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Camillus Kombe
Zegezege Mpemba
Nicas Yabu
Maduhu Kazi
James Machemba
Bernard Kibesse
Dominic Mwita
Evarist Mgangaluma
Sungura Mashini
Andrea Chaula
Ernest Ndunguru
Moto Lugobi
Musa Mziya

Potentiality of Sunflower Sub-sector in Tanzania

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Executive Summary

Sunflower has become one of the major cash crops in Tanzania. The crop can be grown in most parts of the country as it is drought resistant, less susceptible to diseases and cheaper to cultivate compared to other oilseeds crops. Due to huge demand for sunflower products including sunflower oil, the subsector commands a significant potential in terms of economic growth and poverty reduction. However, performance of this subsector remains low and benefits from sunflower value chain have not been adequately realized. For example, edible oil production covers only 40 percent of domestic demand and Tanzania is the net importer of edible oil (ARI Ilonga, 2008).

This study was conducted to investigate potentialities of sunflower subsector and its contribution to the economy. The study was carried out in areas where sunflower is grown, covering all Bank of Tanzania (BoT)'s zones notably, Central Zone (Dodoma, Iringa, Singida and Tabora regions); Eastern Zone (Lindi, Morogoro and Mtwara regions); Lake Zone (Geita, Kigoma, Mara, Simiyu, Shinyanga, Kagera and Mwanza regions); Northern Zone (Manyara, Kilimanjaro, Tanga and Arusha regions); and Southern Highlands Zone (Katavi, Rukwa, Ruvuma, Mbeya, Njombe and Songwe regions).

Overall, the findings indicate that there is a huge potential for producing sunflower seeds in Tanzania. This includes high demand of sunflower oil, large suitable land, availability of market/demand, presence of water bodies, favorable policies and regulations, availability of power in the rural areas (Rural Electrification Programme through REA), and possibility of a wide range of products that can be produced in the sunflower value chain.

Further findings indicate that performance in this subsector does not mirror the underlying opportunities. Production is characterized by small area of cultivation and low yield. On average, cultivation is on small-scale, with an average farmer cultivating 4.0 acres only, producing only 0.6 tons of sunflower seeds per acre. This level is far below productivity of 2.0 tonnes to 3.0 tonnes of sunflower seed per acre. The role of farmers in the sunflower value chain is only confined at production level and selling sunflower seeds. Processing is characterized by small and medium scale processors and is only limited to sunflower oil and animal cake.

It was found that the low performance in this subsector is driven by a number of constraints. These include; poor farming practices, inadequate extension services, poor access to finance, depressed farm gate prices of sunflower products, inadequate processing facilities, threat from imported edible oil and inadequate technology.

To address these challenges, the following measures are recommended; capacity building to farmers, improving extension and processing services; addressing financing needs to the sunflower value chain especially farmers; meeting input needs to the farmers; encouraging public private partnership in the subsector and strengthening marketing infrastructure for sunflower products.

1.0 Background

Sunflower represents one of the key sub-sectors of agriculture in Tanzania[1] (RLDC 2008). According to the Ministry of Agriculture, Food Security and Cooperative (2008), sunflower is a drought tolerant crop, and can survive in areas with low to medium rainfall. The crop is less susceptible to diseases and cheaper to cultivate compared to other oilseeds crops like sesame as well as food crops like sorghum and maize. Accordingly, sunflower is grown in many parts of the country by small-scale farmers.

For this reason, development of the sunflower sub-sector has a great potential for improving welfare of poor households in Tanzania[2]. Significant potential also exists for the sunflower sub-sector to contribute to the overall economic performance due to a number of opportunities[3]:

- Sunflower has many economic uses: production of edible oil, biofuel, animal feed and potentially in latex/rubber production. In view of its diverse application, the subsector has vast investment and employment opportunities.
- Sunflower oil commands significant demand. The crop contains a higher level of healthy nutrients than most other natural and synthetic edible oils. For this reason, there is a strong preference for sunflower seed oil as compared to other edible oil types;
- Sunflower crop has notable drought resistance capabilities largely due to its deep tap root system. It can therefore be planted in less fertile and semi-arid areas. In addition, it can be intercropped with food crops such as maize, sorghum, and other cereals.
- Processing technology is generally affordable and available – mostly from China, India, as well as from local manufacturers such as Small Industries Development Organization (SIDO), Tanzania Engineering and Manufacturing Design Organization (TEMDO), Tanzania Industrial Research and Development Organization (TIRDO) among others.
- There is a tremendous scope for the expansion of sunflower production in many parts of Tanzania as land for cultivation is abundant.

1.1 Objectives of the Study

The general objective of the study is to assess the prospects of sunflower subsector and its contribution to Tanzanian economy. Specifically, the study aims to:

i) Examine the sunflower value chain from the input supply to retail level;

ii) Identify the major challenges facing smallholder sunflower production and marketing;

iii) Identify opportunities and potential policy intervention levers for maximizing gains from the sub-sector value chain.

[1] Rural Livelihood Development Company (RLDC) (2008).
[2] Columbia University School of International and Public Affairs (2010)

[3] Rural Livelihood Development Company (RLDC) (2011).

1.2 Significance of the Study

Despite the promising potentials in the sunflower sub-sector, sunflower production is relatively low and benefits from sunflower value chain have not been adequately realized[4]. The national average yield is 0.6 tonnes compared to potential yield of 2 tonnes to 3 tonnes per acre. Likewise, local production of both factory and home extracted sunflower seed oil contributes about 40 percent of edible oil requirement of 330,000 tonnes, with imported oil occupying a significant portion of the remaining 60 percent.

Therefore, this sub-sector is largely untapped, and given that the crop is produced in most parts of the country, measures to boost sunflower production would definitely impact significantly on economic wellbeing of actors in the value-chain. In order to adequately exploit this notable potential, thorough understanding of various dynamics in the sunflower value-chain including the underlying challenges and opportunities and how they impact on the incomes of various players in the chain is important.

2.0 Policy Issues and Performance of Sunflower Sub-Sector

2.1 Policy Background

The evolution of the agricultural policy in Tanzania started in the 1960's and has continued to be strongly influenced by changes in economic policy regime. The post-independence period (1961-1967) was marked by an emphasis on improved peasant farming through extension services and the provision of credit and marketing structures. Following the Arusha Declaration in 1967, the Government became the sole driver of the economy with private sector playing insignificant role.

However, following multiple distortions and macroeconomic imbalances that resulted from planned economic system, the Government embarked on structural reforms, undertaking macroeconomic policy measures from the early 1980s which were consistent with free market system. Sectoral policies were developed in line with the new policy regime and accordingly, the Statement of Development Policy for Agriculture was adopted in 1983. In line with this policy, some market oriented measures were undertaken as a key step for promoting development of agricultural sector. These include; liberalization of marketing of food grains and price structures for major export crops; removal of the monopoly export powers of crop boards; and restructuring agricultural parastatals. More efforts towards strengthening the sector led to formulation of a more comprehensive Agricultural and Livestock Policy in 1997. Key element of this policy was framework for addressing challenges that were affecting the agricultural sector.

[4] Gabagami and George (2010), Business Care Services Limited and Canter for Sustainable Development Initiatives (2012), Match Maker Associated Ltd (2009 and 2010)

The Agricultural and Livestock Policy (1997), was replaced by the National Agriculture Policy (2013), which took into account opportunities inherent in the agricultural sector. In addition, it aimed at addressing challenges that continued to hinder development of the agricultural sector. Among others, they include low productivity in the sector, vulnerability to unfavorable weather, and inadequate support services. NAP (2013) provided a framework for implementation of the National Strategy for Growth and Reduction of Poverty (NSGRP), Tanzania Development Vision 2025 as well as meeting the Millennium Development Goals.

For the purpose of promoting exports of agricultural products National Export Strategy was formulated in 2009. The strategy articulates on having a modernized, commercialized, competitive and effective agriculture and cooperative systems in place with a special focus on food and commodity crops. The strategy outlines on provision of support measures including better access to finance; use of appropriate seeds, fertilizers and pesticides. It also provides conducive environment for the establishment of sectoral associations, of which the oilseed sector was given a particular attention.

2.2 Laws and Regulations Governing Agricultural Sector

Parallel to formulation and implementation of agricultural policies, a number of regulations were put in place to govern the conduct of agricultural sector. These include;

The Seeds Act (2003), amended in 2007, governs seed production and certification in the United Republic of Tanzania. It controls and regulates all standards related to agricultural seeds, and established the National Seeds Committee, which has the responsibility of acting as a stakeholder forum that can advise the Government on all matters relating to the development of seed industry. The Act protects the interests of both the seed buyer and producer by requiring that the seed is properly labeled and meets minimum standards of quality, and by establishing clear regulations and procedures that level the playing field between seed producers and traders to curb the proliferation of counterfeit seeds on the market.

The Atomic Energy Act (2003) established the Tanzania Atomic Energy Commission. Under this Act, all processed food imports and exports in the United Republic of Tanzania must be tested for radiation by the Commission and obtain a radioactivity analysis certificate, which must demonstrate that the goods are radiation-free for their successful import or export.

The Tanzania Food, Drugs and Cosmetics Act (**2008**) was enacted to regulate food and other manufactured or imported products. The Act establishes the Tanzania Food and Drugs Authority (TFDA) as the executive agency for controlling the quality and safety of food, drugs, poisons and

cosmetics; and regulating the importation, manufacturing, labeling, storage, promotion and general distribution of these items. Regulation is mainly through a system of permits and licenses issued by this body.

The Produce Export Act (2013) provides for the grading, inspection, regulation and preparation of agricultural produce to be exported from the United Republic of Tanzania. The law defines produce to mean any article produced or derived from farming, agricultural operation or stock-keeping. It restricts importation of products regulated under the Act, except through designated points of entry, and subject to inspection or grading in the manner provided for under the inspection rules.

2.2.1 Institutional Setup

In Tanzania, policy formulation and regulation for value chain in crops is mainly organized under two ministries namely the Ministry of Agriculture, Livestock and Fisheries (MALF) and the Ministry of Industries, Trade and Investment (MITI). The MALF is the main overseer of the agricultural sector including the sunflower industry. In the value chain, which runs from production to marketing, the MALF is largely involved in production-oriented policies and regulations. For issues related to marketing, the MITI takes the lead to formulate policies and regulations related to all food and cash crops. The ministry aims to promote industrial development and maintaining trade relations with foreign countries and formulate relevant policy framework.

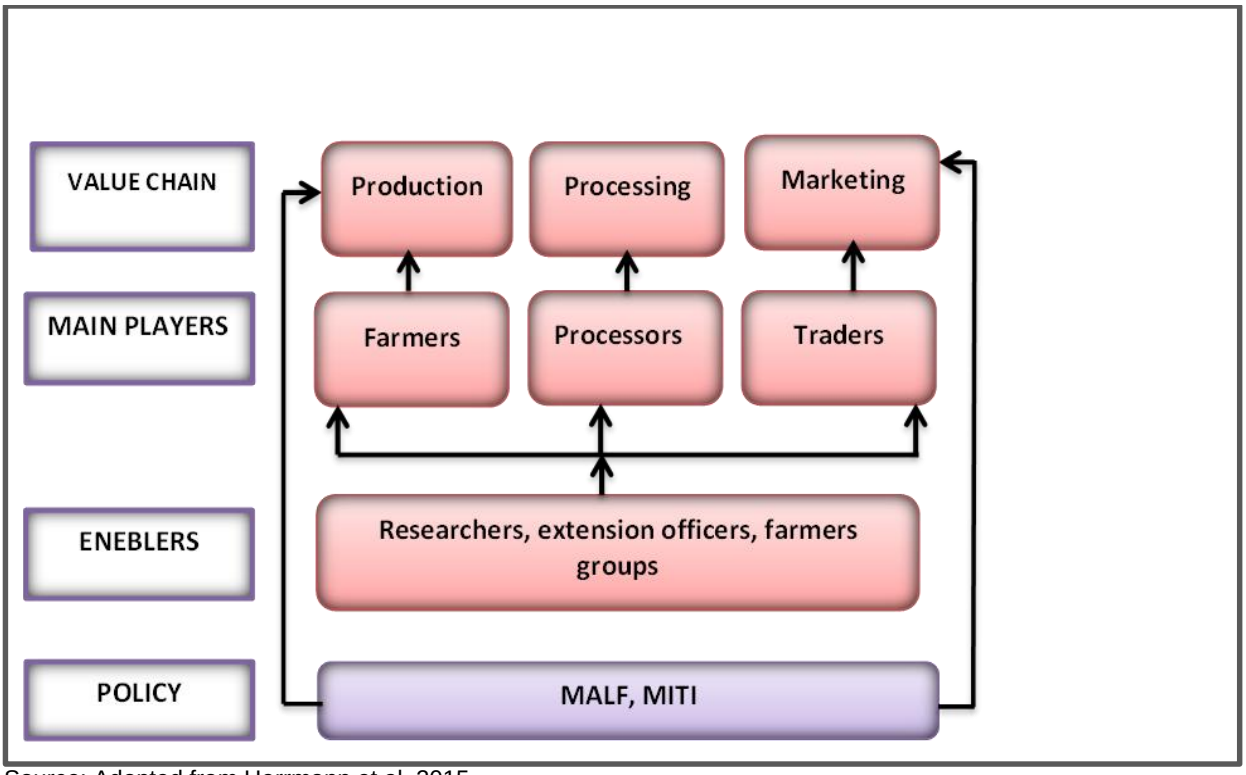
2.2.2 Regulatory Framework and Value Chain

Regulatory activities of agricultural sector particularly on standards of products are handled by the Tanzania Bureau of Standards (TBS), under the MITI. TBS is charged with the role of enacting, formulating and implementing the national standards that various sectors of the economy should abide by. These include quality control, testing, calibration and training. On the other hand, TFDA is mandated to control issues affecting human health and also involved in standard formulation and enforcement. TFDA regulates the promotion of such material, undertakes laboratory analyses, and also controls their import and export. They are also responsible for issuing permits and licenses.

In addition, there are several government departments that provide supportive roles in the supply chain of food crops, mainly research and extension services under MAFC[5]. Other research institutions include the Agricultural Research Institutions (ARIs) under the crop research department, Sokoine University of Agriculture which undertakes crop-related researches as well as NGOs and farmer organizations. The Small Industries Development Organization (SIDO), under the MITI, plays an important role in improving capacities of SMEs, at processors and traders level (**Figure 2.1**).

[5] Most of the research institutions focus on production aspects.

Figure 2.1 Agricultural Crops Sub-Sector Value Chain



Source: Adopted from Herrmann et al, 2015.

2.2.3 Sunflower Sector Development Strategy (2016-2020)

Tanzania developed Sunflower Sector Development Strategy in March 2016. The strategy outlines comprehensive approaches on how to promote sunflower sector in the country. It further identifies the role of each stakeholder in the development of the sunflower sector. It stresses the importance of sunflower sub-sector for the development of the economy as well as the source of welfare for the majority of the population.

It further recognizes the role of both public and private stakeholders in the development of the sunflower sector and implementation of coherent and supportive policies that are in line with the national development objectives.

2.3 Production of Sunflower

2.3.1 Global Production of Sunflower

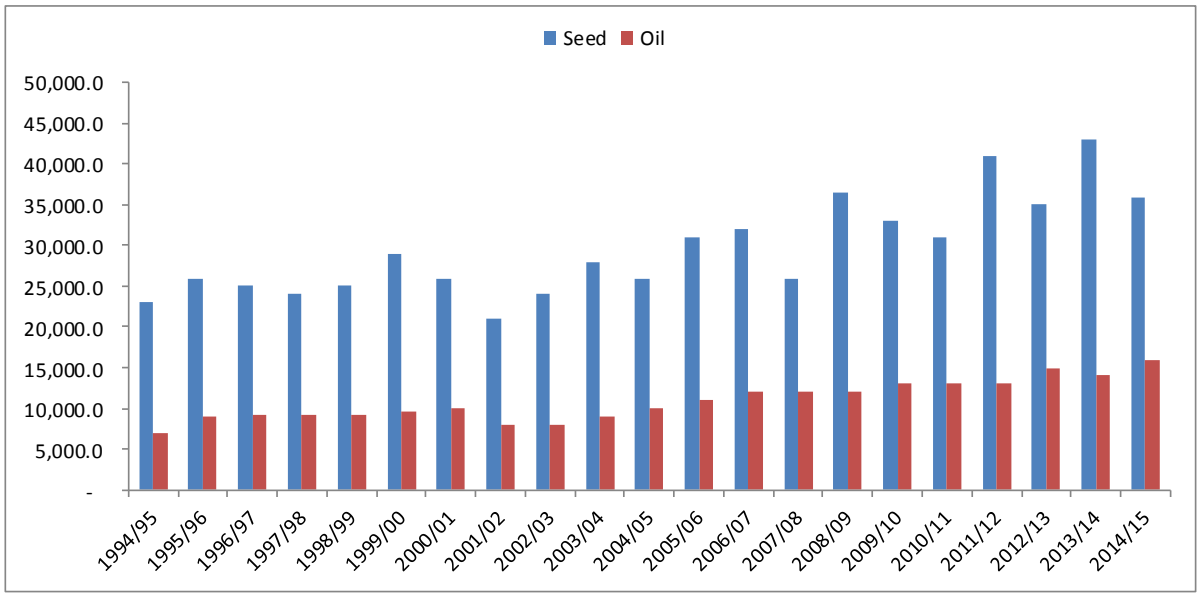
The global production of oil and seed shows that, sunflower industry is dominated by a few large global players, characterized by large, mechanized farms with easy access to inputs and funding. The largest producers are Russian Federation and Ukraine accounting for 25.0 percent and 22.0 percent of the total world production, respectively. Other notable major producers are United States of America and Brazil. African countries account for only 5.5 percent of the world's production of

sunflower oil[6]. Low contribution by Africa is mainly attributed to reliance on smallholder farmers, who have limited access to quality inputs, improved seeds and financial services.

Globally, during the recent years, global trend of sunflower seeds production has been increasing. The production has doubled in the past 20 years (1994/95-2014/15) mainly driven by improved yields and expanded acreage and increasing demand for sunflower related products (**Figure 2.2**).

Figure 2.2: Global Production of Seed and Oil

Thousand Tonnes



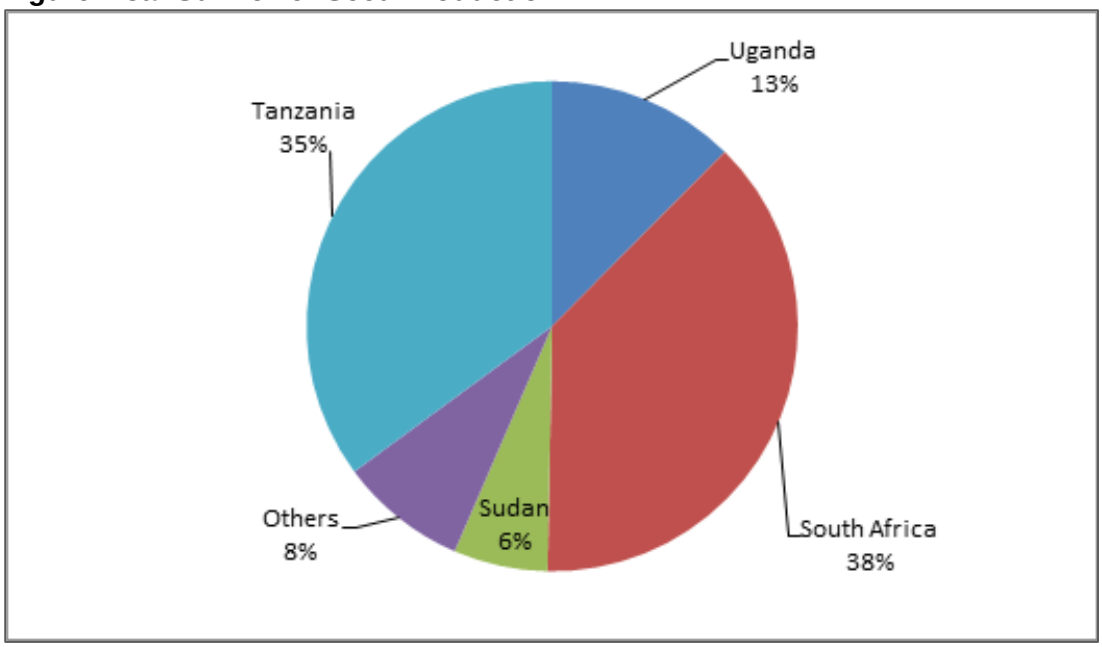
Source: FAO (2015).

2.3.2 Production of Sunflower in Africa

According to FAO (2015) data, South Africa is the largest sunflower seeds producer accounting for 46.1 percent of total continent's production, followed by Tanzania which constitutes 35.0 percent. Tanzania is also continent's second largest producer of sunflower oil, with 23.1 percent of total oil production in the continent. Despite being second in production of sunflower seeds and oil in the continent, Tanzania is a vegetable oil deficit country and its production is mostly characterized by domestic consumption, with low levels of exports (**Figure 2.3**).

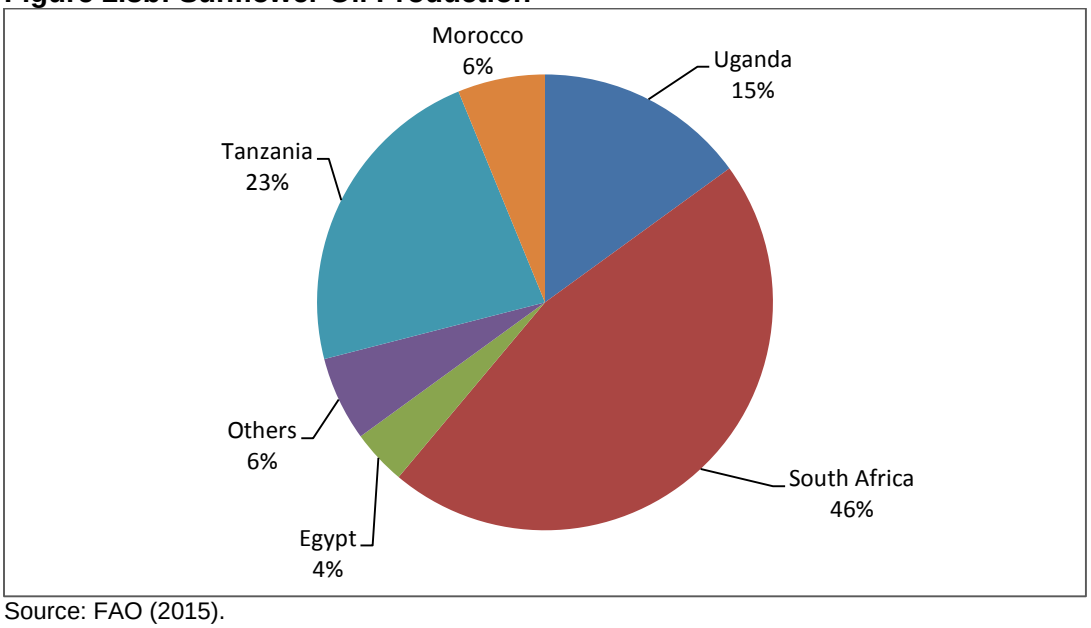
[6] African producers focus almost exclusively on sunflower seed for crushing.

Figure 2.3a: Sunflower Seed Production



Source: FAO (2015).

Figure 2.3b: Sunflower Oil Production



Source: FAO (2015).

2.3.3 Performance of Sunflower Production and Marketing in Tanzania

2.3.3.1 Performance

In Tanzania, sunflower grows in many areas, some of which are semi-arid and semi-humid areas. Generally, sunflower production is largely small scale, rain fed-based and commonly intercropped with staple food crops (URT, 2016). The main sunflower growing areas are central zone, which is popularly known as the Central Sunflower Corridor, comprising of three regions namely Singida, Dodoma and Shinyanga, Northern and Southern Eastern parts of Tanzania. Northern corridor areas have arid zone weather with low and poorly distributed rainfall, suitable for a relatively drought tolerant crop like sunflower (SNV, 2010).

According to URT (2016), sunflower cultivation in Tanzania occupies an estimated area of 1.7 million hectares, with average yield for local varieties of 1.6 tons per hectare. Like other countries in Africa, there are number of challenges identified such as lack knowledge of improved farming methods and access to modern technologies and poor seed quality (Gabagambi and George, 2010).

Oil seeds production has been increasing from 5.5 million tons in 2013/14 to 5.9 million tons in 2014/15. It is estimated that the production will reach 6.3 million tons in 2015/16. Average production of oil seeds for 2013/14 to 2015/16 has been dominated by sunflower with 48.5 percent, followed by groundnut (30.9 percent) and sesame (19.8 percent) as detailed in Table 2.1.

Table 2.1: Production of Oil Seeds (In Tonnes)

	2013/14	2014/15	2015/16p	Average	Percent of total
Sunflower	2,755,000.0	2,878,500.0	2,995,500.0	2,876,333.3	48.5
Groundnuts	1,635,735.0	1,835,933.0	2,025,595.0	1,832,421.0	30.9
Sesame	1,113,892.0	1,174,589.0	1,232,092.0	1,173,524.3	19.8
Palm Oil	41,000.0	41,475.0	41,925.0	41,466.7	0.7
Soybean	6,025.0	6,030.0	6,035.0	6,030.0	0.1
Total	5,551,652.0	5,936,527.0	6,301,147.0	-	100.0

Source: Ministry of Agriculture, Livestock and Fisheries.

During the past decade, area under sunflower cultivation has been increasing steadily (Table 2.2). Area under cultivation has increased from 313.1 thousand hectares in 2009/10 to 1.7 million hectares in 2013/14. Sunflower yield has also increased from 0.7 tonnes per hectare in 2009/10 to 1.6 tonnes per hectare in 2013/14. Yield for groundnuts has also been increasing, reaching 1.8 tonnes per hectare in 2013/14 from 1.0 tonnes per hectare in 2009/10.

Table 2.2: Production of Sunflower and Groundnuts Seeds

		2009/10	2010/11	2011/12	2012/13	2013/14
Sunflower	Area ('000' ha)	431.5	753.8	1,077.6	1,629.7	1,721.9
	Production ('000' tons)	313.1	786.9	1,125.0	2,625.0	2,755.0
	Yield (tons/ha)	0.7	1.0	1.0	1.6	1.6
Groundnuts	Area ('000' ha)	482.3	675.2	839.6	943.7	1,032.0
	Production ('000' tons)	465.3	651.4	810.0	1,425.0	1,503.2
	Yield (tons/ha)	0.96	0.96	0.96	1.51	1.79

Source: Ministry of Agriculture, Livestock and Fisheries 2015.

2.3.3.2 Imports and Exports of Sunflower

Total annual demand for edible oil is estimated at 330,000 tonnes[7] (FAO, 2015). Despite the increase in sunflower seeds production, which had enabled the country to satisfy a larger portion of demand, Tanzania has deficit in the edible oil (FAO, 2015). Currently total extracted oil contributes to about 40.1 percent of the national edible oil requirement, while the remaining portion is imported.

Imports of crude edible oil have been increasing annually, from 0.3 million tonnes in 2012, reaching 0.5 million tonnes in 2015 (Table 2.3). The main imports source countries are Singapore, UAE, Indonesia and India. Crude palm oil dominates the imports of edible oils, accounting for 44.1 percent of the total during 2015. Sunflower (crude) oil imports account for 1.6 percent of total imports of crude edible oil, annually[8]. The other types of crude edible oil imports are palm oil, olive oil, vegetable oil and sesame.

Table 2.3: Imports of Oil to Tanzania

Tonnes

Year	Total Imports	Sunflower	
		Quantity	Percent of Total
2012	296,502.5	5,757.6	1.9
2013	304,457.5	989.9	0.3
2014	398,719.8	9,070.9	2.3
2015	458,532.5	7,677.9	1.7

Source: Tanzania Revenue Authority (TRA).

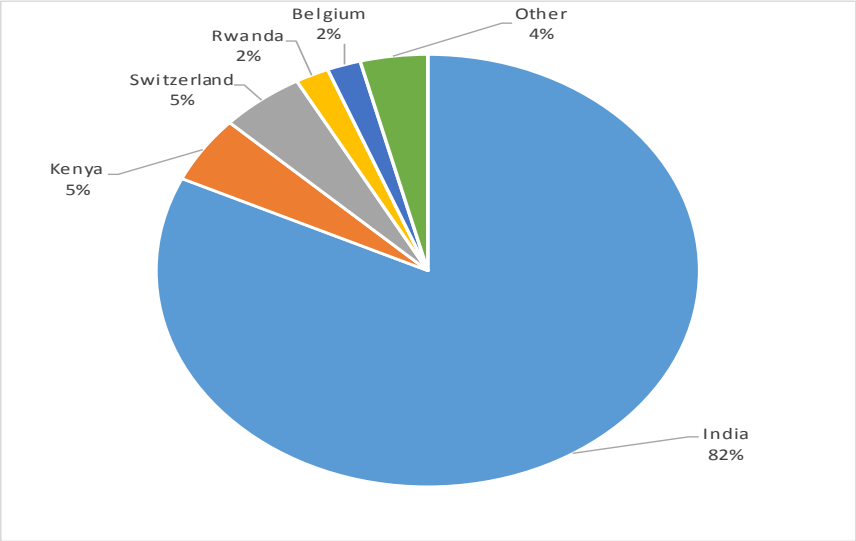
Tanzania has experienced a huge increase in exports of sunflower products, namely seeds, oil and cake, from USD 1.0 million in 2005 to USD 70.0 million in 2014 (URT, 2016). The most important

[7] FAO figures have shown to be greatly different from local sourced data. To maintain consistency, analysis involving Tanzania alone was done using local data.

[8] However, the imported crude oil is normally processed and part of it exported to other countries in the region by local manufacturers.

exported sunflower product is oil cake, whose value reached USD 65.0 million in 2014. By 2014, India was the largest export destination of Tanzania's sunflower products, accounting for 82.0 percent, followed by Kenya and Switzerland each with 5.0 percent of the total value of sunflower exports. The export growth in sunflower sub-sector has been attributed to diversification to new products (specifically sunflower cake) and new markets (particularly India). Exports of sunflower cake began in 2008, at the time when Pakistan and India were the major international markets for Tanzania sunflower products (URT, 2016).

Figure 2.4: Tanzania Destinations of Sunflower Exports, percentage of Total in 2014



Source: URT, 2016.

3.0 Literature Review

Studies examining social-economic potentials of sunflower sub-sector abound. Driven by the notion of lack of awareness about the commercial, nutritional and medicinal potentials of sunflower, Torimio et al. (2014) assess the extent of engagement in sunflower activities among smallholder farmers in two South-Western States (Ogun and Ekiti) of Nigeria and two Districts (Southeast and Kgatleng) in Botswana. A total of two hundred smallholder farmers were randomly chosen from each district. The results showed that 49 percent and 84 percent of the respondents were aware about sunflower crop in Nigeria and Botswana respectively. However, of these, only 10 percent and 25 percent respectively cultivated the crop. The results further showed that all those 25 percent that cultivate the crop in Botswana utilized it as animal feed only, while their Nigerian counterpart utilized for variety of purposes including animal feed (6 percent), manure/fertilizer production (7 percent), cake production (2 percent), traditional usage (5 percent), ornamental purpose (8 percent) and seed extraction (6 percent). The study concluded that although higher proportion of smallholder farmers from Botswana knew about and cultivated sunflower, yet, their Nigerian counterpart utilized

the crop more. The study recommended for the need to continuous popularization of the production and utilization of sunflower crop among the smallholder farmers in both Nigeria and Botswana.

Trotter et al. (1973) conducted a study on potentials of sunflower in the United States by (i) characterizing sunflower potential uses (ii) estimating trends in edible oils markets and the possible place of sunflower oils in these markets (iii) estimating productivity in sunflower production (yield per acre) and price required for sunflower to make it competitive, and (iv) estimating costs and profitability of processing sunflower seed relative to cottonseed. The findings document various industrial uses of sunflower. This includes sunflower oil products including salad-oil (cooking oil), premium-grade margarines, shortening (used in baking) and drying oil products. In addition, sunflower meals (by product obtained when the oil is removed from sunflower seeds) and sunflower hull (by product of sunflower seed crushing operation) provide, respectively, excellent livestock meals especially for the ruminants (cattle, goats etc.) and roughage ingredient for livestock feed. In terms of potential markets for sunflower crop, the study established that a demand trend for sunflower crop is strong worldwide due to various reasons. One reason is on account of its wide industrial application and therefor potential for a wide range of economic activities. The second reason relates to quality of its oil and other by products when compared to other crops. For example, due to its low cholesterol content, sunflower oil has been the benefactor of this health concern than soya bean oil and cotton seed oil[9]. Consequently there is a potential market for sunflower products (such cooking oil, margarine, and shortening) in the United States, Europe and Asia[10]. In addition, depending on the method of extraction, sunflower meals and sunflower hulls which are the by-product of sunflower seed-crushing operation are considered to be rich in protein and energy content and therefore are usually preferred as animal feeds11.

Ugulumu and Inangab (2013) explored how small-scale sunflower farmers perceive the role of building relationships based on demand-driven upgrades, such as knowledge, skills, technology, and support services within the value chain. The study focused on small-scale sunflower farmers in the Singida region of Tanzania. The survey was conducted in twelve Agricultural Marketing Cooperatives (AMCOs) with 229 respondents. The respondents had positive opinions about creating core competencies, concluding that adopting new capabilities, especially with tangible assets such as extension officers, financing, warehouses, and technology, can lead to improved productivity and quality. The information flow from sunflower buyers and consumers is crucial for creating a positive image and hence creating value for farmers. Farmers require negotiating skills that could be attained through improved associations or cooperatives. Respondents also indicated positive benefits of the sector and its risks and income-further diversify.

[9] See for example, Anderson (1970) and Hlavacek (1969)
[10] FAO (1968)
[11] Smith 1968

Rural Livelihood Development Company (2008) conducted market and production analysis of sunflower sector with a view to facilitating market development in Tanzania. The study concluded that national demand for edible oil is huge compared to national supply. In addition, the study finds that the value chain in sunflower sector has notable technical and institutional impediments due to the fact that the sector is dominated by small producers and processors who lack technical and financial ability. Mwatawala et al. (2013) used representative survey to assess the contribution of sunflower production to poverty reduction in Singida region. The study which was carried out in four wards and eight villages revealed that sunflower being the main cash crop in the area, is the main source of income to the majority of households. However, the findings show that frequent fluctuation in prices of sunflower products and unreliable market for sunflower oilseeds have been the major impediments for high income to sunflower producers.

Gillah et al. (2008) explored policy framework/environment for enhancing innovations across the sunflower value chain ranging from production, management aspects, processing, grading, packaging and marketing; focusing on nine Districts in Tanzania. The interviews involve agribusiness firms, representatives of NGOs, business associations, applied research centers, and representatives from the ministries. The findings indicate that there are a number of good policies already in place. However, the main problem relates to lack of commitment in implementing these policies as well as low awareness to such policies by many players in the sunflower value chain especially farmers. The study recommends that, in order to be useful, policies for promoting innovations need to be underpinned by clear implementation strategies by involving all the stakeholders especially the private sector. Furthermore, interactions between agribusiness firms and the main drivers of innovations such as R& D institutions need to be supported.

Barb et al. (2013) investigated chemical composition of sunflower in order to determine potential of sunflower as a source of biofuel production. The study found that overall, sunflower possess as the necessary phenotypic diversity to facilitate development of hybrid sunflower that are rich in biofuel traits. They conclude that sunflower could be used as a source of profitable renewable energy source.

FAO (2009) analysed bioenergy (including biodiesel) potential for Tanzania, focusing on various crops, including sunflower. The results indicate significant potential of sunflower in terms of biomass (biofuel). In addition, adequate processing technology was found to be available and affordable in Tanzania. However, according to production cost analysis, sunflower is currently not a viable feedstock for biodiesel production. This is due to high feedstock production costs and current fossil fuel prices, which make biodiesel from sunflower uncompetitive.

The study makes three key recommendations:

- ✓ Prioritize the production of sunflower and other crops with diversified markets; noting that crops that can serve both energy and food markets provide investors, growers, and local communities involved in the supply chain with diversified market opportunities, and thus are associated with lower risk and more stable income. For example, sunflower growers could benefit from high edible oil prices, while processors could potentially reduce costs by powering facilities from sunflower husks or other biomass residues.
- ✓ Enhance bioenergy technologies and other capacity for maximizing the existing potential in the sunflower sub-sector.
- ✓ Integrate energy and food production policies to contribute towards energy security, food security, and poverty reduction goals.
- ✓ Build capacity and strengthen institutions required to enhance smallholders' ability to participate in the value chain and to increase productivity.

Götz et. al (2005) examined whether it is feasible from an economic, social and ecological perspective to run electricity system in the rural Tanzania (focusing on the village of Laela in Western Tanzania) using locally produced sunflower oil (straight vegetable oil (SV0)) as a substitute for fossil fuel. The study applied qualitative data generated through semi-structured qualitative interviews with local stakeholders and quantitative social-economic household survey through field visits. The findings indicate that small-scale processing of sunflower oil to be used as substitute for diesel in running the generators is economically feasible and has the potential to create additional income for the poorest farmers in the village (if the expeller and microcredits would be provided to those farmers) thereby potentially reducing poverty. In addition, the study found that, potentially, sunflower production in Laela village is sufficient to sustainably substitute for the total diesel demand.

4.0 Methodology

This section presents research design and area of study, data sources, sampling techniques, data collection methods, questionnaires administration and data analysis techniques.

4.1 Research Design and Data Sources

The study used cross-sectional surveys to collect information from sunflower farmers, traders, millers and input suppliers using structured questionnaires. Meanwhile, checklist questions were used to collect information from district extension officers regarding sunflower production in their respective areas. In addition, secondary information was gathered from various publications and Tanzania Revenue Authority to supplement primary data.

4.2 Sampling Techniques and Sample Size

Both purposive and random sampling techniques were used to select sunflower production areas, farmers, millers, traders and input suppliers. The purposive technique was used to select important sunflower production areas, while random sampling was used to select sunflower farmers, processors and input providers. All Bank of Tanzania zones were covered, where the sunflower production areas visited were: Central zone (Dodoma, Iringa, Tabora and Singida regions); Eastern zone (Lindi, Morogoro and Mtwara regions); Lake zone (Geita, Kigoma, Mara, Simiyu, Shinyanga, Kagera and Mwanza regions); Northern zone (Manyara, Kilimanjaro, and Tanga regions); and Southern Highlands zone (Katavi, Rukwa, Ruvuma, Mbeya, Njombe and Songwe regions).

A sample of 200 sunflower farmers were planned to be interviewed in each zone. However, due to some field logistics, number of respondents differed from one zone to another. The outturn of field survey was that, 1066 farmers were interviewed; where 218 were from Central zone; 165 from Eastern zone; 213 from Lake zone; 210 from Northern zone; and 260 from Southern Highlands zone. Meanwhile, 176 processors/millers and 133 input suppliers were interviewed from the five zones.

4.3 Data Analysis Method

Primary data was gathered through structured interviews using questionnaires and analyzed using Statistical Package for Social Sciences (SPSS). The strength of this package is that it can be used to analyze questionnaires with many questions including both closed and open-ended questions (Kothari, 1985). The findings were presented and discussed using charts and tables.

5.0 Findings and Discussion

5.1 Profile of interviewed respondents

Analysis of respondents' socio-economic characteristics forms an important indicator in determining the background of respondents who are involved directly or indirectly in sunflower subsector. This section presents respondents' profile and characteristics of farmers and millers/processors interviewed based on gender, age, education, ownership structure, employment and other characteristics.

i. **Gender:** It was found that about 75 percent and 85 percent of the sunflower farmers and processors interviewed were male. Male dominance could partly be explained by cultural ethics which empower them as household's spokespersons.

ii. **Age:** Majority of sunflower farmers (56 percent) and millers (45 percent) interviewed were aged between 20 to 45 years. At the same time farmers and processors who aged between 41

and 60 years were 37 percent and 42 percent, respectively. This pattern reflects significant participation of youth in sunflower activities.

iii. **Level of Education:** About 80 percent of farmers and 60 percent of processors interviewed had primary education. Graduates accounted for only 1 percent and 6 percent of farmers and processors, respectively. The education pattern suggests that sunflower activities are dominated by low skill cohorts.

iv. **Farm ownership structure and employment:** Farmers who owned land were 71 percent, while those on lease arrangement were 17 percent. At the same time those with both outright ownership of land and leasing arrangements were 12 percent. This reflects availability of land to most of farmers interviewed. However, the findings indicate that cultivated land for sunflower production is lower compared to available land.

For example, on average, the size of land planted sunflower across the five zones in 2014/15 was 4.0 acres per farmer. Central zone has an average of 7.0 acres per farmers, followed by the Northern zone (5.5 acres), Lake zone (3.0 acres), Eastern zone (2.5 acres) and Southern zone (2.0 acres).

v. **Length of stay in processing business:** The study classified experience in processing activities into four major groups: less than 1 year; 2 to 3 years; 4 to 5 years; and above 5 years. Processors with long experience of above 5 years accounted for 31 percent, while those with 4 to 5 years were 27 percent, and 2 to 3 years, 34 percent. Processors with relatively short experience of less than 1 year accounted for 8 percent. Presence of a large proportion of respondents with long experience in processing activities implies positive payoffs.

vi. **Employment:** A total of 176 interviewed processors reported to create permanent jobs ranging from 1 to 60 employees per processor. About 81 percent of the interviewed processors reported to employ less than 5 permanent workers, 14 percent employed 5 to 10 and only 5 percent employed over 10 permanent workers. Temporary workers were the main beneficiaries of seeds processing factories with about 60 percent of respondents reported to employ from 20 to 50 workers per factory, while the rest employed from 4 to 19 workers per factory.

vii. **Contract farming:** It was found that only few processors (about 10 percent) indicated to be engaged in contract farming arrangements with smallholder farmers. Distrust between parties involved has been the main reason for failure of contract farming agreements as farmers

believe that they are exploited by processors and engage in side selling to other traders/ processors[12].

5.2 Sunflower Value Chain

Value chain involves sequential linkages through which raw materials and resources are converted into products for the market. Value chain in sunflower involves a set of activities that bring a basic sunflower product from production in the farm to final consumption, where at each stage value is added to the sunflower products. It includes inputs supply, production, processing, packaging, storage, transport and distribution. Each segment of a chain has one or more backward and forward linkages.

5.2.1 Backward Linkages

Some of the most basic backward linkages, which create value addition in sunflower, include application of modern mechanization, improved seeds, fertilizers, pesticides and herbicides. Also access to credit enables farmers to produce and supply enough sunflower products as well as easy application of advanced mechanization and the use of other agricultural inputs.

i. Equipment Used for Farm Preparation

Evidence indicates that 50 percent of sunflower famers use hand hoe in cultivating their farms, 32 percent use oxen-plough and 16 percent use power tiller. Use of tractors accounts for only 2 percent (**Table 5.1**).

Table 5.1: Equipment used in farm cultivation

	Frequency	Percent
Tractor	23	2%
Oxen-plough	346	32%
Power Tiller	167	16%
Hand hoe	530	50%
Total	**1,066**	**100%**

Source: Field findings (April, 2016)

ii. Usage of Inputs

Agri-input dealers are crucial to the agricultural value chain as they not only provide seeds, pesticides, fertilizers and farm equipment to farmers, but also act as extension arms providing

[12] In contract farming arrangements, side selling occurs when a farmer who is engaged in contract farming sell the contracted crop produce to other buyers other than those contracted.

technical information to the farmers. These are crucial inputs in the value chain and their capacities and quality will determine to a large extent the quality and quantity of the end-product.

About 70 percent of interviewed farmers indicated to use low yield recycled seeds stored from previous harvests. This implies that there is low usage of high yield seeds as indicated by 30 percent of respondents (**Table 5.2**). The low usage of high yield seeds is attributed to unavailability of seeds and high prices. It was further observed that those who managed to use improved seeds they did not sow as required based on the best agricultural practices (i.e. 2 kgs per acre). Most of farmers indicated to sow improved seeds at an average of 3.5 kgs per acre, while those who used recycled seeds sow an average of 4.5 kgs per acre. Consequently, farmers who used improved seeds were able to produce an average of 12 bags of sunflower seeds (each bag contained 65 kgs of sunflower seeds), while those who used recycled seeds produced an average of 7 bags of sunflower seeds (**Table 5.2**).

Table 5.2: Type of sunflower seeds used and number of bags harvested

	Percent of farmers used	**Number of sunflower bags harvested**
Improved seeds	30%	12
Recycled seeds	70%	7

Source: Field findings (April, 2016)

In terms of fertilizer usage, few farmers (22 percent) used fertilizer, mostly organic manure. Meanwhile, only 8 percent and 4 percent were found to use pesticides and herbicides, respectively (**Table 5.3**). Most farmers who happened to use pesticides and herbicides complained on easy and timely availability of these inputs. Large proportion of farmers who were not using fertilizer was largely explained by lack of extension services and high price.

Table 5.3: Usage of Inputs

Type of input	**Yes**	**No**
Fertilizer	22%	78%
Pesticides	8%	92%
Herbicides	4%	96%

Source: Field findings (April, 2016)

iii. Access to Finance

Value addition in agriculture through finance is sometimes known as *'Agricultural Value Chain Finance (AVCF)'*, which is the flow of funds to and among the various links within the agriculture value chain in terms of financial services. The AVCF alleviate financing constraints for all activities in a value chain (Fries, 2007). Overall, the flow of credit to sunflower sub-sector in the surveyed areas was found to be insignificant. For example 90 percent of farmers interviewed use their own or family funds. It was observed that only 10 percent of farmers interviewed had an access to credit facilities of which 2 percent accessed credit from commercial banks, 5 percent from microfinance institutions/SACCOS/VICOBA, and 3 percent accessed loan from traders. For the case of sunflower processors, 23 percent and 7 percent of the interviewees confirmed to receive credit from commercial banks and microfinance institutions, respectively (**Table 5.4**).

This dismal performance in terms of credit flow to sunflower sub-sector has been one of the factors inhibiting growth in sunflower value chain. In particular, it constrains economies of scale, difficulty in obtaining standard grades and high cost of capital per production unit. Processors were found to fail to secure sufficient seeds volumes and thus failed to hold enough stocks in order to operate efficiently.

Table 5.4: Source of Financing

	Farmers		Processors	
Source of Funds	**Frequency**	**Percent**	**Frequency**	**Percent**
Own/family funds	962	90%	124	70%
Loans from banks	17	2%	41	23%
Loans from microfinance institutions/SACCOS/VICOBA	50	5%	11	7%
Loans from Traders	37	3%	0	0%
Total	**1066**	**100%**	**176**	**100%**

Source: Field findings (April, 2016)

5.2.2 Forward Linkages

i. Yields Levels

The results indicate that average production of sunflower seeds was 9 bags per acre. This productivity level contrasts markedly with 18-22 bags per acre in modern farming (RLDC & ASA, 2012). In terms of Zonal production, the findings indicate that the Southern zone produced an average of 11 bags of sunflower seeds per acre, followed by the Central zone (10 bags), Northern

zone (9 bags), Lake zone (8 bags) and Eastern zone (7 bags) **(Table 5.5)**. Factors leading to this poor performance include improper spacing, intercropping, low usage of improved seeds and low usage of fertilizers.

Table 5.5: Sunflower yields per acre (65 kgs/bag)

Zone	Number of bags per acre
Central	10
Eastern	7
Lake	8
North	9
Southern	11
Average	**9**

Source: Field findings (April, 2016)

ii. Sunflower Processing

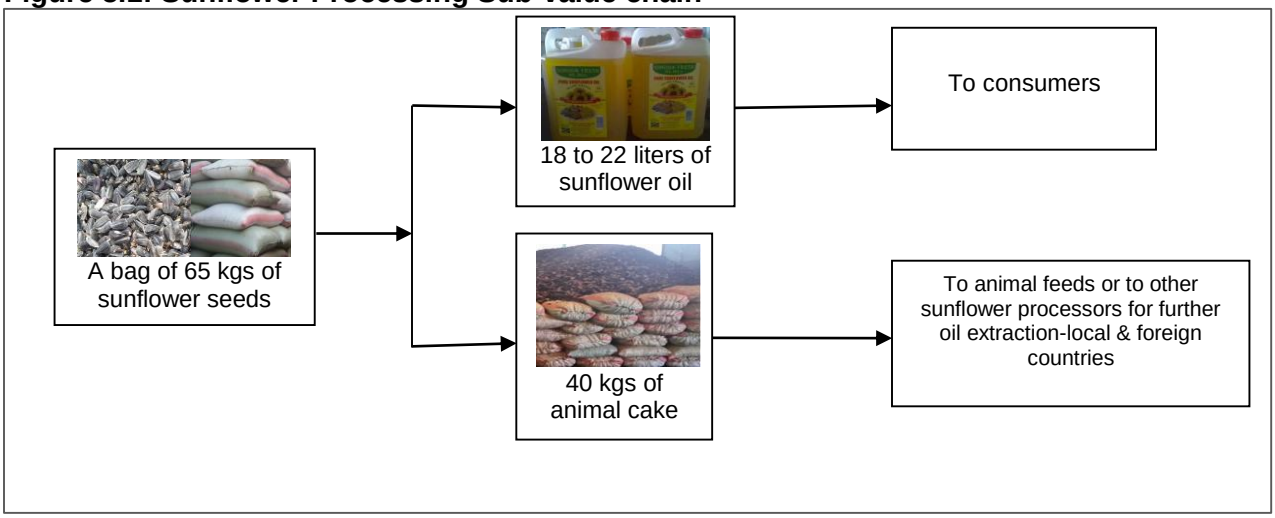
The findings show that about 66 percent of farmers interviewed do not process sunflower seeds. Instead they sell the seeds to traders and millers. The reasons for not processing include inadequate processing facilities (52 percent), high processing cost (34 percent), and processing is time consuming (14 percent). In addition, their awareness on a range of products related to sunflower seeds processing is only limited to sunflower oil and animal cake.

The results indicate that processing capacity in this sub-sector is substantially under-utilized. For example, millers interviewed process an average of 70 bags (4.5 tonnes) per day, which is about 36 percent of the average installed production capacity of 190 bags (12.4 tonnes) per day. Under-capacity utilization in the processing stage was largely due to: inadequate supply of sunflower seeds from farmers. For example, it was found that 71 percent of the interviewed processors indicated that they did not get enough supply of sunflower seeds. Other reasons were; power outage; lack of finance to purchase adequate raw material during harvesting season; competition from low priced imported oil and frequent breakdown of machines partly due to foreign matter. As a result, most small scale processors remain in operation between four and six months in a year.

The survey shows that products that are processed by the majority of millers are sunflower oil and animal cake only. Other products related to sunflower value chain such as detergents, soap, candles, margarine, shortening, lubricants and grease are not processed. This is despite the fact

that some of the processors are aware of some of these products. Inability to produce these products is largely due to lack of appropriate technology as well as required capital for undertaking necessary investments. Nevertheless, capacity to extract oil from sunflower seeds by most of the millers interviewed is significantly low when compared to normal technical standards. For instance, it was found that on average one bag of sunflower seeds with 65 kgs produces between 18 and 22 liters of cooking oil, which is far below 30 liters, a level that is usually achieved by global millers. Likewise, the survey shows that on average 65 kgs of sunflower seeds produce 40 kgs of animal cake (**Figure 5.1**). This product is primarily used for animal feeds and sometimes bought by other sunflower processing factories within and outside the country (basically, Kenya) for further processing.

Figure 5.1: Sunflower Processing Sub-value chain



Source: Field findings (April, 2016)

iii. Packaging and Branding

After processing, oil is mostly packed in containers of 1.5 and 20 litres. Generally, medium and large processors sell sunflower oil in branded packages while small and some medium processors sell oil in unbranded packages or used containers. In addition, farmers who process sunflower oil sell in unbranded packages. Poor branding is largely due to lack of appropriate technical skills as well as inadequate financial capability.

iv. Sunflower Marketing Channels

The main buyers of sunflower seeds are millers who buy from farmers. In some cases, the millers buy from traders after collecting from farmers in villages. On average, processors buy sunflower seeds from traders at TZS 50,000 and TZS 40,000 per bag from farmers. The findings indicate that about 60 percent of the interviewed farmers regard prices, set by buyers as unsatisfactory.

Generally, farmers sold unbranded packages of sunflower oil in their respective village at a very lower price than those with brands. The findings indicate that price of 1litre of sunflower oil was in the range of TZS 2,700 and TZS 3,500. In this case one bag of sunflower, which produces an average of 20 liters of oil, earned an average of TZS 70,000. This is in addition of TZS 12,000 which is a price of 40 kgs of animal cake arising from one bag. Therefore, farmers who managed to process sunflower seeds earned more returns with a maximum of TZS 82,000 per one bag of 65 kgs compared to TZS 60,000 earned for selling sunflower seeds. However, it was observed that farmers who managed to process oil would have to pay a processing fee ranging between TZS 6,000 and TZS 10,500 per one bag of sunflower or alternatively farmers exchange the animal cake for milling services or give out their sunflower cake and process for a bit lower price. Millers offer this discount because they can aggregate the cake and sell it to animal keepers for animal feeding or traders/other millers who do further extract oil.

5.3 Opportunities /Potentialities in Sunflower Production

Tanzania was ranked tenth among the largest sunflower producing countries in the world with a production share of 2.4 percent. Furthermore, in Africa it is the second largest producer after South Africa. Tanzania's share on seeds and sunflower oil production in Africa is 35 percent and 23 percent respectively. In 2014/15, the country produced 2,995,500 tonnes of raw sunflower but it has a potential to increase production to 10 million tonnes per annum[13]. Such a huge potential is underpinned by the following factors:

i. Availability of Suitable Land

In view of its unique characteristics which include drought resistance and deep root system, sunflower is capable of being grown in less fertile and semi-arid areas. In addition, it can be intercropped with food crops such as maize, sorghum, and other cereals. However, only 1.7 million hectares out of 44 million hectare of land that is suitable for agriculture is under sunflower cultivation (URT, 2016).

ii. Availability of Markets

Huge domestic and regional markets exist for sunflower products. This is even more notable in terms of sunflower oil which has higher demand in view of its higher level of healthy nutrients (cholesterol free) when compared with other edible oils. As exemplified by large population, the existing demand is substantially below the current production and processing of sunflower products. For example, domestic production of edible oil covers only 40 percent of the total national demand estimated at 330,000 per annum (RLDC, 2010).

[13] URT (2016)

iii. Presence of Water Bodies

The availability of potential areas for irrigations located along rivers and water streams can support sunflowers production twice a year. Irrigation can be conducted after rainfall seasons and boost production of sunflower seeds.

iv. Favourable Policies and Regulations

There exist a number of policies, strategies and regulations for encouraging production of sunflower in Tanzania. These include; National Agriculture Policy (2013), National Export Strategy (2009), Seeds Act (2003) and Sunflower Sector Development Strategy (2016).

v. Presence of Agricultural Research Institutes (ARIs)

These include Ilonga and Uyole Agricultural Training Institutes. These were given the leading role in undertaking research for improved for oil seeds.

vi. Presence of official bodies for seed production and certification

These include Agricultural Seed Agency (ASA) which is in charge of multiplication of seeds through its commercial farms, the local governments which have authority to produce and distribute Quality Declared Seeds (QDS) and Tanzania Official Seed Certification Institute (TOSCI) which is responsible for control and certification of improved seeds.

vii. Rural Electrification Programme.

Presence of rural electrification programme provides an ample opportunity for investment in small and medium sunflower processing facilities in rural areas. Investment in sunflower processing industries will not only increase income through value chain but also create job opportunities through expansion of forward and backward linkages.

5.4 Challenges

Sunflower production has emerged as a major source of income in Tanzania. Although sunflower is currently one of the major cash crops, there are number of factors constraining its production. They largely include;

- **Depressed prices of sunflower products (seeds and oil) payable to farmers**. The survey observed that buyers were the one who dictate/ determine the price to be paid to the farmers. In case of oil, farmers are compelled to sell at low prices because of competition they face by cheap imported edible oil. Poor marketing infrastructure linking farmers to consumers. It was observed that key marketing platforms such as good physical infrastructure, farmers' cooperatives, warehousing receipts among others were absent in the surveyed areas.

- **Inadequate processing facilities**. Generally processing facilities in some surveyed areas were inadequate and experienced multitude of problems including frequent breakdown, high cost of spare parts, frequent power outages, among others.
- **Poor access to credit by all players in the sunflower value chain**. The subsector is experiencing problems of financing arising from stringent credit conditions including collateral requirements and high cost of borrowing. In addition, micro financing institutions are not vibrant and absence of commercial banks in many areas that were surveyed.
- **Lack of / inadequate storage facilities**. Generally, it was observed that storage facilities for both farmers and millers were inadequate in many surveyed areas
- **Extension services in many surveyed areas were found to be inadequate**. Moreover, the extension officers were not provided with necessary working gears. This has led to poor farming methods such as use of recycled seeds, poor spacing, intercropping, and low use of fertilizer.
- **Unreliable supply of sunflower seeds**. Supply shortages of sunflower seeds to millers are prevalent in many of surveyed areas. As a result, some millers operate below capacity.
- **Threat from imported edible oil**s. Sunflower sub-sector is rendered uncompetitive due to cheap and sometimes tax exempted imported oil products specifically palm oil.
- **Weak and fragmented sunflower value chain.** The chain is largely characterized by unorganized players and to a large degree it includes informal processors usually operating at family level and small scales.
- **Inadequate Processing technology.** Generally, processing equipment in many surveyed areas is of obsolete technology with low processing capacity. In addition, sunflower products especially oil was observed to be poorly branded and packed compared to imported products.
- **Lack of refining facilities.** Virtually, refining capacity is absence outside the large processors. Micro and SME processors are only able to produce crude, filtered oil which does not meet the Tanzania Food and Drugs Agency (TFDA) as well as Tanzania Bureau of Standards (TBS) standards.

6.0 Conclusion and policy recommendation

6.1 Conclusion

This study investigated potentiality of sunflower production and value chain in Tanzania. Both purposive and random sampling techniques were used to select sunflower production areas, farmers, processors, traders and input suppliers from all major sunflower growing districts in the country.

The following is the summary of findings:

- There is a huge potential for producing sunflower seeds in Tanzania. This is attributed to large suitable land, availability of market, preference of sunflower oil over other edible oils on account of its healthy nutrients in particular cholesterol free, presence of water bodies, favourable policies and regulations, availability of power in the rural areas (Rural Electrification Programme through REA), and possibility of a broad product range in the sunflower value chain.

- Hand hoe remains dominant means of farming in this subsector followed by oxen-plough. Production is characterized by small area of cultivation and low yield. For example, on average cultivation is limited to 4 acres per farmer, producing only 0.6 tonnes of sunflower seeds per acre in most surveyed areas. This level was found insufficient to meet processors demand and is far below normal productivity of 2 to 3 tonnes per acre. Indeed, the role of farmers in the value chain is only confined at production level and selling sunflower seeds. Processing is characterized by many small and medium scale processors and is limited to sunflower oil and animal cake only.

- Poor performance in this subsector is driven by a number of challenges. These include; poor farming practices, inadequate extension services, poor access to finance, depressed prices of sunflower products payable to farmers, inadequate processing facilities, threat from imported edible oils, and inadequate technology including packaging and branding facilities.

6.2 Policy recommendations

i. **Capacity building:** Training is required to the farmers on how to undertake modern farming techniques including the use of improved seeds, fertilizers, and proper sowing. With respect to processors training is required on relevant technologies including oil extraction, packaging, branding, grading and labelling. In addition, knowledge on wide range of technologies is critical for a proper choice of processing equipment. Finally, training should also be extended to extension officers in terms of upgrading their skills.

- The Government needs to facilitate research institutions to enable them undertake research on seeds which will be compatible with different locations in the country.

ii. **Facilitation to extension officers.** The government is advised to provide necessary working gears such as transport facilities and training equipment among others. Availability of these gears will enable extension officers reach and provide necessary services to farmers.

iii. **Address financing needs:** Measures need to be taken to ensure that players in the sunflower value chain can access their financing needs. This can be achieved through the following mechanisms;

- Strengthening microfinance institutions at all levels of the chain starting from the farmers. In particular, platforms such as SACCOs, VICOBA, and other microfinance institutions need to be established and provide financial services to all players in sunflower value chain. However, it is imperative that special attention is devoted to farmers who have been found to be more vulnerable to lack of finance.

- In addressing long term financing for millers, the Agricultural Development Bank and Tanzania Investment Bank are advised to consider providing soft credit to famers and SMEs. This will also require informal processors to register and operate formally so that banks can appraise their applications for credit.

- The Government is advised to facilitate issuing tittle deeds for the traditional land ownership and at the same time lending institutions need to be approached through moral suasion and existing Government credit guarantee windows to accept these traditional tittle deeds as collateral.

- The Government is advised to fast-track the warehouse receipt system in this sub-sector so that the acquired receipts can be used by farmers as collateral to obtain credit from the formal financial institutions.

iv. **Availability of inputs to the farmers.** The Government needs to put in place mechanisms for making available all necessary inputs to the farmers. These may be obtained through government subsidies or various credit arrangement supported by the Government. The inputs include; farming equipment, improved seeds, fertilizers, herbicides, among others.

- The Government is advised to provide adequate funding to enable agricultural research institutions identify seed varieties that are high yielding with high oil content and less susceptible to diseases.

v. **Enhance Engagement of Public Private Partnership:** there is a need to enhance Public Private Partnership (PPP) in sunflower value chain activities including production, warehousing, processing and distribution. PPP framework will bring additional resources especially finance and technology.

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