RURAL COMMERCIALIZATION POTENTIAL OF HIGH-VALUE AGRICULTURAL COMMODITIES: THE CASE OF SUNFLOWER VALUE CHAIN IN IDIFU VILLAGE IN CENTRAL TANZANIA

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A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF BUSINESS ADMINISTRATION IN AGRIBUSINESS OF THE SOKOINE UNIVERSITY OF AGRICULTURE. MOROGORO, TANZANIA.

2017

ABSTRACT

The demand for edible oil is currently increasing in Tanzania. There is a great opportunity in investing in sunflower production due to its potentiality on improving the income of smallholder farmers and processors, and substituting imported edible oil. However, little is known in terms of local potentials for profitable commercial participation of smallholders in the sunflower value chain. This study was conducted to assess the rural agribusiness commercialization potential for value added products in sunflower value chain in Idifu village, Dodoma region in central Tanzania. It specifically sought to determine sunflower product lines in the local markets and the potential of linking these production lines with end markets of oilseeds and value added products. The study further aimed at analysing the profitability of sunflower product mix at both, local and urban-based end markets. Finally, the study looked at market requirements and conditions of sunflower product lines in the urban based end markets. The interviews were conducted between August and November 2016. A total of 70 farmers were randomly selected and number of 9 processors and 12 traders of sunflower products were randomly and purposively selected. A structured questionnaire was used in data collection. The findings show that it is apparently profitable for farmers to market sunflower seeds through the incoming middlemen than through local traders and urban markets. However, higher profits were realized by farmers involved in value addition to and commercialization of sunflower oil and cake through the local and rural centre based markets. Furthermore, processors demand for important requirements to be met before sunflower products can be accepted in the market; and these requirements included cleanness and dryness of sunflower seeds, maturity, and the use of improved seeds that yield more oil during processing. Traders at retail level required clean oil, double refined, packaged oil and certification by food

quality and standards regulatory authorities. Based on these findings the paper recommended that rural road networks should be improved to facilitate transportation, promotion and collective action need to be taken among sunflower farmers in order to improve economies of scale and bargaining power, have increased access to affordable improved inputs especially sunflower seeds and agricultural education and training.

DECLARATION

I, SEBASTIAN MAHENGE, do hereby declare to the senate of Sokoine University of Agriculture that, this dissertation is my own original work done within the period of registration and that it has neither been submitted nor concurrently being submitted in any other institution.

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The above declaration is confirmed by;

Dr. Khamaldin Mutabazi — Date

(Supervisor)

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ACKNOWLEGMENTS

First and foremost, my thanks go to the Almighty God who protected me and my family and made it possible for this work to come to a completion.

I would like to express my sincere gratitude to my supervisor Dr. Khamaldin Mutabazi from the School of Agricultural Economics and Business Studies of Sokoine University of Agriculture for his advice, direction, insight guidance and valuable comments, without his professional help it was difficult to successful accomplish this work. My utmost thanks go to Dr. Christopher Magomba and Mr. Charles Mgeni for their constructive comments and advice which made this study to be possible.

I am extremely grateful to my fellow MBA student Betty Begashe for her support and contribution from the beginning until the end of this research activity. My heartfelt thanks also go to my family for moral and financial support during my entire stay at Sokoine University of Agriculture.

My sincere and special thanks go to the German government through Trans-Sec project for their financial support to facilitate this research activity. My deep gratitude also goes to village leaders for their unreserved assistance during the data collection and field work period. Moreover I would like to specially thank small scale sunflower growers at Idifu village, traders and processors in Dodoma region for their cooperation during data collection process. May God bless you all.

DEDICATION

This dissertation is dedicated to my parents Seth and Veronica Mahenge and my brother Jackson Mahenge. Thank you for your support.

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LIST OF ABBREVIATIONS

GM	Gross Margin
HA	Hectare
KG	Kilogram
MBA	Master of Business Administration
MM	Millimeter
NGO'S	Non-Government Organizations
RLDC	Rural Livelihood Development Company
SSA	Sub Saharan Africa
TBS	Tanzania Bureau of Standards
TFDA	Tanzania Food and Drugs Authority
TRANS-SEC	Innovating Strategies To Safeguard Food Security Using Technology and Knowledge Transfer
TSHS	Tanzania Shillings
TVC	Total Variable Cost
URT	United Republic of Tanzania

CHAPTER ONE

1.0 INTRODUCTION

1.1 Agribusiness and Agricultural Commercialization

The agribusiness sector, which encompasses collective business activities carried out from farm to market place, is a major source of employment and generation of income. Recently, the importance of agribusiness sector has risen to higher levels as agricultural development strategies shifted from a pure production oriented approach to a wider systematic perspective that puts emphasis on agri-food chain coordination, value creation and institutional arrangement under which the chains operate (Konig *et al*., 2013).

As farmers are struggling to comply with the wave of new demands made on their supply chains by food consumers and retailers, modernization of food supply chains has contributed to the changes in the performance of agri-food chains, specifically in developing countries. Also it has posed challenges on food production and the distribution system and has recognized best practices and involved small producers in food supply chains (Vorley, 2007).

Smallholder farmers in Sub-Saharan Africa face poverty and food insecurity which emanate from low production resulting from numerous factors such as the use of poor technologies involving the use of poor seeds (World Bank, 2013). Also, climate change and variability posed some challenges to famers as agricultural operation is subjected to risks and uncertainties (Thompson *et al*., 2010). Low commercialization of agricultural products has contributed to stagnation of development of smallholder farmers (Delaney *et al*., 2011).

Developing smallholder agriculture can reduce extreme poverty and starvation in developing countries which do not have many other economic opportunities. Basic conditions for promoting agricultural development in Africa are widely debated in the literature of development economics. Wiggins and Keats (2013) identify some of such factors as creation of a rural investment climate that is favourable to investment and innovation by farmers. They also identify factors in the supply chains and public investment in rural public goods, including roads and other infrastructures, investment in rural people education, health, water, and agricultural research and extension.

Most of the farmers are shifting production from current subsistence towards market orientation (i.e. commercializing) (Jayne *et al.*, 2011). The adoption of modern farming practices eventually transforms the mind set of smallholder farmers to recognize the benefits of producing for commercial purposes. Commercialization, therefore significantly increases their income and standard of living and contributes to poverty alleviation ad economic development (Tirkaso, 2013).

With sustained GDP growth of about 6-7% for more than a decade and anticipated growth in gas and fossil oil extraction (URT, 2016), Tanzania is expected to be a middle income country. In this regard, the income growth is going to reconstruct the national food systems. Smallholder farmers are at the centre-stage of the rural based national food systems. As Shepherd (2007) observes, as income increases, food consumption is likely to change. The demand for fruits and vegetables, animal products, and oil crops such as sunflower is growing and rural farmers are diversifying production to respond to this demand. Consumers start demanding more quality and safety products as income trends leads to consumers demanding convenience food. Therefore, value addition along the

production chain is vital for producers to respond to the needs of consumers. Production, processing and distribution systems have been adapted to reflect this.

1.2 Sunflower Value Chain

Sunflower is primarily used for the manufacturing of sunflower oil and seed cake. The production of edible oil in Tanzania is mainly based on sunflower (35%), groundnut (25%), Sesame (13%) and Cotton (19%). The country is currently producing 3 million tons of sunflower oilseeds per annum (URT, 2016)

The demand for cooking oil in Tanzania is increasing with the minimum national demand estimated to be around 330,000 tons of edible oil per annum in 2010, with the consumption rate growing by 3 percent annually. Currently, more than half (about 60%) of edible oil consumed in the country is imported and only 40 percent is produced within the country. The country spends almost more than $120 million each year importing edible oil (URT, 2016).

Due to an increase of the demand of edible oil, there is a great opportunity in investing in sunflower production due to its potentials of improving the income of smallholder farmers and providing competitive edge against imported oil. Sunflower can now emerge as a crop which plays a significant role in poverty alleviation and economic development (Lubungu *et al*., 2014).

The analysis of sunflower value chain involves a number of activities from the production, processing, marketing and consumption which are intended to add value at each stage of the chain. It has both backward and forward integrations where farmers as growers are at

the central point and can be linked with input suppliers (backward integration); the inputs include sunflower seeds, fertilizers, and chemicals. Also, farmers can be connected further with processors, distributors, and consumers (that is forward integration) (Ugulumu, 2008). The upgrading of sunflower value chain is crucial for improving the production performance of smallholder farmers by considering profitable product lines.

Smallholder farmers can adopt various product lines in commercializing sunflower products. After harvesting sunflower seeds, farmers can sell their products in the market through various pathways, through selling either to their sunflower directly to processors who produce the refined oil, or to middlemen traders who buy seeds from farmers and then sell them to processors. Likewise, farmers can engage in the early stage of processing sunflower and then sell the single refined oil to other firms for further refinery processing. On other hand, farmers can fully be engaged in the processing of sunflower seeds and selling single refined cooking oil as an end product based on market and consumer requirements. For the sake of business sustainability, the markets are expected to reward participating farmers for their investments (Sharma *et al.,* 2012).

This study aims at analysing agribusiness spaces for profitable end market linkages for smallholder sunflower value added products. It further investigates the commercialization potentials of sunflower rural enterprise.

1.3 Statement of the Research Problem

Many farmers attain development through commercialization of their agricultural produce and products (Prato & Longo, 2012). The supply chains are changing rapidly, with transactions increasingly based on chains that involve coordinated links between farmers, traders, processors, and retailers (Herforth *et al.,* 2015). A number of market studies (e.g. Mutabazi *et al.,* 2013; Jastus *et al.,* 2015; Poole *et al.,* 2013; Abafita *et al.,* 2016; Osmani

and Hossain, 2015) have been carried out on the involvement of smallholder farmers in commercialization of agricultural products. Most of these studies provide numerous potential advantages vested in farmers at improving their linkages with buyers indicating a number of factors favoring farmers to commercialize given local and market conditions and requirements. However, there is a gap in developing profitable product lines in the local market to the end markets.

Markets are not enough to guarantee success. They otherwise expected to be capable of showing a profit for an entrepreneur who is linked to farmers and the market, in turn will need to be assured of higher net incomes from entering into a new venture as opposed to what they could obtain from the existing or alternative activities., estimates of farm profitability must be made at an early stage. Such calculations should be fully costed making realistic assumption about production yields (Shepherd, 2007).

The focus of this study was on value chain of rural products. This is specifically because some believe limiting factors in rural areas such as high cost involved in production, technology, resource and skills, make smallholder farmers fail to comply with the current trends in market demands. This research aims at analysing the rural agribusiness commercialization potential for value added products in the sunflower value chain in the local and the end markets.

1.4 The Research Objectives

1.4.1 Overall objective

To assess the rural agribusiness commercialization potential for value added products in the sunflower value chain in the local and end markets.

1.4.2 Specific objectives

1. To determine the sunflower product mix in the local markets.
2. To analyse the profitability of sunflower product mix at both, local and urban based end markets.
3. To characterize market requirements and conditions of sunflower product lines in the urban based end markets.

1.5 Research Questions

1. What are the sunflower product lines and value added products in the local markets?
2. Which sunflower product lines at local and end markets are profitable?
3. What are the requirements and conditions of sunflower product lines at the urban based end market outlets?

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Smallholder Commercialization in Africa

According to Abafita *et al*. (2016), commercialization refers to the ability of producers to transforming their products into market oriented basing on their production decisions through observing market signals, handling, and its placement in the market for selling purpose. Smallholder commercialization involves transformation of individual farms from subsistence agriculture to specialized production for attaining a certain market for their output (Jaleta, 2009). Kirimi (2013) views commercialization as an avenue for improving food security and reducing food poverty through enabling smallholder farmers to access production inputs and participate in the market.

Jayne (2011) views smallholder commercialization as the use of technologies in their farms during the production which result into the expansion of production as the land bears higher yields in a given unit of land. The intensification of productivity leads to more outputs which increase the farmers' ability to participate in the market which eventually leads to an increase of their income and the rise of their standard of living.

In a study of smallholder agricultural commercialization for income growth and poverty alleviation in southern Africa Zhou *et al*. (2013) uncovered some important insights into the role, conceptual understanding, measurement, drivers, determinants, strategies and effects of agricultural commercialization in southern Africa. The contribution of agriculture and commercialization towards income growth, employment creation, economic growth, livelihood improvements and poverty alleviation is evidenced by a

comprehensive body of literature attesting to this. Although commercialization has been traditionally associated with large scale producers, growing opportunities are making it inevitable for smallholders to be integrated into the market economy.

A study done by Wiggins and Keats (2013) on linking smallholders to markets revealed that an enabling investment climate and the provision of rural public goods by the state are necessary conditions of ensuring fair and efficient market linkages though not always sufficient. Also, most smallholder farmers have limited access to inputs, technical advice, insurance, credit and other financial services and output markets. Increasing market access is a major challenge for smallholder agricultural development.

Successful links between smallholder farmers and markets call for considerations and planning among smallholder farmers and their partners in the supply chain. Thereby, the government needs to provide an enabling environment for investment in rural areas in terms of peace and security, a stable macro economy, and key institutions such as property rights, and trading standards such as weight and measures (Adelman, 2000). According to Magingxa and Kamara (2003); Lerman (2004) and Jastus *et al.*, (2015), government has to invest in rural public goods such as roads and power, education, health care and clean water, agricultural research extension and market centres for the provision of market information. Linkages between farmers and markets usually need to be organized by a catalyst, either a private firm as supply chain champion or a non-government organization often in partnership with private firms (Poole and de Frece, 2010).

2.2 Value Chain for Enhanced Commercialization of African agriculture

Most of the efforts to develop smallholder value chains in Africa have focused on collective marketing, often, with little emphasis on the value chain. However as Shepherd

(2007) argues, the efforts to organize farmers into marketing groups will have little impact if the rest of the supply chain is not functioning well. Supporting farmers' participation in the value chain needs identification and addressing of value chain constraints faced both by farmers and marketing system. Collective action is not always essential. Selling of staples to local markets may yield few returns from formal collective marketing activities, although farmers may benefit from informal activities. Farmer organizations and groups must be seen as a means to an end, and not as an end in themselves (Shepherd, 2007). Detailed analysis of the socio economic situation of the farmers and relevant supply chains are critical in deciding as to whether or not to organize farmers into groups.

A study by Ugulumu and Inanga (2014) in central Tanzania found that farmers believed that a strong and well-coordinated sunflower value chain would elevate their income levels and reduce costs. Ferris *et al*. (2014) showed that modernizing extension services can accelerate productivity of smallholder farmers and improve their market performance. Sunflower sector development, among other things, requires effective policy reform, engagement of private sector, improvement of communications and access to services, and strengthening demand through more stable trading.

Mitchell and Keane (2009) examined how value chain approach can enable the rural poor to participate gainfully in local, regional, and global trade. Value chains can be developed through upgrading activities that target at enhancing product transformations, functions, and processes. Upgrading of the value chains can help the rural poor to acquire the technologies, institutions, and market capabilities, which would in turn, improve their competitiveness and thereby move into higher value activities.

Rural Livelihood Development Company (RLDC) considers the sunflower value chain as basing on production, processing, and consumption domains with sub-activities on adding value on products at each stage of production. The production stage comprises small producers who are able to cultivate one to three acres, and medium or large scale farmers cultivating more than a thousand acres of sunflower seeds. Producers mostly use two main inputs in production namely, seeds and fertilizers (RLDC, 2008). However, majority of smallholder sunflower producers do not use fertilizers.

According to RLDC (2008), the second stage involves crushing of seeds to get sunflower oil and seed cake. Crushing is done by small oil mills that are capable of crushing 30 to 50 bags of sunflower seeds per day, while medium-scale mills can crush about 150 to 200 bags per day; and large-scale mills can crush more than 200 bags. The refined oil produce is consumed at the end market by whole sellers, retailers and supermarkets. Also, seed cake is sold in the market for animal feed (RLDC, 2008). The oil produced by small scale mills is basically single refined oil while that produced by large mills is fortified double refined oil (Lubungu *et al.*, 2014).

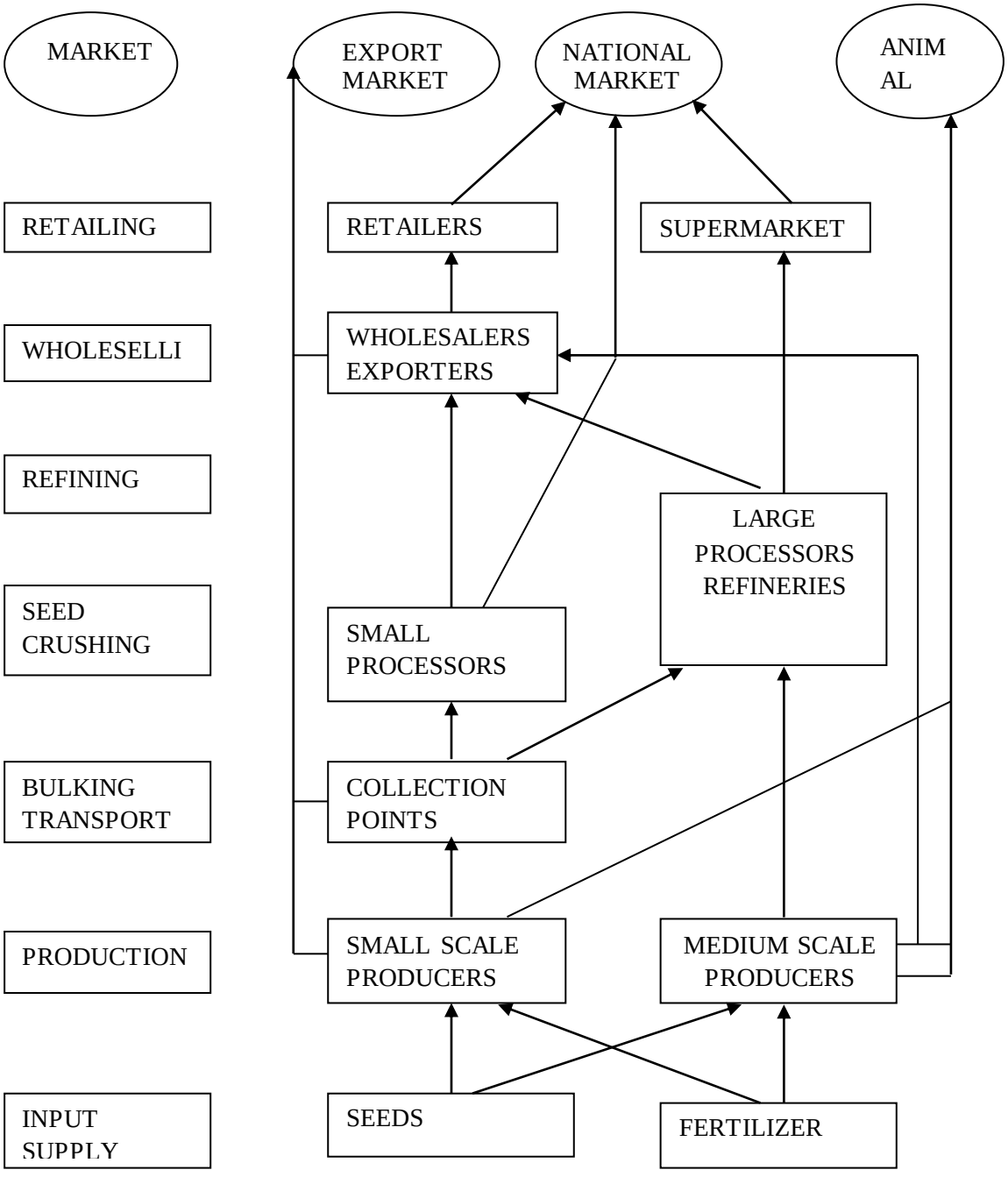

Figure 1: Sunflower value chain map

Source: RLDC, 2008

Ugulumu (2008) describes value chain analysis as comprising a number of functions and institutions. The author refers to smallholder farmers as growers at central points and who are linked with input suppliers (backward integration). The inputs include fertilizers, sunflower, seeds and chemicals. After harvesting, farmers use some routes used to sell products in the market and these are termed as forward integration. Farmers can sell their products directly to processors or they can use traders and middle men to reach the market. Transporters bridge the gap between farmers and processors or buyers of products. Furthermore, processors have a good linkage with suppliers of machineries, spare parts utility suppliers and packages. After production, there are further activities involved including transporting, wholesaling, retailing and distribution. Farmers can also process seeds into oil for home consumption.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Description of the Firm or Business Industry

Trans-SEC is a research for development project funded by the German government. The project aims at innovating pro-poor strategies in the rural food system and value chain to safeguard food security using technology and knowledge transfer. It focuses on smallholder farmers across rural Africa especially in Sub-Saharan Africa (SSA) where majority is locked into abject poverty and food insecurity.

Trans-SEC has a project of developing smallholder rural based agro-processing service enterprise and commercialization through vertical integration for sunflower value chain upgrading in rural Tanzania. The project has a case study site in the semi-arid area, in Dodoma region with little prospects in value addition linkages to profitable markets.

The current study intends to unravel limits and unlock opportunities for developing a sustainable smallholder-based sunflower agribusiness value chain. It also investigates agribusiness spaces for profitable end-market linkages for smallholder sunflower value added products. It further investigates the potential commercialization pathways of the sunflower rural enterprise that leverage rural income generation and wealth creation.

3.2 Description of the Study Area

3.2.1 Description of the region

The study was conducted covered two districts, namely, Chamwino and Dodoma urban district in Dodoma region. The region is primarily Semi-arid with warm temperature

throughout the year and covers 41 311 square Kilometres. The average rainfall in Dodoma region ranges from 500 to 800 mm and majority (more than 90%) of the population depend on rain fed agriculture (Njau *et al.*, 2014). The region is administratively divided into seven districts namely Bahi, Chamwino, Chemba, Dodoma urban, Kondoa, Kongwa and Mpwapwa. According to the 2012 population Census, the population of Dodoma region is 2 083 588 people.

3.2.2 Description of Chamwino district

Chamwino is one of seven districts of Dodoma region. The district extends between latitude 40^0 and 80^0 south and between longitude $35^0$and 37^0 East. The district is administratively divided into 32 wards.

3.2.2.1 Population

According to 2012 National population census, Chamwino district has about 330 543 people 171 661 of these are females and 158 882 are males. The district has about 57 992 households, out of these, 50 292 are involved in crop production and livestock keeping.

3.2.2.2 Climate

Chamwino district has dry Savanna climate accompanied by long dry season starting from late April to early December and a short wet season staring from December to mid-April. The average annual rainfall is 500 mm and the area receives rainfall in four months between December and March. Rainfall in the district is relative low and unpredictable. Abiding by rain season, most of the crops are grown in December and January.

3.2.2.3 Land

The district has a total area of 8 056 square kilometre which approximately equal to 805 600 hectors. About 70% of the total arable land is suitable for crop production. About

563 920 hectares of the district are suitable for Agricultural production and 246 821 hectares are used for crop production. This shows that there is a potential for the expansion of agricultural production through increasing area under cultivation, since small part of land is used for crop production.

3.2.2.4 Economic activities

The main economic activities in Chamwino district are crop production and livestock keeping, thus making Agricultural and Livestock sector constitute high percentage to the economy through the provision of income, employment, and food supplies. A small part of the population is engaged in commercial and industrial sector.

3.2.2.5 Crop production

Chamwino district is engaged in the production of a variety of food and cash crops and these include Sorghum, maize, and cassava. Other crops include grapes, sunflower, sesame, groundnuts, bulrush millet, and paddy. The district aims at promoting the use of modern technology in agricultural production including promoting the use of Motorized power tillers, expansion of area under cultivation for improved irrigation and the use of modern farm implements.

3.2.2.6 Vegetation

The district has six forest reserves which cover 107 720 ha. There are subdivision of this forest reserve namely, Chine forest reserve covering 29 839 ha, Chinyami 43 330 ha, Sasajila 1 145 ha, Goima 6 959, and Chamhena 3 785 ha. The forest and woodland areas have been destructed by deforestation resulting from uncontrolled bush fires and shifting cultivation.

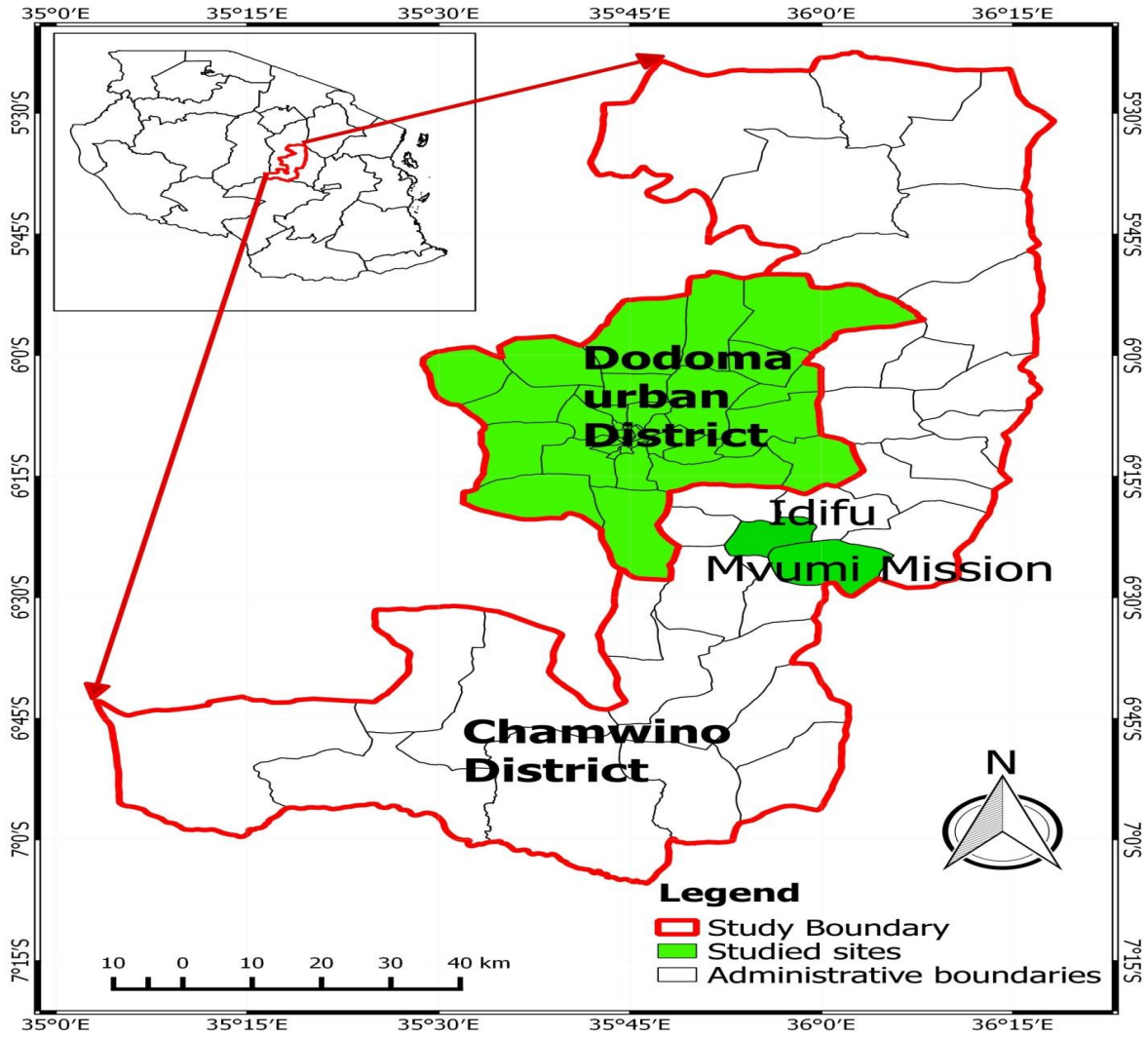

Figure 2: A map showing the study areas

3.3 Research Design

A cross-sectional research design was used to collect data from smallholder farmers at a single point in time through a questionnaire survey. The cross sectional research design is useful as it allows collection of data from different groups of respondents at a single time. It is also considered to be more appropriate because it is time and resource effective as it is conducted at once with a greater degree of accuracy compared to other designs (Kothari, 2004). Interviews were carried out in the study village, at the nearby Mvumi centre and in Dodoma town where a number of commercial oil press units are operating as the end market. In these locations the interviews involved farmers, traders, and processors.

3.4 Sample and Sampling Technique

The study was conducted at Idifu village in Dodoma which is the leading region in sunflower production in Tanzania. The study involved the collection of data from sunflower smallholder farmers, processors, and traders or buyers of sunflower products within and outside the village.

3.4.1 Selection farmers

A list of 200 farming households involved in sunflower production was obtained from the village government office. This list was used as a sampling frame for drawing a study sample of farming households. The sample size was determined by considering both the statistical procedure and available research resources in terms of time and financial budget. Key aspects considered in the determination of the sample size include the anticipated confidence level, required degree of precision and level of heterogeneity in the research population (Cochran, 1963). In our case, we adopted the 90% confidence level, 10% precision level or error margin of error and 0.5 was assumed a maximum measure of heterogeneity in the population.

$$n_o = \frac{z^2 pq}{e^2}$$

Where: n_o = the sample size; z^2 = the z-score (the abscissa of the normal curve that cuts off an area at the tails, which is 1.65 for 90% confidence level); e = the desired level of precision of 10%, that is, the margin of error that is acceptable; p = proportion of the population having the characteristic, $q = 1$-p.

The formula gave a total sample of 68 farming households. As a result, 70 sunflower producing households were randomly selected from the list of sunflower producers in the village.

3.4.2 Selection of processors

The selection of sunflower processors mainly based on the readiness of the processor to accept sparing his time for interviews. At village level, the only one existing processor (the farmer group supported by the Trans-SEC project) was covered in the survey. At the rural centre of Mvumi four sunflower mills and two processors were covered in the survey. In urban centre, six processors including one large processor, two medium processors and three small processors were interviewed. A total of 9 processors were interviewed. One processor was large with the capacity of processing more than 20 000 tons per year, two were medium with the ability of processing between 500 and 20 000 tons and six were small processors with the capacity of crushing between 0 to 500 tons of sunflower per year.

3.4.3 Selection of traders sunflower products

Purposive sampling technique was used to select traders who would participate in the interviews. The selection criterion was willingness to participate. Twelve traders including seven shops, two supermarkets and three other buyers of sunflower products were interviewed

3.5 Types of Data and Data Collection

The study used both quantitative and qualitative primary data. Primary data included the information collected directly from farmers, traders and processors. Questionnaires were administered to respondents to obtain primary data. The researcher used structured questionnaires which comprised both open and closed ended questions for data collection. Other data collection tools such as interviews and observation were applied in this study with the purpose of getting relevant additional information and field experiences.

3.6 Data Analysis

3.6.1 Determination of sunflower product mix in local markets

The sunflower product mix was traded among the rural sunflower farmers was identified. The respective analysis involved establishing the distribution of different sunflower produce and value added products in the study area. The analysis used includes frequencies and percentages indicating the relative importance of each traded sunflower product among the farmers.

3.6.2 Analysis of profitability of sunflower product lines at local markets and urban-based end markets

The gross margin approach was used to analyse profitability of different sunflower seed and value added products among different value chain actors across different markets. The gross margins account for the difference between the value of sales and the costs at each stage in the value chain. It is a common means of measuring market efficiency through evaluating price efficiency. The gross margin analysis helps to determine the value of incremental sales and guiding pricing and promotion decisions which eventually show the profitability of an enterprise. Some farmers' activities were carried out by using family labour, the cost of such farmers were estimated by an average cost of activity for all farmers.

3.6.3 Characterization of end market requirements and conditions

The requirements and conditions for accepting the products by a range of buyers in the sunflower end markets were assessed. The assessment aims at depicting the implications of small-scale rural producers and processors to comply with such end market requirements and conditions.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 Social economic characteristics of respondents

The social economic profiles of respondents have implications on production and marketing of products. They may determine the volume of production, decision making based on the production and market stability of a farmer, and easiness of adapting to the dynamic market situation. This section covers the age, education, and occupation of the respondents.

4.1.1 Occupation of respondents

Majority which is about three quarters (74%) of smallholder farmers were engaged in farming activities as their sole livelihood occupation; and the remaining quarter participated in both farming and non-farming activities. The rural non-farm sector is growing leading to increase of livelihood diversification; this helps to reduce the risk of hunger and food insecurity and broadens the income base. According to Kahan (2007) farmers must diversify production as a successful risk management strategy.

Table 1: Occupation of respondents

Activity	Frequency	Percent
Farming	52	74.3
Farming and non-farming	18	25.7
Total	**70**	**100**

4.1.2 Education level of farmers

Table 2 presents the distribution of farmers according to their education levels. Most of smallholder sunflower farmers had no formal education; and about the same percentage attained primary education. Only a few (1-9%) attained secondary and tertiary education.

Education helps famers to produce more efficiently as it becomes easier for them to comprehend and adopt good agronomic practices; it also enhances their ability to identify market potentials for selling their products profitably.

Table 2: Education level of respondents

Level of education	Number of farmers	Percentage
No formal education	32	46
Primary education	31	44
Secondary education	6	9
Post-secondary education	1	1
Total	**70**	**100**

4.1.3 The age of farmers

Majority (62%) of the respondents were in their active age group of 18-40 years (Table 3) and more than a quarter (34%) of the respondents were still in their economically active age group. Very few elderly people participated in the sunflower value chain. According to D'Souza (1993), farmers in the active age group are likely to adopt sustainable agricultural practices which facilitate expansion and improvement of productivity. Henceforth, there is potential for farmers experiencing higher production as active group is engaged in agricultural activities.

Table 3: The age of farmers

Age (years)	Number of respondents	Percentage
Less than 18	0	0
Between 18-40	43	62
Between 41-64	24	34
Above 65	3	4
total	**70**	**100**

4.2 Sunflower Production

4.2.1 Land holding size

Majority of the farmers cultivated sunflower on farms of up to 2 hectares. The farm sizes were therefore close to those of the average national smallholder farm holding of 0.2 to 2 hectares (Salami *et al.*, 2010). Therefore, sunflower cultivation is still done on smaller family farms but with the potential of expanding. The expansion of sunflower farm size needs to go hand in hand with the efforts to increase productivity per unit farm area.

Table 4: Land used for sunflower production

	Land holding size		**Land used for sunflower production**	
	Frequency	**Percentage**	**Frequency**	**Percentage**
Up to 2 ha	26	37.14	66	94.28
2 to 5	35	50	3	4.29
Above 5 ha	9	12.86	1	1.43
Total	**70**	**100**	**70**	**100**

4.2.2 Sunflower inputs

Seeds

Majority (90%) of the sunflower farmers used local recycled seeds. Very few (3-7%) used either improved seeds or both. Local recycled seeds have low productivity and produce low sunflower oil content . With good agronomic practices, one hectare of improved quality seeds can produce an average yields of between 1.9 and 2.4 ton/ha of sunflower compared to traditional seeds which can produce between 0.5 and 0.8 ton/ha (Gabagambi and George, 2010). One kilogram of recycled seeds produces an average of 0.3kg of oil (RLDC, 2008). There is potential of improving productivity among smallholder farmers using improved seeds because of its advantages of providing high yields, being resistant to diseases, and being tolerant to drought conditions.

Table 5: Type of seeds used in production

Type of seed	Number of farmers	Percentage
Local recycled seeds	63	90
Improved seeds	2	2.9
Both	5	7.1
Total	**70**	**100**

Fertilizer application

Farmers use organic fertilizers to improve soil fertility of sunflower fields (41%). Most of the farmers can access farm yard manure because livestock they keep as an important component of the local farming system. The use of manure was by farmers who believed that that the land was already fertile enough for production. Sunflower farmers did not use industrial fertilizer at all. There is a potential of improving productivity through increased use of organic fertilizers.

Table 6: Fertilizer application

Type of fertilizer	Number of farmers	Percentage
Organic fertilizer	29	41
Inorganic fertilizer	0	0
No fertilizer application	41	59
Total	**70**	**100**

4.2.3 Sunflower average productivity

The average yields for farmers cultivating up to two and above 5 hectares were less than 0.5 ton/ha (Table 7). The higher average yields of 0.5 ton/ha were achieved by farmers who were cultivating between two and five hectares. This is relative closer to the national standard of 0.6 ton/ha. Less average yields were a result of numerous factors which included drought, variation on the use of agricultural inputs such as seeds and fertilizers, planting dates and soil type. There is an opportunity for smallholder farmers to increase

productivity by cultivating more hectares, abiding by good crop management practices, and taking care of the risks accompanied with expansion.

Table 7: Average productivity

Land size	Frequency	Average yield (tonne/ha)	Minimum yield (tonne/ha)	Maximum yield (tonne/ha)
Up to 2 ha	26	0.42	0.09	1.16
2 to 5	35	0.5	0.06	1.51
Above 5 ha	9	0.47	0.20	0.96

4.3 Farmers' Sunflower Profitability

4.3.1 Sunflower marketing channels

Sunflower is mainly sold as oil seeds without being transformed into value added products through a number of outlets. Over three quarters (86%) of sunflower farmers sold their oil seeds to village-based small traders. A few farmers (7%) sold their seed produce through middlemen and town based markets.

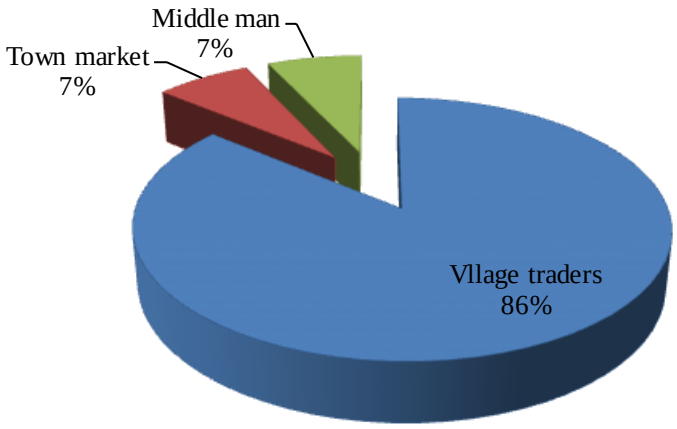

Figure 3: Sunflower marketing channels

4.3.2 Profitability of sunflower seeds through different marketing channels

Findings in Table 8 indicate that farmers participate in the marketing channels through incoming middle men registered higher productivity per unit area than those selling in the urban markets and to local traders. The difference seem to result from the use of improved seeds; as the cost of seeds for those dealing with distant markets was almost double of that of those selling in the local markets (to both village-based traders and to the incoming middlemen).

The producer prices of sunflower were also higher with distant marketing channels than was the case for other marketing channels. Farmers who sold to local traders were relatively high cost producers compared to those who sold locally to urban-based markets and incoming middlemen. Those who were marketing their seeds through distant markets tended to incur higher cultivation costs per unit land than was the case for those who marketed in the local markets. The revenue for farmers selling seeds to local traders was lower than that of those who sold to the other market channels. This is because local buyers purchased sunflower from them at low price and sell it to other profitable markets. The levels of gross margins indicate that it would be profitable for sunflower farmers to engage in commercialization through incoming middle men. The profit margin is over a hundred times and one fold of the profits earned by farmers selling locally to village buyers and urban based markets, respectively. A study by Abebe *et al.* (2016) found that trading with middlemen is beneficial in the value chain as it enhances commercialization by linking low income farmers with the final markets.

Table 8: Profitability of sunflower seeds through different marketing channels

	Marketing channels		
Average revenue, Cost & Gross margin	**Local trader (n=51)**	**Incoming Middlemen (n=4)**	**Urban market (n=4)**
Revenue			
Yield (ton/ha)	0.484	0.504	0.476
Price per ton	537 634	645 161	752 688
Average total revenue	**260 215**	**325 161**	**358 279**
Average Costs (Tshs per hectare cultivated)			
Cultivation	66 838	63 750	103 125
Planting	17 647	19 375	13 750
Weeding	46 520	41 875	43 750
Harvesting	37 745	37 500	34 375
Transport from farm	17 500	16 250	23 125
Input costs (Tshs per hectare cultivated)			
Cost of seeds	12 908	12 856	23 250
Cost of fertilizer	588	0	0
Transport cost to alternative markets	0	0	7 324
Average Total Variable cost (TVC)	**199 746**	**191 606**	**248 699**
Gross Margin (GM)	**60 469**	**133 555**	**109 580**

4.3.3 The contractual arrangements with sunflower buyers

Findings in Figure 4 indicate that majority (98%) of farmers did not enter into any contractual arrangement with anyone while very small percentage (2%) cultivated under informal contracts with buyers. contractual arrangement may involve formal or informal agreements between buyers and farmers. These agreements establish conditions for production and marketing of sunflower products. The agreement takes into account the quantity to supply, delivery schedule, and the quality of the product. Buyers agree to purchase produce from farmers on conditions of providing agricultural inputs in some instances. Using contracts in agriculture is critical to farmers, especially in assuring ready

market availability profitable prices. Most farmers seem to avoid contract farming due to poor understanding of contract farming practices.

4.3.4 Sunflower oil and cake marketing channels

Sunflower involves value additional processes with the production of oil and cake. These primary products are sold through a number of market channels. The findings in Table 9 indicate that majority (79%) of smallholder farmers were processing sunflower to obtain oil and cake, less than quarter (21%) of the farmers did not process sunflower after harvest. These smallholder farmers did not seem to be aware of the benefits of value addition to their sunflower.

Table 9: Sunflower processing and commercialization

Activity	Frequency	Percent
Processing	55	79
Not processing	15	21
Total	**70**	**100**

4.3.5 Profitability of sunflower oil through village shops and rural centre markets

Findings in Table 10 indicate that farmers were marketing their oil through village shops and rural centre based markets. Majority (88%) of farmers produced oil for family consumption and the prices of their products were based on given market values. On the other hand, only 12% put their oil product for commercial purposes. In each market category, farmers sold only sunflower oil as processing costs were relatively low and left seedcake to processors. The average productivity of farmers in the village markets were high, raising revenue generation in this channel. Farmers who managed to trade in rural centre markets experienced higher production costs compared to those who sold at the

local shops. This was contributed by transport costs to distant markets. The level of gross margin indicates that, farmers who marketed oil at local shops attained more profits.

Table 10: Profitability of sunflower oil through village shops and rural centre markets

	Village based markets			Rural centre		
Revenue, Cost and Gross margin	**Home consumption (n=8)**	**Trade (n=3)**	**Average**	**Home consumption (n=20)**	**Trade (n=1)**	**Average**
Average revenue						
Amount of sunflower, ton/ha	0.501	0.536	0.519	0.458	0.291	0.375
Sunflower oil output/ton	0.16	0.17	0.165	0.14	0.09	0.115
Price of oil, Tsh/ton	2 900 000	2 900 000	2 900 000	3 000 000	3 000 000	3 000 000
Total revenue	**464 000**	**493 000**	**478 500**	**420 000**	**270 000**	**345 000**
Average cost						
Production cost, Tsh/ha	196 628	203 000	199 814	196 131	198 250	197 191
Transport cost				35 231	22 385	5 762
Processing cost, Tsh in tonnes	53 871	57 634	55 753	49 247	31 290	40 269
Total Variable Cost	**250 499**	**260 634**	**255 567**	**280 609**	**251 925**	**266 267**
Gross Margin	**213 501**	**232 366**	**222 934**	**139 391**	**18 075**	**78 733**

4.3.6 Profitability of sunflower oil and cake through village and rural centre markets

Majority (92%) of farmers Table 11 processed sunflower into oil and cake for home consumption, while a small percentage (8%) of farmers sold the obtained end products through village and rural centre markets. The average revenue generated from sales of oil and seedcake was high compared to the revenue collected by farmers from sales of oil only (Tables 10 and 11). This difference was attributed to the sales of sunflower cake..

Higher costs of production incurred by farmers engaged in the sales of sunflower oil and cake to non-village markets were attributed to transport costs resulting from the use of motorbikes that charged higher rates. The cost of processing sunflower into oil and cake was twice as much that of processing sunflower into oil only, leaving seedcake to processors. The findings as indicated in Table 8 reveal that there is a potential of utilizing the local market opportunities instead of using other distant markets, which are accompanied with higher production costs resulting from poor road infrastructures that link farmers and other non-village traders. As indicated in Tables 10 and 11, there is noticeable variation of gross margin between farmers dealing with both oil and cakes and those who leave seedcake to processors. These findings are in line with those in the work by Anderson (2009) who revealed that value added products are perceived to be more valuable by many customers, serving as the basis for creating a profitable and substantial enterprise. It is therefore beneficial for farmers to commercialize value added products given the higher profits obtained.

Table 11: Profitability of sunflower oil and cake through village and rural centre markets

Revenue, Cost and Gross margin	Village based markets			Rural centre		
	Home consumption (n=5)	Trade (n=1)	Average	Home consumption (n=18)	Trade (n=1)	Average
Average revenue						
Amount of sunflower, ton/ha	0.419	0.543	0.481	0.381	0.87	0.626
Sunflower oil, output/ton	0.13	0.168	0.149	0.12	0.27	0.195
Price of oil, Tsh/ton	3 000 000	3 000 000	3 000 000	2 900 000	2 900 000	2 900 000
Oil revenue	390 000	504 000	447 000	348 000	783 000	565 500
Seedcake output, in tonnes	0.23	0.3	0.27	0.21	0.45	0.33
Price of seedcake, Tsh	350 000	350 000	350 000	300 000	300 000	300 000
Seedcake revenue	80 500	105 000	92 750	63 000	135 000	99 000
Total revenue	**470 000**	**609 000**	**539 750**	**411 000**	**918 000**	**664 500**
Average cost						
Production cost, Tsh/ha	201 685	196 500	199 093	210 600	200 750	205 675
Transport cost				29 308	66 923	48 116
Processing cost, Tsh in tonnes	90 108	116 774	103 441	81 936	187 097	134 517
Total Variable Cost	**291 793**	**313 274**	**302 534**	**321 844**	**454 770**	**388 307**
Gross Margin	**178 207**	**295 726**	**237 217**	**89 156**	**463 230**	**276 193**

4.3.7 The marketing constraints faced by farmers

The major sunflower marketing constraints reported by farmers include low producer prices, unreliable markets and poor road infrastructure (Table 12). Other marketing constraints reported though by relatively fewer respondents include lack of market information and storage facilities. Improving market transparency could address some of the first two major constraints. Poor market information was reported as a problem as well

(Table 12). Majority (64%) of the farmers depended on the buyers for market information, and about a quarter (29%) relied on other farmers in the village for market information (Table 13). Over-reliance of farmers on buyers jeopardized the ability of farmers - particularly those selling in the local markets - to negotiate price fairly.. There is a great potential of expanding sunflower production if the limiting factors indicated here are overcome (Dalipagic and Elepu, 2014).

Table 12: Marketing constraints faced by farmers

Marketing problem	Number of respondents	Percentage of respondents
Low producer price	26	37.1
Lack of a reliable market	21	30.0
Poor road infrastructure	14	20.0
Poor market information	4	5.7
Lack of standard weight measures	3	4.3
Poor storage facilities	2	2.9
Total	**70**	**100**

Table 13: Sources of market information

Source of information	Number of farmers	Percentage
From buyer	45	64.3
From other farmers	20	28.6
From village leaders	2	2.9
Processors	1	1.4

4.4 Sunflower Processors

4.4.1 The trend of annual average amount of sunflower processed

Figures 4 and 5 show that the average amount of sunflower processed by small and medium processors was low compared to amount processed by large processors. This was

because the former have lower processing capacity compared to the latter. The trend for both processors indicates that from January to March, production is low and starts to pick up from May through September when there are higher yields of sunflower in many places. Large processors are capable of maintaining high production throughout the year due to using highly mechanized facilities and the ability to store large quantities. Commercialization of sunflower products depends on the demand of sunflower products from processors. The processing capacity is big enough to accommodate most of the sunflower seeds produced, henceforth; there is the potential among farmers of selling sunflower profitably in this market.

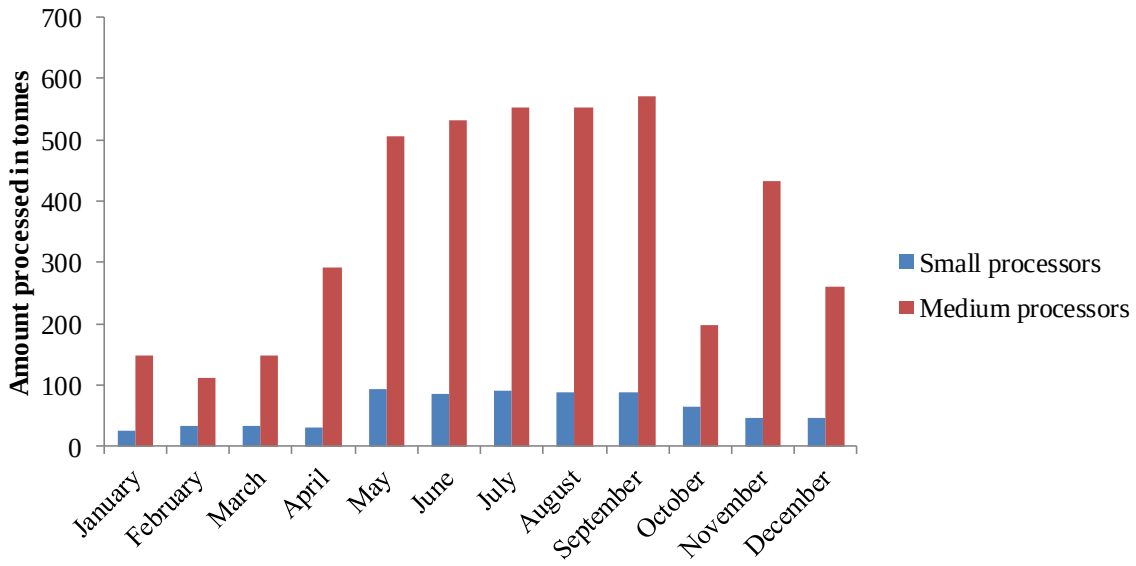

Figure 4: Trend of annual average amount of sunflower processed by small and medium processors

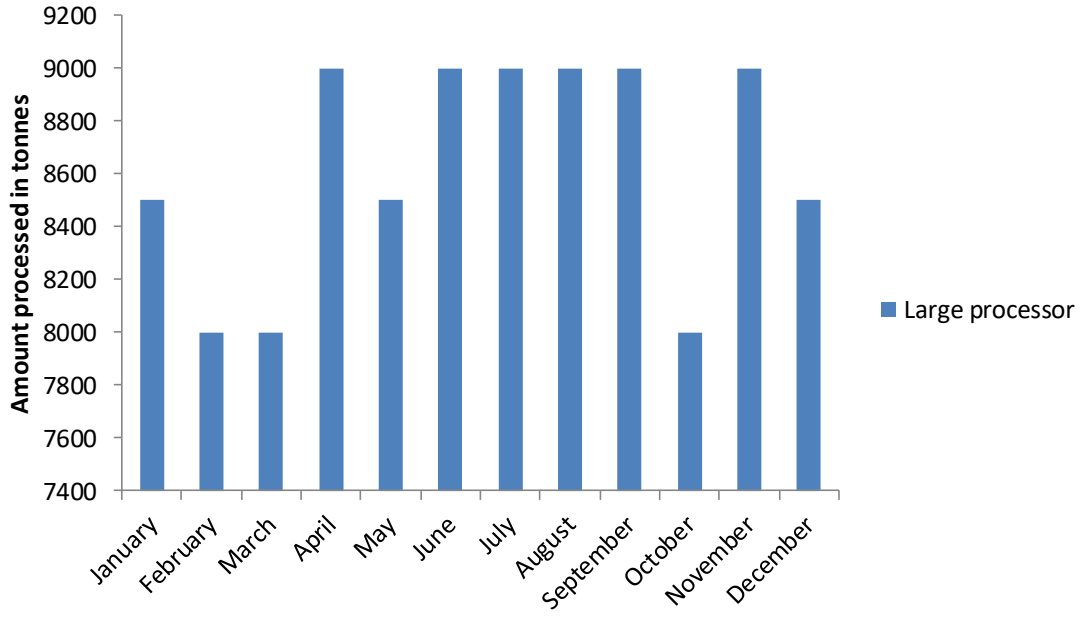

Figure 5: Trend of annual average amount of sunflower processed by large processor

4.4.2 The annual average price of sunflower seeds

Figure 6 demonstrates the trend of prices of sunflower seeds from processors. The market price is usually high in January and March for both processors; it starts to decline and remain low in harvesting season, April through September where there are high yields. The prices increase in October to December. The prices charged by medium processors are slightly higher than those charged by small and large processors in all seasons. The prices of sunflower seeds depend on the demand and supply forces. The amount of profit of an enterprise usually is determined by the prices charged for the product; higher prices are likely to maximize profit of smallholder farmers. There is an opportunity for farmers getting higher profits by selling seeds to medium processors with considerable slight price difference.

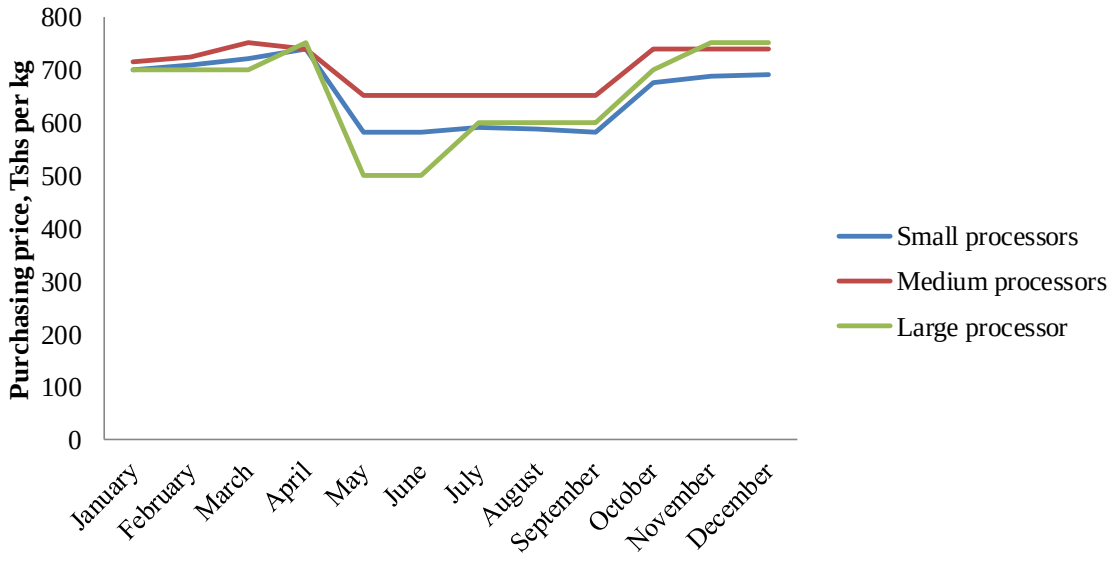

Figure 6: The trend of price of sunflower seeds from processors

4.4.3 The average selling price selling price of sunflower oil and seedcake by processors

The lowest average sunflower oil selling price was Tsh 2 870 per litre and the maximum was Tsh 3 130 per litre. For the sunflower cake, the minimum average price was 295 Tshs per kilogram while the maximum average price was Tsh 375 per kg. The selling price starts to decrease during harvesting time specifically from April to September as the product becomes scarce in the market. In this season, processors tend to sell products from their stocks. The ability of farmers sell value added products at profitable prices is determined by the market price basing on the production and harvesting season. The price trend of the products in different seasons enables farmers to realize the importance of storing products for the purpose of selling them in the profitable market.

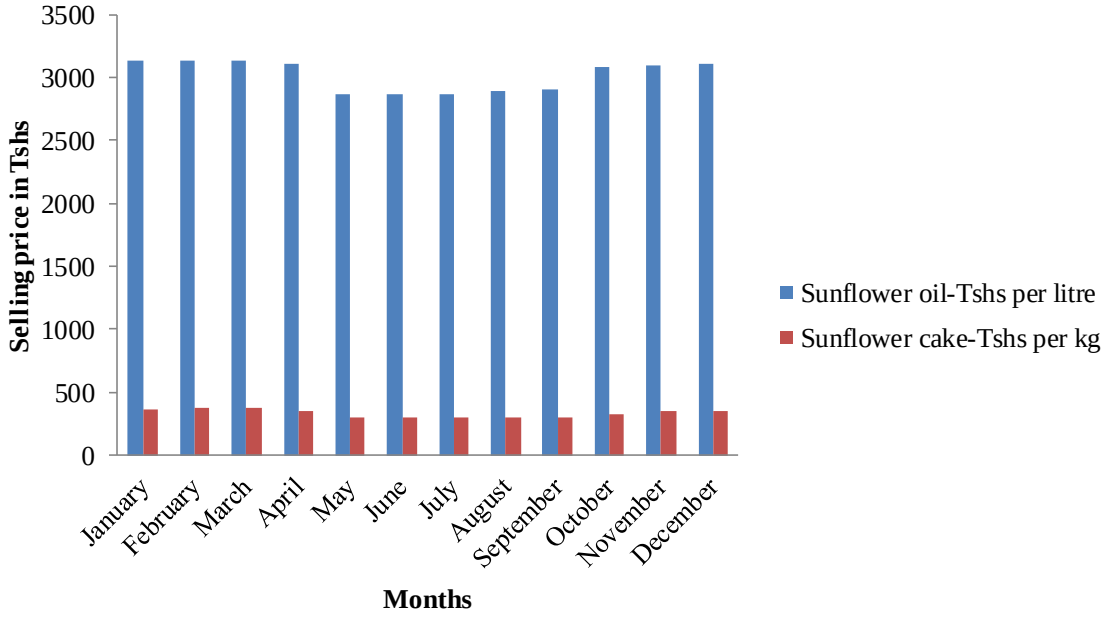

Figure 7: An average selling price of sunflower oil and seedcake

4.4.4 The annual average gross margin of small and medium sunflower processors

The findings in Table 14 show that the revenue for small processors is lower than revenue generated by medium processors. The level of gross margin indicates that medium processors make more profit than small processors do. However, small processors are likely to survive in the business as their competition for factors of production is minimal compared to the medium and larger processors. The survival of sunflower farmers in the business depends on the processors profitability as their performance affects the sunflower market situation. The higher the positive gross margin implies the higher the possibility of linking farmers in the profitable market. This is a result of increased demand of sunflower in the market.

Table 14: The annual average gross margin of small and medium processors

Average revenue, costs and gross margin	Small processors	Large processors
Revenue/Benefits		
Amount processed	410	1 800
Oil output	128	558
Price of oil, Tsh/ton	2 856 000	2 850 000
Oil revenue	365 568 000	1 590 300 000
Seedcake output	226	1 116
Price of seedcake, Tsh/ton	315 000	315 000
Seedcake revenue	71 190 000	351 540 000
Total revenue (Tsh)	**436 758 000**	**1 941 840 000**
Average Costs		
Working capital (Tsh)	289 862 140	1 345 800 000
Operating costs (Tsh)	77 230 000	205 600 000
Total Average cost (Tsh)	**367 092 140**	**1 551 400 000**
Gross margin	**69 665 860**	**390 440 000**

*Amounts of sunflower seed, oil and cake are in tonnes

4.4.5 Processors' requirements for good sunflower seeds

Majority (82%) of processors believed that clean, matured and dried improved seeds are the basic requirements for standard sunflower. Lower than quarter (18%) of the processors cited dried seeds as an important factor when purchasing sunflower from farmers. Improved seeds are considered as more valuable to many processors due to its high weight and high oil content (Habwe, 1992). It is therefore important for farmers to improve production by using quality seeds and other cited requirements for attaining good prices in all market outlets.

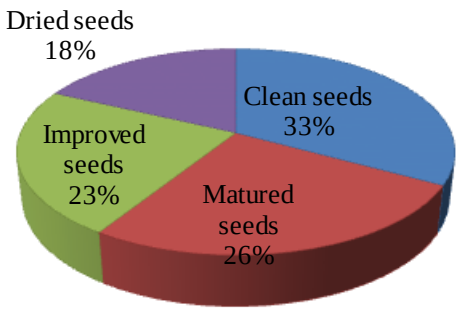

Figure 8: Requirements for sunflower as highly mentioned by processors

4.4.6 The contractual arrangements by processors

Findings in Table 15 show that three quarter (77%) of the processors had not entered into contracts with smallholder farmers; a quarter (23%) of processors had entered into contracts with farmers aimed at ensuring that there is a constant supply of sunflower throughout the year. Contractual agreements between processors and farmers facilitate backward and forward linkages and ensure constant supply of raw materials throughout the year, majority of processors however did not make such agreements.

Table 15: The contractual arrangement by processors

Description	Frequency	Percentage
Contractual arrangement	2	23
No contractual arrangement	7	77
Total	**9**	**100**

4.5 Traders/Buyers of Sunflower Products at Local and Alternative Markets

4.5.1 The Average buying and selling price of sunflower products at the local and alternative markets

The average selling and buying price of sunflower oil was lower at the local market than was the case at the non-local markets (Figure 9). The selling price of sunflower cake was

also higher in distant market than was the case at the local market. Commercialization of sunflower products at the local market is more profitable as only small production was involved; other cost for instance transportation costs and packaging costs were minimized. As Glancey (1998) argues, small firms operating in rural areas are more likely to generate more profit than those trading products in urban areas which face the challenge of operating at high cost and stiff competition from other firms dealing with similar products. Furthermore if the production is made at large scale, farmers need to find other alternative market which would cover for production and operating costs to make business profitable.

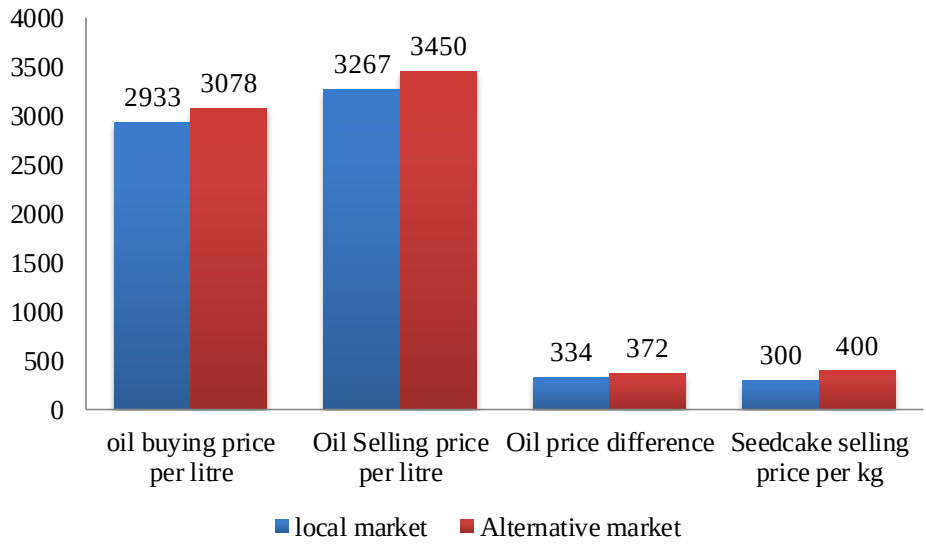

Figure 9: Average selling and buying price of sunflower products

4.5.2 Sunflower oil requirements from traders

Findings in Tables 16 and 17 indicate that, majority (71%) of traders from local and rural market centres reported having single refined, clean and enough quantities of oil as the standard requirements looked for by suppliers, few (29%) traders required double refined and packaged oil. However, in the urban markets, more than three quarters (80%) of traders mentioned packaging, double refined and authorization by regulatory authority

(TBS and TFDA) as the prerequisites for standard oil in business, small percentage (20%) required packed, single refined, and clean oil. Basically, Farmers have the potential of commercializing sunflower products for the local and rural markets by complying with production requirements. However, the expansion of production for other profitable market outlets will require more value addition to oil products to make them competitive in the market. As Nondizor *et al*. (2015) reveal, there are numerous factors driving consumers to purchase sunflower oil including their income, size of packages, quality, and personal preference.

Table 16: The requirements for sunflower products at local and rural centre market

Requirements for oil product	**Frequency**	**Percentage**
Single refined, clean oil and enough volume	5	71
Double refined and packed oil	2	29
Total	**7**	**100**

Note: *This table includes only the most frequent answers

Table 17: The requirements for sunflower products in urban traders

Requirements for oil product	**Frequency**	**Percentage**
Packed, Double refined and authorized.	4	80
Packed, single refined and clean oil	1	20
Total	**5**	**100**

Note: *This table includes only the most frequent answers

CHAPTER FIVE

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

This study assessed rural agribusiness commercialization potential for value added products in sunflower value chain. Various product lines were analysed including commercialization of sunflower for the local market, for the middle men and for the urban based markets. The study also looked at value addition to sunflower and marketing of sunflower oil and cake at the local shops and rural market centre. The gross margin method was used to determine the profitability of each product line.

The findings show that, it is relatively profitable for farmers to market sunflower seeds through the incoming middle men than through local traders and urban markets. Those who were selling products to local traders got lower profits as they faced high production cost and low selling price which further reduced profit. On the other hand, those involved in value addition to sunflower and commercialization of sunflower oil and cake to local and rural centre based markets enjoyed higher profits.

Furthermore, linking famers into local and alternative markets required acceptability of the product. Marketing sunflower products starts from the initial stages of production which involves preparation of the product to meet the requirement of the end market. For the case of sunflower, processors demanded that certain requirements be met before the accepting the product for the products for the local market. And these requirements include cleanness of sunflower, maturity, the use of improved seeds during production and dryness of sunflower. Processors and sunflower buyers demand that all the mentioned

requirements be met because they are usually the determinants of high quality and quantity of sunflower oil and seedcake. Also traders of sunflower products reported the requirements for good sunflower oil and cake at the local market and alternative market. The local traders need single refined and clean oil with enough volume. The other alternative markets have strict conditions including packaging of the products and the oil to be double refined and authorized by regulatory authorities.

However, despite that rural farmers have the potentials of commercializing sunflower into profitable markets, they are still constrained with some limiting factors for improving productivity as well as accessing good markets for products. The major challenges revealed in this study include predominant use of local seeds which have low germination rate by majority of farmers. The use of local seeds has been attributed by numerous factors including high price of input (seeds), lack of knowledge on the significance of modern seeds, poor access to improved seeds and the belief that of the use of modern seeds will make them lose traditional seeds. Other challenges include low producer prices at the local market, lack of reliable market, poor road infrastructure, poor market information, lack of standard weight measures and poor storage facilities.

5.2 Recommendations

The sunflower sector in Tanzanian is potential in boosting the income, improving nutrition status of rural farmers and in saving more than $ 230 million spent per year on importing cheap edible oil and thus contributing to the macroeconomics potential of the country. The following are recommendations are meant to unravel the limits and unlock opportunities for developing a sustainable smallholder based sunflower agribusiness value chain:

(i) The Government should improve road transport which is mostly used by farmers in transporting products out of the village. The quality of transport infrastructure will strengthen linkages between actors in the value chain including farmers, input suppliers, and buyers of sunflower products which enhance product marketability and strengthen networking system.

(ii) Finding good market for the products depends also on the level of output produced. Most of the sunflower buyers require large quantities of sunflower products for them to meet transport economies of scale. Government and Non-Government Organizations (NGO's) should organize farmers to form common collection points to help them to collect their product over time until it reaches the amount required in the alternative market. This will help famers to have the guaranteed market of selling their products for profitable prices.

(iii) Seeds are a major input used by village farmers for production. One of the challenges leading to poor sunflower production is the predominant use of local seeds. Government should provide subsidized improved seeds and expand the distribution centres for improving smallholder farmers' productivity.

(iv) The provision of agricultural education and training are important tools for improving productivity in the sunflower value chain. These trainings are crucial for changing the mind set of farmers into adopting modern farming systems including the use of modern seeds, fertilizers and other mechanized instruments for sunflower production. The development of agricultural sector will depend on the efforts made by the government and other Non-Government Organization in providing material and other non-material support.

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APPENDICES

Appendix 1: Questionnaire for smallholder farmers

1. Date of interview…….
2. Name of respondent……..
3. Village name……..Ward name……
   Sub ward name……..
4. Gender of respondent ( )
   a. Male b. Female
5. Age of respondent ( )
   a. 0-18 b. 18-25 c. 26-35 c. 36-45 d. >45 years
6. Marital status ( )
   a. Married b. Single c. Widowed d. Divorced
7. Education of the respondent ( )
   a. No formal education b. Primary c. Secondary d. Post-secondary education
8. Main occupation ( )
   a. Farming b. elf employed c. Unemployed d. other, specify
9. Do you own farm for sunflower seeds production? ( )
   a. Yes b. No
10. What is the size of your farm?.....acres

    What is the value of farm?.....Tshs per acre

11. Have you hired farms for sunflower seeds production? ( )
    a. Yes b. no

    If yes, what is the size of your hired farm?.....acres

    What amount do you pay for hiring one acre in one production season?.....Tsh per year.

12. Do you use family labor in production? ( )
    a. Yes b. no
13. If no, how many people are employed in your farm for production?.....
14. How much do you pay labor for the all activities in one season?……tsh
15. What type of seeds do you use for production? ( )
    a. Local variety b. improved seeds c. other, specify…….

16. What quantity of seeds is used?.....per acre
17. What is the price of sunflower seed?.....per kg.
18. What is the price for pesticides……Tshs
19. What type of fertilizer do you apply? ( )
    a. Manure fertilize b. artificial fertilizer c. both, manure and artificial fertilizer
    d. no fertilizer application e. other, specify…….
20. What amount of fertilizer do you apply?.....kg per acre?
21. What does it cost to get 1 kg of fertilizer?.....tshs
22. What is the cost of the following activities in one production season?
    Preparation of farm……..tshs per acre
    Ploughing……..tshs per acre
    Harrowing……..tshs per acre
    Planting……..tshs per acre
    Fertilizer application……tshs per acre
    Transportation……tshs per acre
    Herbicides application……tshs per acre
    Harvesting……tshs per acre
    Transportation of sunflower seeds from farm……tshs per acre
    Other
    cost,specify……
    ……
23. What amount do you harvest in one production season?.....kg per acre
24. Do you allocate land, inputs, equipment and labor to market oriented production? ( )
    a. Yes b. No
25. What amount do you sell in the market?.....kgs
26. Where do you sell your crops? ( )
    a. To local processors b. To middle men c. village collectors d. town market
    e. other, specify……..
27. What is the transportation cost of your crops to the market (local
    market)?.....tshs per bag
28. How much do you sell for the specified market?.....tshs per kg
29. At what terms? ( )
    a. Cash b. credit c. other, specify……
30. Did you know the price before selling your crops? ( )
    a. Yes b. no
31. Who set price of your produce? ( )
    a. Buyer b. seller c. other, specify…….

32. What motivated you to sell crops? ( )
    a. Cash problem b. price c. Preparation for next season d. place for next harvest
    e. Other, specify
33. If transporting to other areas (out of local market), where and what is the transportation cost? Place…….
    Cost……tshs per bag

34. Do you have any kind of arrangement (contractual) with buyers of crops? ( )
    a. Yes b. no
35. If yes, what are they? ( )
    a. Formal contracts b. informal contracts
36. What does contract specify?

    Price……

    Quality……..

    Time……..

    Other…….

37. How do you get information on the market and prices of your products?
    ……
38. What are the constraints in marketing your products?
    ……..
    ……..
    ……..
    ……..

Farmers processing sunflower seeds

39. Do you process your sunflower seeds? ( )
    a. Yes b. no
40. Where do you process your sunflower seeds? ( )
    a. Village processors b. nearby village processors c. Town processors d. urban processors e. other, specify……
41. How many kg of sunflower seeds do you process?.....kg
42. What is the quality of sunflower oil do you get? ( )
    a. Crude oil b. Single refined oil c. Double refined oil d. other, specify
43. How much do you pay to process 1kg of your crop?.....tshs

44. What quantity of sunflower oil do you get?.....litres
45. What amount of sunflower cake do you get?.....kg
46. What amount of other by products do you get?.....kg
47. Where and at what price do you sell your end products?

Market	**Crude oil (price per litre)**	**Sunflower oil (price per litre)**	**Sunflower cake (price per kg)**	**Other by product (price per kg)**
Retailers				
Whole sellers				
Processors				
Middle men				
Town market				
Other, specify				

48. Do you pack your products? ( )

    a. Yes b. no

    If yes, what is the price for packages?.....tshs

    other cost,

    specify……

    ……

Appendix 2: Questionnaire for sunflower processors

1. Date of interview.....
2. Name of the factory/ company……
3. Size of processor ( )
   a. Small processor [(0-1400)kg per day] b. Medium processors [(1401-4200)kg per day] c. Large processors [>4200kg per day]
4. District……Ward……Sub-ward…….
   Village…….
5. What price do you charge to process sunflower seeds from farmers?.....tshs per kg plus sunflower cake and
   Price……tshs per kg without sunflower cake
6. What amount of products do you get after processing…….sunflower seeds?
   Crude oil…….....litres Single refined oil……litres
   Double refined oil……litres seedcake……kg
7. Do you fortify sunflower cooking oil? ( )
   a. Yes b. No
8. Where do you get sunflower seeds for your company/processing unit?.....
9. Processing amount and costs in 12 months

Month/item	**Amount of seeds(Unit)**	**Purchasing price**	**Amount of Output**			**Selling price/unit**		
			Single refined oil in litre	Double refined oil in litre	Seedcake in kg	Single refined in litre	Double refined in litre	Seed cake in kg
Jan								
Feb								
March								
Aprli								
May								
June								
July								
Aug								
Sept								

Oct								
Nov								
Dec								
Total								

10. Who sets price? ( )
    a. Buyers b. Sellers c. Government e. other, specify……
11. What factors are considered in price setting? ( )
    a. Grade quality b. Supply/demand forces c. other, specify……
12. What is your total operating cost per annum?.....Tshs
13. What is the total cost of working capital per annum?.....Tshs
14. What are the qualities of sunflower seeds do you need?
    ……
    …….
15. Do you offer transportation of sunflower seeds from supplier? ( )
    a. Yes b. no
16. How can you describe the relationship with your supplier of sunflower seeds? ( )
    a. Very good b. Good c. Moderate d. Poor e. Very poor
17. Do you have any kind of arrangement (contractual) with your suppliers of sunflower seeds? ( )
    a. Yes b. no
18. Are your contracts formal or informal? ( )
    a. Formal b. informal
19. What is specified in the contract?
    Price…….
    Quality…….
    Quantity…….
    Time……
20. What are challenges do you face by doing business with sunflower seeds suppliers?
    ……
21. What are your suggestions for alleviating the said problems?
    ……..

Appendix 3: Questionnaire for traders/other buyers at the end market

1. Date of interview…….
2. Name of trade/buyer…….
3. District……Ward……Sub-ward……
   Village……
4. Main occupation……..
5. What type of sunflower product do you trade/use? ( )
   a. Sunflower cooking oil b. Sunflower cake c. both, sunflower cooking oil and sunflower cake d. other by products
6. Who are your suppliers of the product?.....
7.

Description	Unit	Buying price(tshs/unit)	Quantity per day	Selling price(tshs/unit)
Sunflower cooking oil	litre			
Sunflower cake	kg			
Other by products	kg			

8. What are the important requirements you consider before purchasing a product from supplier?
   ……
   ……
9. What conditions do you give to suppliers as they are delivering product?
   ……
   ……
10. Do you buy product basing on the various grades?( )
    a. yes b. no
11. What are qualities/ specification required from each grade?
    Grade 1……..
    Grade 2…….
    Grade 3……..
    Other grades, specify…….
12. Who sets price for the product? ( )
    a. Buyer b. seller c. other, specify

13. What are factors used to set price ( )
    a. Supply b. Demand forces c. Quality/grades d. others, specify……
14. What mode of payment do you use? ( )
    a. Cash b. credit c. other, specify
15. Do you have any kind of contractual arrangements with your suppliers of sunflower cooking oil?( )
    a. Yes b. no
16. Are the contracts formal or informal? ( )
    a. Formal b. informal
17. What is specified in contract? In terms of:
    Price……
    Quality……
    Time……
18. What are the challenges in doing business with the suppliers of your product?
    ……
    ……
    ……

THANK YOU