills (km).	+ve
Availability of market information. If available = 1, Otherwise = 0.	+ve
Price trends: If increased = 1, Otherwise = 0.	+ve

4.6.2 Analysis results

The estimates of logit and probit models for farmer participation in the value addition on sunflower produce (FPVA) are presented in Table 16. The column on the left consists of independent (explanatory) variables, while the middle and right side columns consist of logit and probit marginal effect estimates corresponding to their respective variables. The estimates from the two models tell the consistent information. The signs of the coefficients are the same across the two models, and six out of ten variables are statistically significant in each model. However, the magnitude of slope coefficients are not comparable, however, they don't differ very much. Usually the magnitudes of logit estimates are larger than the probit estimates.

Table 16: Logit and Probit Estimates of Value Addition Participation

Dependent variable: (FPVA)	Farmer participation in value addition	
Independent variables	Marginal effects after logit	Marginal effects after probit
Age categories	-0.048	-0.046
Sex	0.038	0.052
Education	0.046*	0.044*
Households size	-0.009	-0.007
Poor knowledge on sunflower processing	-0.575***	-0.529***
Source knowledge	-0.385***	-0.387***
Source of income	-0.318***	-0.317***
Distance to oil mills	-0.009	-0.008
Poor market information	-0.396*	-0.387*
Price trend of sunflower	0.400***	0.392***
Pseudo R-Squared	0.353	0.355

4.6.3 Interpretation of results

Since both models give the same estimates, the logit model is selected for reporting. The value of pseudo R-squared of 0.353 or about 35% implying that 35% of variation in farmer participation in value addition on sunflower is explained by the factors in the model while the remaining 65% is explained by variable not included in the model at 5% precision level.

4.6.3.1 Education of the farmer

The study results indicate that education has a positive influence on farmer participation in value addition on sunflower crop. The slope coefficient for education of farmers in the study area is 0.046 or about 4.6% implying that an increase in

education by one year increases the probability of the farmer participation in value addition on sunflower by 4.6%. This concurs with the study on linking small scale farmers to market, conducted by Kulindwa (2008) which shows also the positive relationship between education and farmer participation in the marketing. It concurs also with Asfaw and Admassie (2004) and Meena *et al.* (2001) reports that diffusion of technologies among illiterate farmers may not be effected with the desired rate, education, therefore, can be seen to have a positive correlation with adoption.

4.6.3.2 Price trend

Increased price of value added sunflower products is statistically significant and positively influences participation in the addition to sunflower produce. The slope coefficient of price is 0.400 or about 40% implying that, a unit increase in price of value added sunflower products increases the probability of the farmer participation in value addition to sunflower crop by 40%. This result complies with the law of demand and supply which states that increase in price *ceteris peribus,* increases the quantity supplied. In this case, increased price of value added sunflower products motivated farmers to participate in value addition to the crop. The new entrants in the industry, therefore, aimed to produce and add value to the crop.

4.6.3.3 Sex of the farmer

The male sex of the farmer had the positive effect with slope coefficient of 0.038 implying that male farmers have more probability of participating in value addition to sunflower than female farmers by 3.8%, because the category is more advantaged

than the other in access to knowledge about production, processing, market information. However, it was not statistically significant.

4.6.3.4 Inadequate knowledge on value addition

Inadequate skills on value addition to sunflower produce significantly impeded farmer participation in value addition in the study area. The magnitude of impediment as presented in table 4.7 is -0.575 or about 57.5%, implying that a farmer who lacks skills on value addition has lower probability of participating in value addition to sunflower crop by about 57.5% than the skilled ones. It is obvious that farmers who are knowledgeable in a given technology are expected to adopt faster than those who are not.

4.6.3.5 Formal sources of knowledge

The model estimates indicate a significant negative relationship between knowledge developed formally and farmer participation. The slope coefficient for the formal sources of knowledge is -0.385 or about 38.5% which implies that formal knowledge lowers probability of farmers' participation 38.5%. Probably this is because knowledge developed solely formally is sometimes too expensive for the most of small scale farmers to apply. It might be also due to limited involvement of farmers/the users in the process of developing technologies/knowledge. This concurs with Raij et al. (2002) report that many of the technologies generated and promoted in this way are too expensive for the hundred of millions of small-scale farmers who cannot afford to invest in the package of required inputs. As a result, most of these farmers have been reluctant to adopt the technologies offered by conventional

research and extension. It also concurs with Nikita *et al.* (2009) report that organic wastes and night soils were not an economically viable without some kind of subsidy in Kumasi Ghana. It again concurs with Kirway *et al.* (2003) report that farmer involvement improves researchers understanding of farmer conditions and vice versa thus complements solely scientific and informal approaches. It also concurs with TARP II SUA Project (2005) report that there is need for researchers to view farmers as partners and collaborators who, if their role is considered in the project design, they can be instrument in spreading technologies.

4.6.3.6 Low income of the farmer

The study results indicate that majority of sunflower farmer had one source of income which is the sales of crops they produce. The model estimates show a statistically significant ($P > 0.05$) and negative relationship between low income and farmer participation in value addition on sunflower. The slope coefficient which is -0.318 or about 31.8% implies that low income of the farmer lowers the probability of participation in value addition on sunflower crop by 31.8%. This relationship is also reported by Rutatora *et al.* (2004) that peasants in Tanzania earn so low incomes that they cannot meet the basic needs of individual or the household. This reflects also the situation of small scale farmers of sunflower in the study area who are constrained by low income thus unable to participate in value addition of sunflower they produce.

4.6.3.7 Poor marketing information

The model estimates show also a significantly negative relationship between this factor and farmer participation in value addition. The magnitude of the factor is -0.396 or about 39.6% which implies that poor marketing information accessed by the farmer in the study area lowers the probability of farmer participation in value addition to sunflower crop by 39.6%. This concurs with URT (2006) report that market access problem accounts for 75% followed by market information problem in rural area of Tanzania. It also concurs with ICT-Update (2010) report that access to market information assists a farmer in making decision on the type of crops, the quantity and quality to produce and the time which maximizes revenue.

4.6.3.8 Aged farmers

Ages above 50 years old had negative effect with the slope coefficient of -0.048. This implies that I year increase in age above 50 lowers farmers participation in the value addition to sunflower by 4.8%; however, it was not statistically significant.

4.6.3.9 Household size

The result indicates also that household size had a negative effect with a slope coefficient of -0.009. This implies that as a household size increases by 1 member the probability farmer participation in the value addition was lower 0.9%; however, it was not statistically significant.

4.6.3.10 Distance to the oil mill

The distance to the oil mills had a negative effect with magnitude of -0.009, implying that an increase in distance by 1kilometre between a farmer's home and an oil mill lowers probability of farmers' participation in value addition to sunflower produce by 0.9%. However, it was not statistically significant.

CHAPTER FIVE

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

This study aimed at evaluating farmers participation in the value addition to oilseeds and its implication on farmer's income with objective of increasing sunflower production and income generation through value addition in the rural sunflower potential areas of Tanzania. Based on the aim, objectives and hypothesis of this study it is concluded that:

The capacity utilisation of the oil mills in the study area was still low, far below 50%. This reflects the extent of underutilization of oil mills capacity in the area and, therefore, confirms that farmers' participation in the value addition activities was still low. Farmers' participation in value addition to sunflower produce was influenced by multiple factors; however, six factors were significant. Education of the farmer and increased price trend had positive influence. But, inadequate knowledge on sunflower processing acquired by the farmer, formal sources of knowledge, low farmer household income and poor marketing information had negative influences. Other factors which had negative effects although were not significant are age of the farmer of above 50 years, larger household size and longer distance to the oil mills.

Due to lack of market information, low household income and inadequate farmer value added sunflower products most of farmers sold their sunflower oil to the final consumers in the village markets, while a few of them sold to small scale hoteliers

and retailers. The raw sunflower was sold to local intermediary traders who then resold to the regional traders. Seedcake was sold to local millers who then resold in large quantities to feeds processors located in Morogoro and Dar es Salaam. The farm gate value of a processed bag of sunflower was higher by 62.7% compared with raw sunflower in the study area in 2009.

Oil mill industry in the study area was constrained by breakdown of oil press machine, frequent power cuts, high running cost and scarce sunflower as a raw material. If the necessary conditions are optimally in place sunflower production and farmers participation in the value addition as well as farmer income in the study area and other potential rural areas will increase.

5.2 Recommendation

Oil millers should allocate the milling machines closer to farmers in order to increase sunflower production and farmer participation in the value addition. The central and local governments should create conducive environment including reliable electricity, rural roads and transport for ease distribution of oil mills.

The government should increase financial support to research, training and extension services so that technologies and knowledge required in production, value addition and marketing can be developed. However, technology and knowledge development needs to some extent farmers involvement thus complementing scientific and informal approaches which is believed to increase the rate of adoption. This can be done deliberately through, for example, collaborative project design, farmer field

school where farmers can observe and learn under the field conditions, and farmer visit by research or extension officers for timely feedback.

Financial institutions should establish a possible mechanism of supporting farmers so that they can reduce or overcome the constraint of inadequate capital necessary for financing farm operations and marketing.

The government should establish a simple and reliable system countrywide which can transmit market information between producers and buyers of agricultural produces. We can, for example, copy from Ghana and Uganda where Agricultural Market Information Centre uses mobile phone to transmit market information which enables sellers and buyers to receive an instant SMS alert as soon as anyone else on the network submits an offer. Transmitting market information through news paper, radio and television alone does not guarantee effective reception in the rural areas since unlike the mobile phone, not full time the farmer will be accessing these media.

Local governments should strengthen farmer groups networking in the rural areas; this may as well increase the chance for fund raising necessary for running farm operations.

5.3 The input of the study

A new knowledge is developed on the current status of capacity utilization of sunflower oil mills. It is realised that the capacity utilisation is below 50% in the study area and the situation probably reflects other rural areas of Tanzania.

Underutilization of rural oil mills capacity confirms that farmers' participation in the value addition activities is still low, implying that most of farmers sell sunflower in raw state. Selling non value added sunflower the farmer looses 62.7% of a value of the produce. Meanwhile an increasing demand for sunflower oil and import of edible oils of about 50% in Tanzania is an indicator of farmers' unexploited sound opportunities in this industry. Stakeholders in the industry are informed and should bear in mind that farming knowledge, market information and institutions (research, training and extension) have influence on farmer participation in the sustainable and value addition activities. I am optimistic that when these factors are properly in place, farmers and other stakeholders will fully benefit from this industry.

5.4 The suggested areas for further studies

Further studies are needed in the area on climate change in relation to agriculture especially oilseeds, the current status of oilseeds in relation to other crops and the roles of financial institutions in supporting farmers participation in value addition activities in the potential rural areas of Tanzania.

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Appendix 1: Preliminary survey on sunflower oil millers in Kilosa district 2009/10

Name of the miller.....Village.....
Ward.....Division.....

1. When did you start sunflower oil milling business?.....

2. In which months of the year sunflower oil milling is carried out?
1. At harvest time [ ] 2. Throughout the year [ ] 3. Otherwise (mention)
.....

3. On average what quantity of sunflower is brought at the mill in a day?
1. Lower than one bag [ ] 2. One bag [ ] 3. Two bags [ ] 4. Otherwise (mention)
.....

4. On average what quantity of sunflower is brought at the mill in a month?
1. Lower than two bags [ ] 2. Two bags [ ] 3. More than two bags [ ]
4. Otherwise (mention) .....

5. On average what quantity of sunflower is brought at oil mill in a year?
1. Lower than ten bags [ ] 2. Ten bags [ ] 3. More than ten bags [ ]
4. Otherwise (mention).....

6. In which months of the year sunflower oil milling is the highest?
1. Harvesting period [ ] 2. When approaching production season [ ]
4. Otherwise (mention).....

7. In which months of the year sunflower oil milling is the lowest?
1. Harvesting period [ ] 2. When approaching production season [ ]
4. Otherwise (mention).....

8. How do you integrate this agribusiness?
1. Produce – process – marketing [ ] 2. Process – marketing [ ] 3. Process farmers' Sunflower only [ ] 4. Otherwise (mention).....

9. Please complete the table below

Mill capacity kg/day	Quantity milled (kg)			Quantity milled in five years (kg)				
	Daily	monthly	yearly	2005	2006	2007	2008	2009

10. Please complete the table below

Sunflower product	Quantity/bag of sunflower	Milling cost per kg of raw sunflower (Tshs)				
		2005	2006	2007	2008	2009
Oil (lts)						
Seedcake (kg)						

Appendix 2: A questionnaire for farmers of sunflower in Kilosa district

Number of questionnaire [.....]

Location of the farmer
Division.....
Ward.....
Village.....

1.0 Farmer characteristics
1.1 Age of the farmer.....(in years) 1.2 Sex of the farmer: 1=Male [ ] 2=Female [ ]

1.3 Level of education (in years)
1=Primary [ ] 2=Secondary [ ] 3=Post secondary [ ] 4=Other (specify).....

1.4a Total land available to farmer for farm and off-farm activities.

Own land (acres)	Hired land (acres)	Total land (acres)

1.4b Distribution of the total land among farm and off-farm enterprises in 2008/09

Crops/others	Maize	Paddy	Sunflower	Livestock	Off farm	Others	Total
Acres							

1.4c Is inadequate own land the real constraint to you? 1=Yes [ ] 0 =No [ ]

1.4d Please list other assets you possess
.....
.....

1.4e Is poor capital the real constraint in sunflower farming? 1=Yes [ ] 0 =No [ ]

1.4f Please mention sources of your income (more than one answer allowed)
1=Sales of crops [ ] 2= Sales of livestock [ ] 3= Shop [ ] 4=Farm rent [ ]
5= Building houses [ ] 6 = Carpentry [ ] 7 = Hotel [ ] 8 = Wages [ ] 9 = Loans [ ]

5a Please give information on your household composition and size.

House hold composition	Number
Parents	
Sons	
Daughters	
Others (specify)	
Total	

1.5b Please mention types of labour used in your farming activities.
1=Hired labour [ ] 2=Family labour [ ] 3=Hired and family labour [ ]

2.0 Processing of sunflower

2.1 How long have you been cultivating sunflower? .....years

2.2 How long have you bee processing sunflower? .....years

2.3a Is poor knowledge on sunflower processing a constraint to you? 1=Yes[ ]
0=No[ ]

2.3b If not, mention important skills you possess, sources and year obtained?

On production	Sources	Year	On processing	Sources	Year

2.4 Mention farming groups of which you are the member, location and year joined .

Name of the group (association)	Location	Year started	Year joined

2.5a Whose pressing machine do you mostly use to processes your sunflower?
1=Own machine [ ] 2=Other privately owned machines [ ] 3=Institutes machines [ ]

2.5b Is a distance to the pressing machine the real constraint? 1=Yes [ ] 0 =No [ ]

2.5c. What is estimated distance to the oil mill?.....km

2.5d Is transport for your products to the oil mill a real constraint? 1=Yes [ ] 0 =No[]

2.5e What type of transport do you mostly use to access the oil mill?

Type of transport	On foot	Bicycle	Animals	Motor cycle	Motor car
Amount transported					
Cost (Tshs)					

2.6a In which months do you process large quantity of sunflower?
1=May - July [ ] 2=August-October [ ] 3=November-January [ ]
4=February-April [ ] 5=Other (specify).....

2.6b Why?.....

2.7 Please give information as required in the table below (weight of one you adopted).

Weight of one bag	Crude oil extracted	Pure oil produced	Seedcake produced
kg	lts	Lts	kg

2.8 Please mention quantity of sunflower (bags) processed and sources 2008/09?

From own farm	Purchased	Total bags	Total bags processed

3.0 Marketing of sunflower

3.1a The main customers of raw sunflower

Customers (tick the main)	Main location	Price/kg(Tshs)
Local processors		
Local intermediary traders		

3.1b The main customers of farmer processed sunflower oil

Customers (tick the main)	Main location	Price/litre(Tshs)
Retailers		
Small scale hoteliers		
Final consumers		

3.1c The main customers of sunflower seedcake

Customers (tick the main)	Main location	Price/kg(Tshs)
Final users		
Oil millers		

3.2a Who determines prices of the products?
1=The farmer [ ] 2=The customer [ ] 3=The market [ ] 4=Negotiable [ ]

3.2b How was the price trend for raw sunflower from 2006 to 2009?
1= Decreased [ ] 2= Constant [ ] 3= Increased [ ]

3.2c How was the price trend for farmer processed sunflower oil from 2006 to 2009?
1= Decreased [ ] 2= Constant [ ] 3= Increased [ ]

3.2d How do you characterize the demand for farmer processed sunflower cooking oils?
1=Lower than supply [ ] 2=Equal to supply [ ] 3= Is higher than supply [ ]

3.2e Is poor market information the real constraint? 1=Yes [ ] 0 =No [ ]

3.3 Are TBS requirements the real constraint? 1=Yes [ ] 0 =No [ ]

3.4 Rank four main challenges which hinder processing of sunflower in your area.

1.....2.....

3 ..... 4.....

3.5 Suggest the possible interventions for improving farmer processed sunflower.

1.....2. .....

3.....4.....

THANKS FOR YOUR COOPERATION

Appendix 3: A questionnaire for the sunflower oil millers in Kilosa district

Number of questionnaire [.....]

Location of sunflower oil pressing business centre

Division.....
Ward.....
Village.....

1. Sunflower oil pressing business centres

1.1 When did you start sunflower processing business? .....year.

1.2 Please give information on you business capital and sources as per table below?

	Start-up (Tshs)		Operational (Tshs)	Total (Tshs)
Capital				
Sources				

1.3a. Please give information on technical aspects of the sunflower oil milling business

Origin of the mill machine	Manufacturer capacity (kg/day)	Present capacity (kg/day)	Utilized capacity (kg/day)	
			At peak	At trough

1.3b. Rank problems you face in using this technology at your business centre?
1.....
2.....
3.....
4.....
5.....
6.....

1.4a.Please describe the organizational aspects of your personnel as per table below?

Position	Gender and number of employees		Total employees
	Male	Female	
Total			

1.4b. Types of labour used in the oil milling business.
1=Hired labour [ ] 2=Family labour [ ] 3=Hired and family labour [ ]

1.5a. Would you please provide information about the sources of sunflower you mill?

Sources	Own farm	Purchased	Farmers-processors	Total (%)
Estimated quantity (%)				

1.5b. Please mention the quantity and sources of sunflower you processed in 2008/09

Sources	Own farm	Purchased	Farmers-processors	Total (bags)
Quantity (bags)				

1.5c. How supply of raw sunflower to your centre fluctuated in 2008/09?

Period/supply	Lowest supply (Kg)	Highest supply (Kg)
Months of the year		
Quantity per day		

1.5d. Why?.....

2. Marketing of farmer processed sunflower

2.1a Who are your customers for processed sunflower oil?

Main customers (tick the main)	Location	Price/litre(Tshs)
Final consumers		
Local intermediary traders		
Hoteliers		

2.1b Who are your customers for sunflower seedcake?

Customers (tick the main)	Location	Price/litre(Tshs)
Final users		
Local intermediary traders		
Feeds processors		

2.1c How was the price trend sunflower oil from 2006 to 2009?
1= Decreased [ ] 2= Constant [ ] 3= Increased [ ]

2.2 Is your sunflower cooking oil certified by **TBS**? 1=Yes [ ] 0=No [ ]

2.3 Rank the four main complaints from your customers regarding oil milling services.
1=Low oil output per bag [ ] 2=Frequent breakdown [ ] 3=Inconsistent work time table [ ] 4=harsh language [ ] 5=Delayed services [ ] 6=Nil [ ]
7=Other (Specify).....

2.4 Suggest the possible main interventions for improving farmer processed sunflower.
1.....2. .....
3.....4.....

THANKS FOR YOUR COOPERATION

Appendix 4: Production plan and implementation - Kilosa district 2005-2009

Cash crop	2005/06			
	Plan		Implementation	
	Acreage	Yield (tones)	Acreage	Yield (tones)
Cotton	18,190	22,738	2,350	2,350
Simsim	6,000	4,200	2,053	1,437
Sunflower	4,300	3,010	4,012	2,808
Onions	741	9,262	653	8,162
Sugarcane	7,513	450,780	7,513	450,780
Miwa ya mezani	625	12,520	625	12,520
Coconuts	83	778	83	778
Groundnuts	3,075	2,460	3,265	2,612
Total	**40,527**	**505,748**	**20,554**	**481,447**

Cash crop	2007/08			
	Plan		Implementation	
	Acreage	Yield (tones)	Acreage	Yield (tones)
Cotton	18,190	22,738	1,245	1,245
Simsim	6,000	4,200	4,290	4,290
Sunflower	4,300	3,010	3,500	3,500
Onions	741	9,262	687	8,587
Sugarcane	7,513	450,780	4,850	4,850
Miwa ya mezani	625	12,520	509	509
Coconuts	83	778	83	83
Groundnuts	3,075	2,460	2,110	1,688
Total	**40,527**	**505,748**	**17,274**	**24,752**

Cash crop	2008/09			
	Plan		Implementation	
	Acreage	Yield (tones)	Acreage	Yield (tones)
Cotton	18,190	22,738	26,671	
Simsim	6,000	4,200	4,133	
Sunflower	4,300	3,010	3,256	
Onions	741	9,262	680	
Sugarcane	7,513	450,780	4,117	
Miwa ya mezani	625	12,520	537	
Coconuts	83	778	83	
Groundnuts	3,075	2,460	1,278	
Total	**40,527**	**505,748**	**14,755**	