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**Improving Productivity and Production of Sunflower Oilseeds among
Smallholder Sunflower Farmers: A Value Chain Analysis Approach, A case
study of Kalambo District, Tanzania.**



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The Netherlands**

September 2019,

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**Improving Productivity and Production of Sunflower Oilseeds among
Smallholder Sunflower Farmers: A Value Chain Analysis Approach: A case
study of Kalambo District,
Tanzania**

**A Research project submitted to Van Hall Larenstein University of Applied Sciences
In partial Fulfilment of the Requirements for the degree of
Msc.in Agricultural Production Chain Management,
Specialisation Horticulture Chains.**

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September 2019, The Netherlands**

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Stay Blessed & Keep healthy!

Gothard Sammy Liampawe

“FOR GOD AND MY COUNTRY, TANZANIA”

DEDICATION

I dedicate this research work to Almighty God for leading me to accomplish my research and also to my Daddy and mummy for their prayers and inspiring words to me all the period of my studies. My special thanks go to my lovely wife (Halima Ramadhan Said), my children (Francisco and Focus) for their exceptional and unmeasurable support and assistance toward the victory of this research.

ABSTRACT

Sunflower is one of the cash crops in Tanzania. Its agronomic advantages are tolerant to drought, low disease vulnerability and easy to cultivate compared to other oil crops. High demand for sunflower cooking oil makes for huge potential in subsector economic growth and poverty reduction. However, the performance of this subsector remains low and the benefits from the sunflower value chain have not been identified. For example, edible oil production covers only 40 per cent of local demand and 60 per cent of the edible oil is imported. This study was conducted to identify limitations of production and productivity by smallholder sunflower farmers in order to recommend possible ways of improving the productivity and production which will increase the bargaining power and value of the crop in the domestic and global market. The study was done in areas where sunflower is grown as a significant crop for better improvement of smallholder farmers' income from Msanzi, Matai, Mkowe, and Lyowa in Kalambo Rukwa Tanzania. Overall, the findings revealed the huge potentiality of the sunflower oilseeds production in Tanzania. This includes the high demand for sunflower cooking oil, ready market to the local level, suitable land, huge export market opportunities. Further findings indicate that performance of sunflower subsector does not mirror the underlying opportunities. Production of sunflower oilseed is characterized by a small area per farm and low yield. An average farmer cultivating 4.0 acres only, producing only less than 0.6 tons/ha of sunflower oilseeds. This level is far less than the potential productivity of 2.0 tonnes to 3.0 tonnes of sunflower oilseed per hectare. The role of smallholder sunflower farmers in the sunflower value chain is only limited to the production level and selling sunflower seeds. It was found that there is low productivity and production of sunflower oilseeds among smallholder sunflower farmers and they are facing a number of constraints. These include: use of local traditional seeds among the sunflower farmers, lack of good agriculture practices standards among the Sunflower smallholder farmers, poor access to market information, unavailability and accessibility of agro inputs, poor value adding skills such as packaging, processing, inadequate extension services, poor access to finance, depressed farm gate prices of sunflower products, poor processing technology, Land conflicts, poor market infrastructures, lack of sunflower policy, lack of budget allocation, poor relationship between Kalambo district council and other stakeholders in the chain, lack of producer's organisation. To solve these constraints, the following measures are recommended; Formation of producer's organisation, creating awareness on the use of improved seed, market information availability, Kalambo should build strong relationships with stakeholders along the value chain mainstreaming, improving extension services, providing regular training to government extension officers, creating awareness on the use of a calibrated weight scale, improving record keeping to sunflower smallholder farmers, farmers should be aware with the use of calibrated weight scales, SHF's should eliminate poor ideology of smallholder farmers against the crop. encouraging public private partnership in the subsector and strengthening marketing infrastructure for sunflower products, addressing financing needs especially to farmers, meeting input needs to the farmers, capacity building to farmers, improving extension and use of advanced processing technology.

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LIST OF ACRONYMS

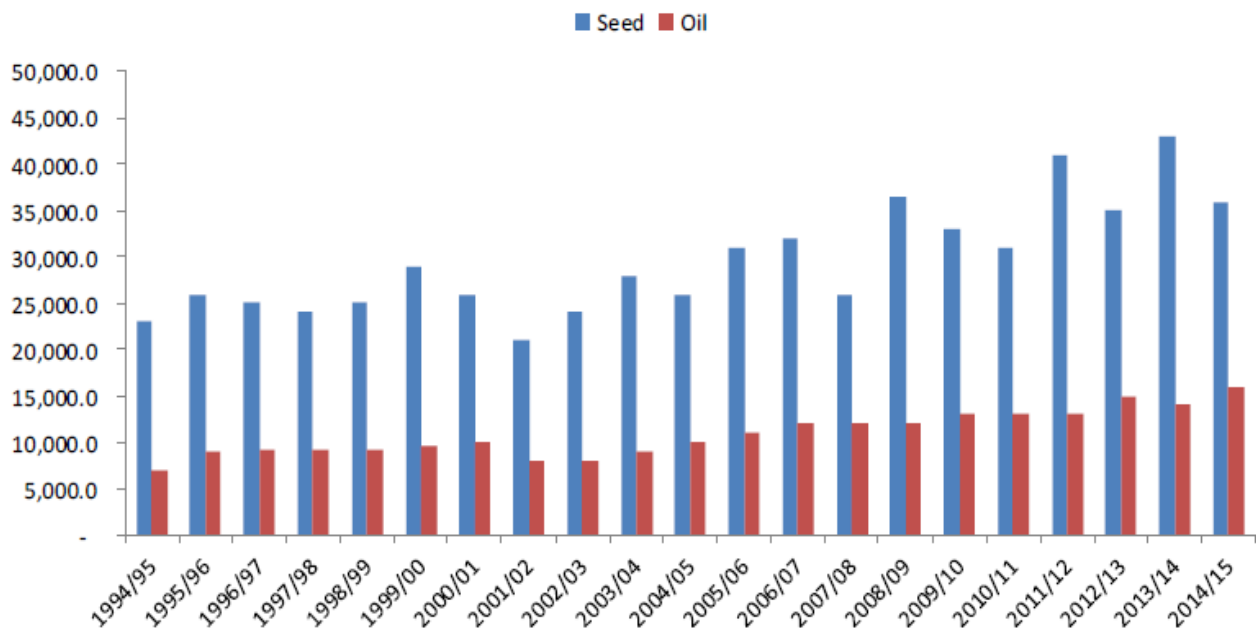
ASA	Agriculture Seed Agency
AMCOS	Agriculture Market Cooperative Societies
ASDP	Agriculture Sector Development Program
ARDS	Agriculture Rural Development Software
CA	Conservation Agriculture
CCM	Chama Cha Mapinduzi (Revolution part)
CHADEMA	Chama cha Democrasia na Maendeleo
DAICO	District Agriculture Irrigation and cooperative Officer
FAO	Food Agriculture Organisation
FGD	Focus Group Education
GAP	Good Agricultural Practices
GPHH	Good Post Harvest Handling
MAFC	Ministry of Agriculture Food Security Cooperatives
METL	Mohamed Enterprises Trading Limited
MITI	Ministry of Industries, Trade and Investment
NGO	Non-Governmental Organisation
NMB	National Microfinance Bank
RAS	Region Administrative Secretary
SWOT	Strength, Weakness, Opportunity, Threats.
SACCOS	Saving Credit Cooperative Societies
SPSS	Statistical Package for the Social Sciences
TBS	Tanzania Bureau of Standard
TFC	Tanzania Fertilizer Authority
TOSCI	Tanzania Official Seed Certified Institute
TRA	Tanzania Revenue Authority
UNCTA	The United Nations Conference on Trade and Development
UNIDO	United Nation Industrial Development Organisation
USDA	United States Department of Agriculture
VEO	Village Executive Officer
WARC	Ward Agricultural Resource Centre

CHAPTER 1: INTRODUCTION

1.1 Overview of the sunflower sector in the World.

The Sunflower (*Helianthus annuus*) is said to have originated on the North American continent and belongs to the plant genus *Helianthus* and the family *Asteraceae*. This is described as an annual plant (Agriculture Council of Tanzania, 2010). 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 which account for 25.0 per cent and 22.0 per cent of the total world production, respectively. Other notable major producers are the United States of America and Brazil. African countries account for only 5.5 per cent of the world's production. According to FAO (2015), the volume traded in 2003 reached 3.4 million tons for US\$ 1,583 million. Argentina (30%), Ukraine (27%) and The Netherlands (10%) being the main exporters. The Netherlands (11%), Bulgaria (8%) and Germany (6%) are the main buyers of sunflower. The world production of sunflower pellets is also important, as it is the principal grinding sub product. Argentina is the largest exporter, and the European Union the greatest importing block USDA; Circular Series FOP 4-09 (2009). The 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 the use of improved sunflower varieties, expanded acreage cultivation and increasing demand for sunflower related products.

Figure 1: Global Production of Seed and Oil (Thousand Tonnes)



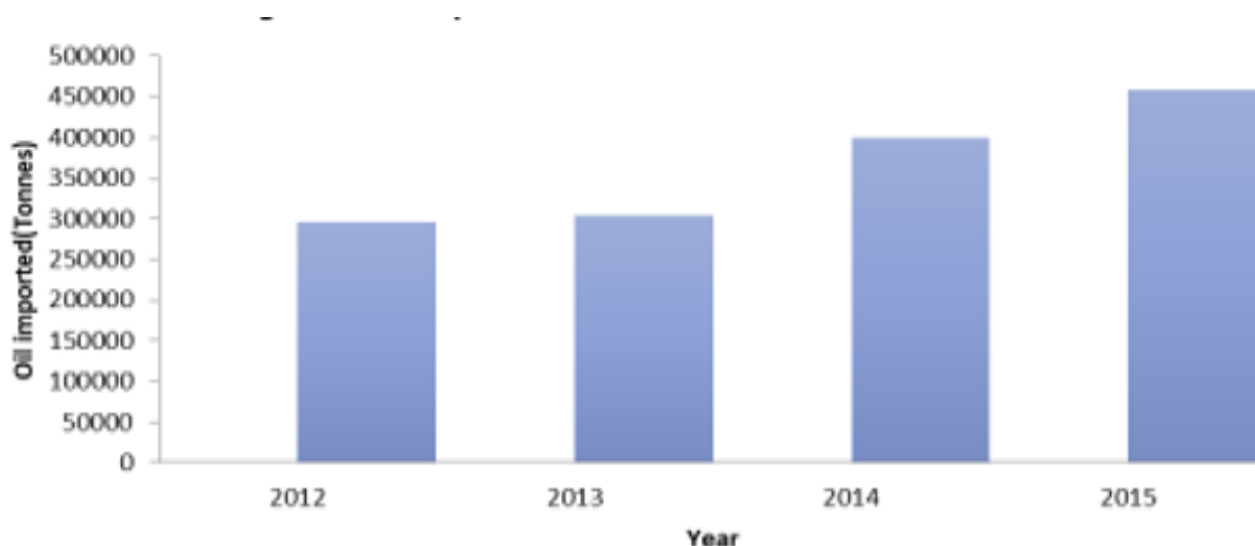
Source: FAO, (2015).

1.2 Overview of the sunflower sector in Tanzania

Sunflower is part of the oil plant category with fruit (achene) contains 50% oil, which is marked by notable properties of the food and high degree of conservatism (Elena & Chiurciu, 2018). It is adaptable in a wide range of environments and grown on a large scale. The crop is popular in the eastern, central, northern and southern highlands of Tanzania. It plays a significant role in the agricultural sector. Its products named as sunflower oil and seedcake. Sunflower oil contributes around 13% to the production of high-value edible oil (Gabagami & George, 2010). Sunflower subsector in Tanzania produces the most cooking oil and feed for internal and external markets; it offers various livelihood options and an estimated four million smallholder farmers are active in the value chain (Mgeni, et al., 2018). According to the Annual report of UNIDO (2018), Sunflower is grown mostly by small scale farmers. That is why the development of the

sunflower sector has great potential for improving the prosperity of relatively poorer households and livelihoods (UNIDO, 2018). According to the MAFSC (2008), a sunflower is a drought-tolerant crop and can grow in areas with low amount of rainfall. The crop is less vulnerable to diseases and inexpensive to grow compared to other oil-bearing seeds such as sesame and food crops such as sorghum and maize. Also, the sunflower is grown in many parts of the country by small-scale farmers. According to this reason, sunflower subsector development has great potential for improving the revenues of poor households in Tanzania. Sunflower has many economic uses, such as the production of cooking oil, biofuel, animal feeds and possibly in the production of latex/rubber. The subsector has huge investment and employment opportunities. For this reason, there is a strong preference for sunflower oil compared to other edible oils. Sunflower crop has remarkable drought resistance capacities. Sunflower can be planted in less fertile and semi-arid areas. In addition, it can be intercropped with food crops such as corn, sorghum and other grains. Sunflower is becoming increasingly popular and current data show that local production from both factory and household oil contributes to around 40% of the national requirement for cooking oil with imported oils accounting for a significant proportion of the remaining 60 % (Jones & Hall, 2009). Tanzania imports crude and refined cooking oil to reduce the deficit in this product. The import of edible oil has increased annually, from 0.3 million tons in 2012 to 0.5 million tons in 2015 (Mgeni, et al., 2018).

Figure 2 Total Import of Sunflower oil to Tanzania 2012-2015



Source: Tanzania Revenue Authority (2017)

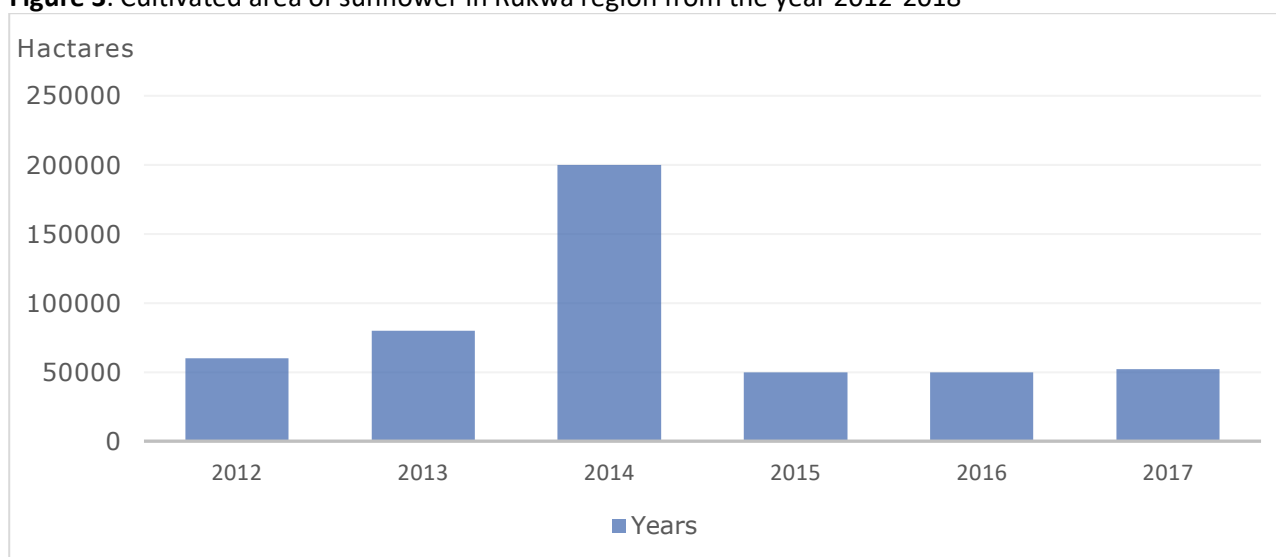
1.3 Overview of the sunflower sector in Kalambo district:

In Kalambo District council Sunflower oilseeds production is fast becoming a popular cash crop and its production is dominated by smallholder farmers, who account for 95 % of the produce. These farmers are characterized by land of less than five acres, and most often lack mechanized farming techniques. But also, Medium-scale farmers with 5–100 acres of land make up 4 % of the sector and usually rely on rented farming equipment especially tractors for ploughing. Only 1 % of Kalambo sunflower producers are classified as large-scale farmers with >100 acres under sunflower production and their farm operations are mechanized (Mrango, 2019). Out of the above proportional of smallholder farmers, 65% of them are women. In Kalambo, planting sunflower starts from March to mid-April yearly under rainfed and harvesting is done from September to October annually. Most of the sunflower oilseed produced by the smallholder farmers are processed by small-scale processors and they use old technology to extract sunflower oil. Processors are using poor technology facilities for extraction of sunflower oil. According to telephone conversation done with district agriculture officer Mrango Nicholas, (2019), he stated that the price of sunflower oilseed is 487.73Tshs (1euro= 2,567.29Tshs) and during offseason, the price goes higher to 1488.86Tshs. Kalambo district is one of the districts in Rukwa region producing sunflower oilseeds.

1.3.1. Production trend of Sunflower in Kalambo district council

According to data of ARDS (2018), the average production of sunflower oilseeds per unit area at Kalambo district council for the agriculture season 2017/2018 was 1t/ha (See appendix 1). Despite the promising potentials in the sunflower sub-sector in Tanzania, but sunflower productivity is still relatively low (Kombe, et al., 2017). The national average yield is 0.6 t/ha compared to the potential yield of 2 t/ha to 3 t / ha (Kombe, et al., 2017). In Rukwa region, most of the smallholder farmers achieved the productivity levels between 1 t/ha which is low as compared to 2t/ha of potential productivity (Wangabo, 2018). There is the main challenge in increasing production and productivity of sunflower including due to the use of the local planting material which are susceptible to disease, inadequate distribution system of improved seeds from existing companies, inadequate of GAP knowledge, high cost of inputs, weak extension services, weak research, and weak seed inspection (Mgeni, et al., 2018); (Gabagami & George, 2010). The importance of research on how low and middle income Communities at Kalambo can increase the value of their production and participate in a domestic and global market.

Figure 3: Cultivated area of sunflower in Rukwa region from the year 2012-2018



Source: Regional Administrative Secretary Rukwa (2018).

Table 1: Description of Sunflower production

Category	Descriptions
❖ Sunflower	❖ <i>Helianthus annuus L.</i>
❖ Country of Origin	❖ North America, Asia, South or Central America) Europe southern Canada to Mexico. Spain, Russia
❖ Oil contents	❖ 28% to 50%.
❖ Uses	❖ Edible Oil: Source of cooking oil, high level of unsaturated fatty acids, lack of linolenic acid, bland flavour, source of animal feed, varnishes and plastics. Meal: Proteins (28% for non-dehulled seeds to 42% for completely dehulled seeds). ❖ Industrial Uses: Varnish and plastics, manufacture of soaps and detergents, pesticide carrier production of agrochemicals, adhesives, plastics, lubricants and coatings ❖ Animal feed: Sunflower seedcake
❖ Growth Habit	❖ Annual plant, erect, broadleaf plant with a strong taproot and prolific lateral spread of surface roots. Stems are usually round early in the season, angular and woody later in the season, and normally unbranched. pollen movement between plants by insects
❖ Temperature	❖ semi-arid regions, it is tolerant of both low and high temperatures but more tolerant to low temperatures.

	❖ Optimum temperatures for growth are 70 to 78°F.
❖ Soil type	❖ Sand to clay, fertile soil with soil macronutrients ❖ Good drainage soil.
❖ Rainfall	❖ 500 to 1 000 mm
❖ Seed rate	❖ 2kgs of sunflower seed/acre
❖ Fertilizer	❖ Nitrogen, Phosphorus and Potassium
❖ Soil PH	❖ 5.7-8.0
❖ Weed control	❖ Combination of Cultural and Chemical method (Annual weed, perennial weed)
❖ Diseases	❖ Fungal disease-Rust, downy mildew, verticillium wilt, Sclerotinia stalk, head rot, phoma back stem and leaf spot
❖ Insect pest	❖ Sunflower moth, Sunflower head clipping weevil, Sunflower maggot
❖ Maturity	❖ Occurs when the backs of the heads are yellow, but the fleshy sunflower head takes a long time to dry.
❖ Harvest	❖ A sunflower head is harvested
❖ Storage	❖ Seed should be 12% moisture for temporary storage and below 10% for long storage

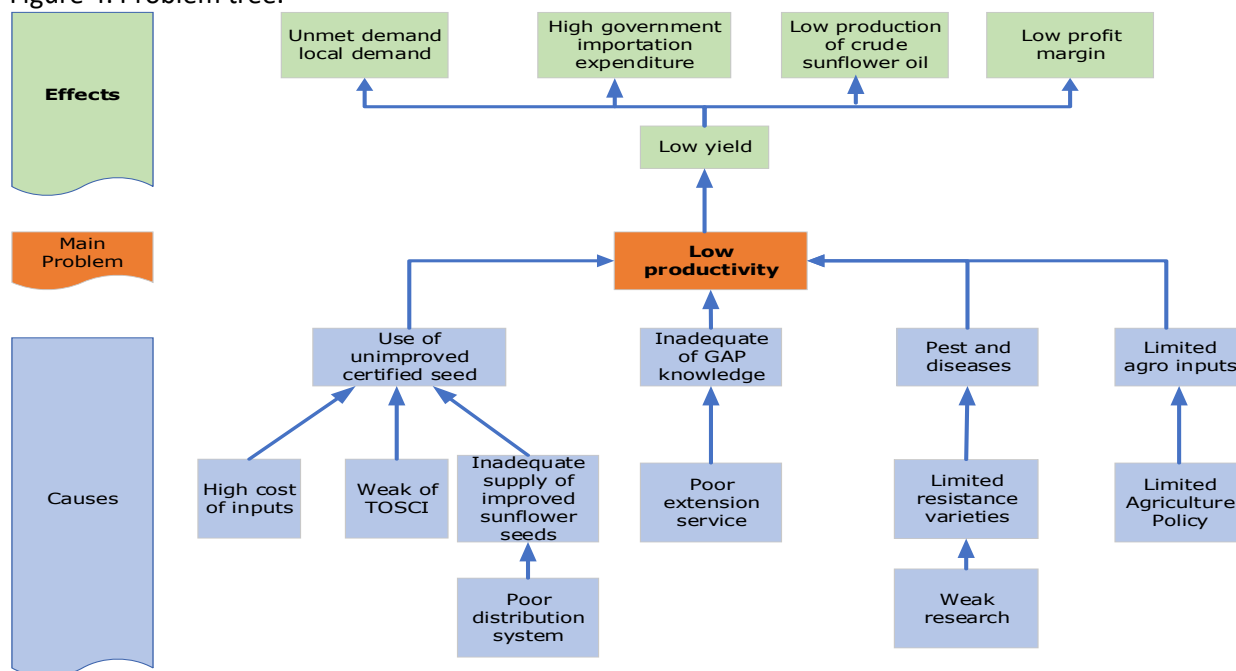
Source: (Putnam, et al., 2019).

1.4 Problem statement

Sunflower is one of the rapid upcoming potential commercial crops at Kalambo district for its great impacts on socio-economic development to the community. However, the crop is not fully utilized to its potential due to technological, financial and technical challenges facing farmers. Smallholder sunflower yields have remained stagnantly low. There has been a decline in production trends of sunflower oil over the last three in Kalambo district. Low productivity and production are attributed by factors namely poor price for produce, poor research linkage, weak extension services, inadequate of seeds, presence of adulterated input fertilizer together with low input use especially certified seeds, fertilizers, crop management practices like late poor planting, inadequate weed control, thinning, and seed rates at higher densities than recommendations. Therefore, all mentioned challenges are reducing the production and productivity of the sunflower oilseed in Kalambo district council.

1.5 Problem tree

Figure 4: Problem tree.



Source: Author (2019)

1.6 Problem owner

Kalambo district council and Smallholder Sunflower farmers are the core owner since the main responsibility of the Agriculture department in the district is policy implementation through provision of extension service to farmers.

1.7 Objective of research

To identify constraints of production and productivity by smallholder sunflower farmers in order to recommend to Kalambo district council the possible ways of improving the productivity and production which will increase the bargaining power and value of their sunflower production in a domestic and global market.

1.8 Research questions

- **What are the challenges and opportunities for improving the sunflower oilseeds productivity and production among the smallholder sunflower farmers?**

Sub questions

- A. What is the current sunflower value chain?
- B. Who are the stakeholders in the sunflower value chain, their roles and interrelationships?
- C. How can smallholder farmers of sunflower increase their production through sustainable production practices?
- D. What are the constraints facing smallholder farmers to grow sunflower in Kalambo district council?
- E. What are the stakeholder challenges in the sunflower value chain?

- **What is the current enabling environment on sunflower oilseeds subsector at Kalambo district?**

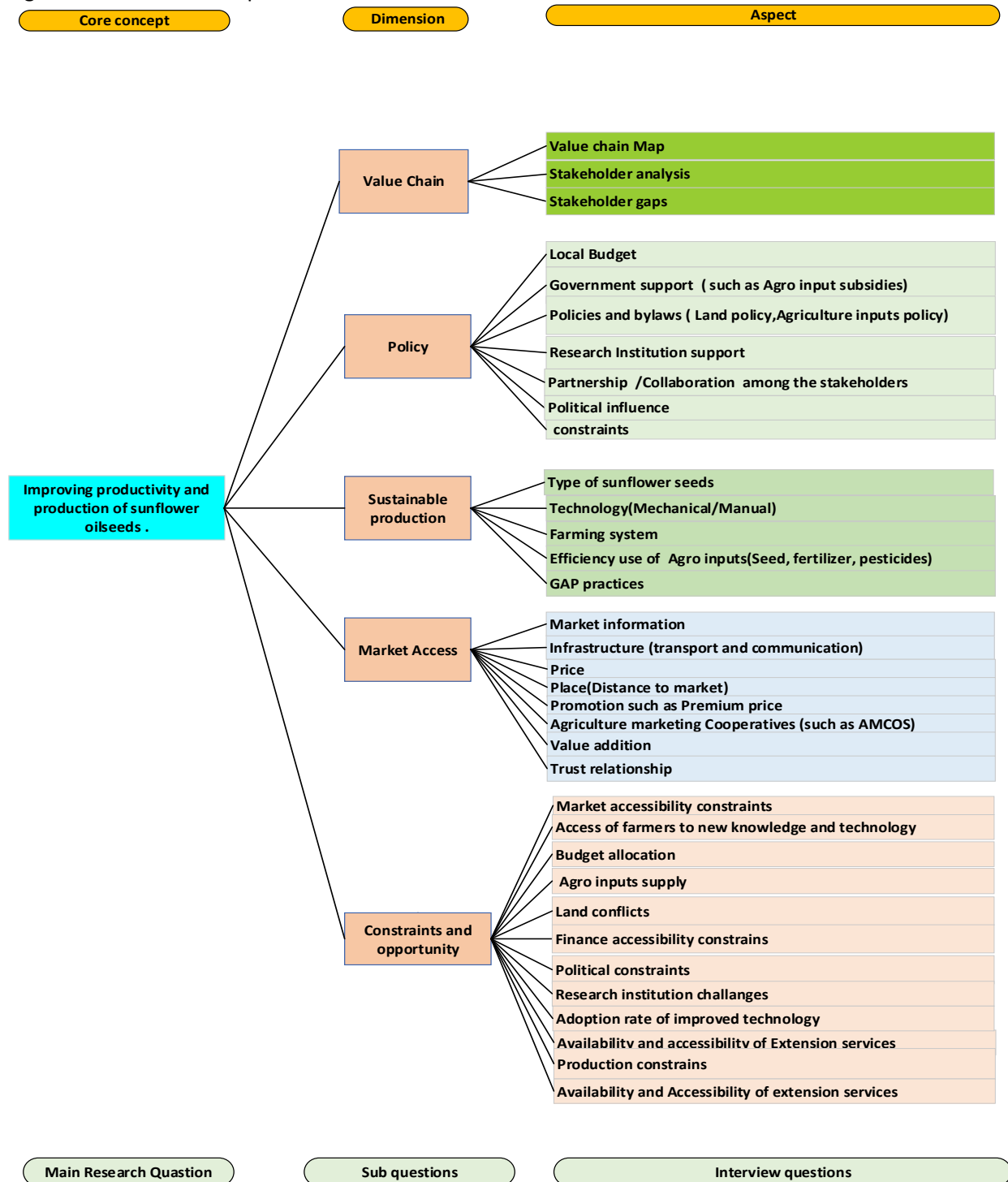
Sub questions

- A. What are the current policies of agriculture supporting smallholder farmers within the sunflower subsector in Tanzania?
- B. How market access can contribute to the production potential of sunflower in Kalambo district?
- C. What could be done to improve production and productivity sunflower oilseeds in Kalambo districts?

2.1 The conceptual framework

The conceptual framework plays an important role in guiding the entire process of the research study. This research is focused on identifying the constraints, of smallholder farmers within the sunflower oilseeds value chain. The core concept has been divided into 2 dimensions (enabling environment, constraints analysis) and each dimension has an independent aspect. Core concept formulated from the Main research question, Dimension articulated from sub-questions and aspects are the sourcing from the interview question.

Figure 5: Research conceptual framework



Source: Author,2019

2.1.1 Definition of concepts

- Enabling environment:

An enabling environment combines macro-economic policies that favour markets and trade, the provision of inputs, related physical infrastructure (such as roads and irrigation) and social infrastructure (such as education and research together with institution and regulations (Frankenberger , et al., 2014).

- Crop productivity.

It is the capacity of an area to produce crops. Crop productivity reflects the overall performance of an area in terms of crop production (Biswas, 2017).

- Smallholder farmer.

Smallholder farms consist of an average not more than 5 household members with a mean land holding capacity of around 1.2 hectares (FAO, 2018).

- Policy.

The policy is a law, regulation, procedure, administrative action, incentive, or voluntary practice of governments and other institutions. Policy decisions are frequently reflected in resource allocations. Health can be influenced by policies in many different sectors (Stewart, 2014).

- Market.

According to the Organisation for Economic Co-operation and Development (2012), stated that it is a widely applied analytical framework to examine and to evaluate competitive concerns. The relevant market should be defined in a way such that the competitive constraints a firm faces, i.e. demand and supply side substitution, are captured as accurately as possible (OECD, 2012).

2.2 Agricultural productivity concept

Improving agricultural productivity is essential for global food security. Increasing agricultural production reduces land pressure and avoids the Malthusian dilemma, while increasing labor productivity in agriculture in poor countries, increasing incomes and stimulating broader economic development (Fuglie, 2018). By reducing the amount of land, labour and other resources needed to produce food, increased agricultural productivity makes food cheaper and more abundant and has a powerful effect on poverty reduction (Fuglie, 2018). Crop productivity in many places in sub-Saharan Africa is low. This has an impact on food security and rural life. Identifying limitations and opportunities is an essential first step in development processes to improve crop productivity. Diagnostic methods at the macro and meso levels often point to agronomic and soil fertility practices as important limitations (Kraaijevanger , et al., 2016). National and global agricultural productivity trends are important to follow and evaluate. Proof of a slowdown in agricultural productivity can be a foreshadow of higher food prices, increased pressure on the environment and constant regression towards sustainable development goals (Fuglie, 2018). According to Razack et al (2011), he stated that in Tanzania, in the small-scale agricultural sector, the yields of the most important crops decreased in the 2000s, and total factor productivity and the application of technologies such as improved seeds and inorganic fertilizers decreased (Razack , et al., 2011).

2.2.1 Importance of agriculture productivity.

Structural transformation, Well-being, and development can be affected by the level and dynamics of agricultural productivity in the least developed countries (Gollin, 2010). According to the UNCTA report (2015), it has stated that in most cases agricultural productivity is the most important determining factor for the income of most workforce. Low agricultural productivity is an important reason for the prevalence and persistence of poverty in most developing countries, leaving a large part of the rural population trapped in a vicious circle of poverty, in which poverty leads to malnutrition, poor health, poor cognitive development and limited acceptance of new technologies, which in turn lead to low productivity and low

revenues. Growth in agricultural productivity is, therefore, an essential condition for poverty alleviation in the short and medium term and contributes through various channels (UNCTAD, 2015).

2.3 Value chain concept.

According to Kidoido and Child (2014), stated that the value chain concept is an operational and analytical model. This illustrates the vertical integration and disintegration of production and distribution systems; As an operation, the chain model is a collection of entities and activities that characterize the production process. Because most products are consumed far from the production point, the value chain in the simplest sense is all activities, institutions and entities involved in transformation, processing, transport and add value to the product before the product reaches the end user. Various actors throughout the chain exchange ownership of raw materials, semi-finished products and end products. These different actors are connected by complex relationships, including the demand for goods and services from each (Kidoido & Child, 2014). As an analytical model, the value chain provides a framework for analyzing product movements from the production point to the consumption point. They offer a framework to investigate what potential value chains are. Institutional and administrative issues embedded in the chain. Update along the value chain and how the knowledge gained is suitable for development interventions because they enable a better insight into interactions between different actors and activities along the product line. This allows development agents to increase efficiency and aggregated value in the value chain, increasing the relative share of benefits for different actors in the value chain (Kidoido & Child, 2014). value Agri-value chains. Relates to changes in production processes to improve productivity and products that are increasingly defined by domestic and international quality standards and food safety measures (Kilelua, et al., 2017).

2.3.1 Product upgrading.

Involves improving product quality (e.g. certification, safety standards, traceability) or moving to more sophisticated products (e.g. processing, packaging) and is often linked to process upgrading (Kilelua, et al., 2017).

2.3.2 Process upgrading.

Involves improving productivity to increase volumes or reducing production costs (Kilelua, et al., 2017).

2.3.3 Role Upgrading value chain

The main aim of a value chain is to produce value-added products or services for a market, by transforming resources and using infrastructures within the opportunities and constraints of its institutional environment (Trienekens, 2011).

2.4 Sunflower processing.

- Cleaning and grinding Incoming oil seeds are passed over magnets to remove any trace of metal before being de-hulled. The de-hulled seeds are then ground into coarse meal to provide more surface area to be pressed. Mechanized grooved rollers or hammer mills crush the material to the proper consistency. The meal is then heated to facilitate the extraction of the oil. While this procedure allows more oil to be pressed out, more impurities are also released with the oil, and these must be removed before the oil can be deemed edible.
- Pressing the heated meal is then fed continuously into a screw press, which increases the pressure progressively as the meal passes through a slotted barrel. Pressure generally increases from 68,950 to 206,850 kilopascals as the oil is squeezed out through the slots in the barrel and is recovered.
- Extracting additional oil: It is solvents After the oil has been recovered from the screw press, the oil cake remaining in the press is processed by solvent extraction to attain the maximum yield. A volatile hydrocarbon (most commonly hexane) dissolves the oil out of the oil cake, is then distilled out of the oil and passes through the matter, to be collected at the bottom.
- Removing solvent traces Ninety per cent of the hydrocarbon remaining in the extracted oil simply evaporates, and, as it does, it is collected for reuse. The remaining hydrocarbon is retrieved with

the use of a stripping column. The oil is boiled by steam, and the lighter hexane floats upward. As it condenses, it too is collected.

- Refining the oil: The oil is next refined to remove colour, odour, and bitterness. Refining consists of heating the oil to between 40 and 85 °C and mixing an alkaline substance such as sodium hydroxide or sodium carbonate with it.
- Packing the oil: After processing, clean oil is normally measured and packed into a clean container ready for sales. A container can be a glass or plastic bottle.

2.5 Value Chain Finance.

According to Miller and Jones (2010), reported that cash flows to and among the different links in a value chain include what is known as value chain financing or any or all financial services, products and support services that flows to and or through a value chain to meet the needs and limitations of those involved in that chain, whether it's access to finance, securing sales, buying products, reducing risk and or improving efficiency in the chain. Value chain financing offers an opportunity to expand financing possibilities for agriculture, improve financing efficiency and repayments and consolidate value chain connections between chain participants (Miller & Jones, 2010). Internal financing of the value chain takes place within the value chain, such as when an input supplier gives credit to a farmer or when a leading company passes on resources to a market intermediary. External financing of the value chain is made possible by value chain mechanisms and relationships: for example, a bank provides a loan to farmers based on a contract with a trusted buyer or a warehouse receipt from a recognized facility

2.6 Sustainable agriculture production.

According to Imad, et al.,(2016), stated that refers to agricultural production in a way that does not harm the environment, biodiversity and the quality of agricultural crops. Sustainable crop production increases the ability of the system to maintain stable levels of food production and quality in the long term without increasing the demand and requirements of agricultural chemical inputs to control the system. Sustainable crop production is concerned with keeping the soil alive with organic matter, integrated pest management and reducing the use of pesticides, protecting biodiversity, guaranteeing food safety and food quality, improving nutrient quality and fertilizing the soil with organic fertilizers (Imadi, et al., 2016).

2.6.1 Good agriculture practices(GAPs)

Good agricultural practices' is used to refer to widely varying elements, from the monitoring of pesticides, fertilizer, use, to more encompassing aspects of primary production and post production systems, such as environmental impact assessment or labour conditions. The GAP process embraces actions, technologies and systems that are accepted as most effective for optimal management of soil and water, and for crop and livestock production, from the point of view of microbiological and chemical safety, with the added dimensions of environmental, economic and social sustainability (Poisot, et al., 2004).

2.6.2 Research and extension service.

Agricultural growth, or increased productivity, is based on the application of improved technologies. This is a continuous cycle that involves technology renovation and adoption.

In this sense, research and extension service play major roles to increase the productivities (MAFSC, 2015).

2.6.3 Farming system.

According to the report of the Tanzania Ministry of Agriculture (2013), stated the culture of sunflower and growing season requirements makes them a good niche in cropping systems where small grains are the predominant crops. Markets are generally available in most areas where sunflower has been traditionally grown. Mixed cropping is a major farming system of which most of the farmers are practice. Two crops are grown together on the same piece of land, in this system the crop systematic arranged in rows with proper spacing, however various mixing ratios are used depending on the choice of farmers. Intercropping system is also applied in Tanzania whereby two crops or more intercropped on the same plot of land. In Tanzania farmers prefer mixed cropping because is labour serving, large canopy inhibits weed growth. these farming

systems are preferable since it is more efficient to use of land, also prevent runoff water to hence reduce soil erosion.

2.6.4 Conservation agriculture.

Conservation agriculture has three core practices: 1) minimizing tillage and other soil disturbance, 2) maintaining permanent soil cover, and 3) diversifying crop rotations. By reducing soil disturbance and improving water and nutrient availability to crops, CA can increase yield, improve drought resistance, and reduce environmental impacts. Profitability often increases because of lower input and/or labour costs, combined with higher yields. CA can be used for a wide variety of grain and horticulture crops including sunflower. It is readily adapted to both small- and large-scale farms (Milder, et al., 2012).

CA is already in use in Tanzania, but not at a large scale. However, worldwide it has been applied on more than 100 million hectares, and CA has already been mainstreamed in diverse contexts including for smallholder agriculture in Zambia and for large commercial grain farms in Brazil, Eastern Europe, and North America. If applied at scale across the Southern Corridor, CA could yield hundreds of thousands of tons of additional grain output, while potentially reducing water use and increasing carbon storage in agricultural soils. The most important need for scaling-up CA is a concerted extension program emphasizing CA practices through participatory training approaches (e.g., through Farmer Field Schools). In addition, improved access to inputs and CA machinery is needed to enable uptake by both small-scale and large commercial farms (Milder, et al., 2012).

2.6.5 Crop Rotation.

Sunflower can be rotated with soybeans but there are some similar broadleaf diseases that can affect both crops. For farmers who have sunflower in their crop rotation, it is typically planted once every three to five years. Sunflower is a deep-rooted crop. The roots can reach depths of six feet and my residual soil moisture and nutrients. Some farmers follow a rotation system using crops that root deeper with each successive crop. An example is two years of wheat followed by corn and then sunflower and then back to wheat. In this rotation, the sunflower is likely able to tap unutilized nutrients that have leached to depths the other crops cannot reach (Association, n.d.).

2.6.6 Fertility management.

Agricultural production and productivity are directly linked with nutrient availability. For sustained high crop yield, the application of nutrients is required. Sunflower does respond to nitrogen (N) and is the nutrient of the greatest need for optimum plant growth and yield. A rule of thumb is 23kg of N for each 454kg of expected sunflower yield. The clear majority of sunflower grower's soil test to determine the exact amount of fertilizer to apply. The amount of N required varies greatly with soil type, soil moisture levels, yield goal, cost and residual levels of soil N (Association, n.d.).

2.7 Policies.

Governments play a central role in creating a favourable environment for agricultural development. By providing a stable policy environment and preventing unforeseen policy changes, poor regulatory transparency, poor enforcement of contracts or restrictive investment policies, farmers (among the stakeholders) can be supported in carrying out productive and useful commercial activities (Frankenberger , et al., 2014). The major components of the supportive enabling environment depend not only on the presence of laws and regulations but also on their implementation; in agriculture, this requires strong political support for the sector at the highest level (Frankenberger , et al., 2014). The most important components of a supportive environment are well-functioning inclusive markets, micro-insurance and agricultural financing. Inclusive markets facilitate trade and enable the distribution and allocation of resources in society. They are vital for the development of agriculture and the fight against poverty, as a basis for the rapid development of the value chains of the agro-industry that offer opportunities to small farmers (Frankenberger , et al., 2014). Accessible agricultural financing is the provision of various types of services designed to support agricultural activities inside and outside the country. The credit allows farmers to buy agricultural means of production, to invest in their farms or to pay for other products and services,

between the cash sales of their crops. Access to credit is easy and accessible in a suitable enabling environment (Frankenberger, et al., 2014).

2.7.1 Policy issues and performance of sunflower sub-Sector.

The evolution of the agricultural policy in Tanzania started in the 1960s 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 (Kombe, et al., 2017). Following the Arusha Declaration in 1967, the Government became the sole driver of the economy with the private sector playing an insignificant role (Madyibi, 1967). However, following multiple distortions and macroeconomic imbalances that resulted from the planned economic system, the Government embarked on structural reforms, undertaking macroeconomic policy measures from the early 1980s which were consistent with the 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 the development of the 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 the formulation of a more comprehensive Agricultural and Livestock Policy in 1997. A key element of this policy was a framework for addressing challenges that were affecting the agricultural sector. The Agricultural and Livestock Policy (1997), was replaced by the National Agriculture Policy (2013), which considered opportunities inherent in the agricultural sector. In addition, it aimed at addressing challenges that continued to hinder the development of the agricultural sector. Among others, they include low productivity in the sector, vulnerability to unfavourable 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 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 the provision of support measures including better access to finance; use of appropriate seeds, fertilizers and pesticides. It also provides a conducive environment for the establishment of sectoral associations, of which the oilseed sector was given attention.

2.7.2 Policy, laws and regulations governing agricultural sector.

In Tanzania despite an apparent commitment to policies and strategies to transform the agriculture sector, performance in agricultural output and productivity has been disappointing (Leyaro, et al., 2014). Parallel to the formulation and implementation of agricultural policies, several regulations were put in place to govern the conduct of agricultural sector. These include;

2.7.3 The seeds act (2003).

It was 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 labelled 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 (TOSCI, 2004).

2.7.4 Agricultural extension services policy statement.

According to Tanzania Agriculture National Policy (2013) statement has stated that extension services shall be transformed to ensure the provision of quality services with increased private sector participation, Farmers education and publicity services shall be strengthened for effective linkage and dissemination of technologies and information. A strong technology transfer and partnership entity shall be established in tandem with a semi-autonomous research institution to strengthen research extension farmer training linkages, Participatory approaches and gender aspects shall be promoted in the provision of extension

services, Specific commodity extension services shall be promoted and strengthened, and The Government shall ensure adherence to performance standards, regulations, supervision and accountability (MAFSC, 2013). Extension services are crucial in supporting poverty reduction in rural areas and market competitiveness for commercial agriculture in the domestic and global markets. It enables producers to realise increased production and productivity through access to marketing information and other support services essential for agricultural development (MAFSC, 2013).

However, the provision of agricultural extension services in the country is hindered by lack of strong research extension farmers linkage, weak supervision and insufficient manning levels, low participation of private sector in extension services delivery, lack of service delivery performance standards and regulations, poor living and working conditions of extension officers, insufficient knowledge regarding technological advancements and weak coordination of agricultural extension services (MAFSC, 2013). Agricultural growth, or increased productivity, is based on the application of improved technologies. This is a continuous cycle that involves technology renovation and adoption. In this sense, research and extension service play major roles to increase the productivities (ASDP II, 2015).

2.7.5 Agriculture inputs policy statement.

According to National agriculture policy of Tanzania (2013), it has stated the Government shall enforce laws and legislation to safeguard farmers from the supply of substandard inputs, Input production, procurement and distribution shall be strengthened, Private sector participation in multiplication of pre-basic and basic seed shall be promoted, Domestic production, multiplication and distribution of agricultural inputs shall be promoted to involve both public and private sectors, Farmers shall be supported to access modern inputs, and Agrochemical and fertilizer manufacturing industry shall be developed (MAFSC, 2013).

2.7.6 Agricultural partnership.

Combining the core competencies of diverse organizations through multi-stakeholder partnerships can generate benefits such as, Increased financial, human and technical resources, resulting in greater impact on the ground, New expertise developed through the combined, knowledge and experience of diverse stakeholders, Development of innovative new business and collaboration models, Greater understanding of other stakeholders ,perspectives, goals and capabilities, Development of new mindsets, leadership approaches or institutional strategies across the sector (Dreier, 2016). However, partnerships are not an ideal solution for every problem. Their complexity creates high transaction costs and relatively lengthy time frames to generate results. The lack of well-tested, widely-accepted partnership models generates a great deal of innovation – as well as repetition of common mistakes. Before embarking on any new partnership initiative, leaders should evaluate carefully whether the multi-stakeholder partnership (Dreier, 2016).

2.7.7 Political influence.

One of the agenda of the current ruling party (CCM) in Tanzania is to promote industrialisation to the mid-level through agriculture. His Excellency Hon President in Tanzania Dr Joseph Pombe Magufuli has already identified four main crops as cash crops, namely Sunflower, Coffee, Cashew nut and Cotton. Since sunflower of its important and high demand of the crop to the domestic market., the global market, the Ministry of Agriculture and Ministry of trade together are both workouts hardly to improve on the sunflower value chain. Also, political conflict can put down the sunflower sector. In Tanzania there are 13 political parties, the ruling party is called CCM. There is no Conflict among the political parties, though strong competition between CCM (ruling party) and CHADEMA(opposition party) are still existing. Therefore, political competition may affect the sunflower value chain

2.7.8 Institutional setup.

In Tanzania, policy formulation and regulation for the value chain in crops is mainly organized under two ministries namely the Ministry of Agriculture, Food security and Cooperative and the Ministry of Industries, Trade and Investment (MITI). The MAFSC is the main overseer of the agricultural sector including the sunflower industry. In the value chain, which runs from production to marketing, the MAFC 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 (MAFSC, 2013).

2.7.9 Land tenure.

According to Sylvester Suzan (2013), she stated that the current situation in Tanzania about land ownership, control and management of land. The fundamental title is vested in the President as trustee for and on behalf of all citizens. For the purposes of management only, all land is classified as general land, Village land and reserve land. The President has powers to transfer land from one category to another. The Commissioner for Lands is the sole authority responsible for the overall administration of all lands but has delegated his powers to authorized land officers at district/municipal level (Sylvester, 2013). The Village Councils manage all village land with advice from the Commissioner for Lands. The reserved lands are managed by statutory bodies Tanzania Land Policy and Genesis of Land Reforms (2012).

2.8 Marketing.

The agricultural markets in East Africa region are characterized by some constraints, including very long chains of the transaction between the farmers and the consumers; inadequate access to reliable and timely market information; small bulks of produces of high quality offered by individual smallholder farmers; and poorly designed and inefficient markets. This has caused wastage of produce and low price to smallholder farmers. Shortage of timely and appropriate market information to all market actors results in distrust and therefore sometimes dishonesty. Under such circumstance, dubious intermediary actors have flourished and further damaged the trust relationship needed for the efficient and profitable market along the whole value chain (FAO, 2018). There is evidence that rural farmers have little access to the agricultural market as compared to other market actors like food suppliers, collectors, and traders. Some constraining factors can be identified, including physical access to market; the structure of the market; and the producer's lack of skills, information, and organisation (Magesa, et al., 2014).

2.8.1 Market information.

Access to agricultural markets and marketing information are indispensable factors for promoting competitive markets and improving the development of the agricultural sector. The agricultural sector employs the majority in developing countries and makes an important contribution to the development of these countries. Unfortunately, most farmers are smallholders who live in isolated rural areas, and therefore they have insufficient access to outlets and market for their products and they have no information about the agricultural market. In the absence of these, smallholder farmers exploited by greedy traders and receive low prices for agricultural products (Magesa, et al., 2014). Low yields of agricultural products for small farmers are associated with a lack of market access and marketing information. Due to the lack of market information, farmers do not negotiate better about the prices of their products and therefore receive a small compensation. The small size of the products and poor road conditions can prevent farmers from travelling to distant markets to find a better price. The lack of market information has also led to the introduction of middlemen or intermediaries who are better equipped with marketing information (Magesa, et al., 2014)

2.8.2 Marketing strategies.

An effective marketing strategy combines the 4 Ps of the marketing mix. It is designed to meet marketing objectives by providing its customers with value. The 4 Ps of the marketing mix are related and combine to establish the product's position within its target markets. Product: The produce offered by smallholder farmers, Price: The amount of money paid by customers to purchase the produce, Place (or distribution): The activities that make the produce available to consumers, Promotion: The activities that communicate the product's features and benefits and persuade customers to purchase the product (Kotler & Cunningham, 2005). Premium pricing strategies bring higher product prices than similar products on the market. This strategy used to maximize profits in areas where customers want to pay more, where there are no alternatives for products, where there are obstacles to entering the market or when sellers cannot save costs by producing at high volumes. Premium prices can be used to increase brand identity in certain markets because high prices indicate consumers that the product is of high quality.

2.8.3 Infrastructure.

Improved infrastructure such as road, a supply of electricity, works toward the overall reduction in the price of production, as greater efficiencies lead to reduced costs. Also, it simplifies the accessibility of Agro inputs, extension services, communication among the stakeholders in the sunflower value chain (Agriculture Council of Tanzania, 2010).

2.8.4 Value addition.

A change in the physical state or form of the product (such as extraction cooking oils from oilseeds).The production of a product in a manner that enhances its value. Because of the change in physical state or the way the agricultural commodity or product is produced and segregated, the customer base for the commodity or product is expanded and a greater portion of revenue derived from the marketing, processing or physical segregation is made available to the producer of the commodity or product (USDA, 2019).

2.8.5 Research Institution.

In Tanzania, Research institution dealing with sunflower are three in number namely as Ilonga agriculture research institute and Uyole agriculture research institute and Sokoine University of Agriculture (SUA). Agricultural research has an important role to play in a meeting of the productivity and production of sunflower oilseed targets since many of the new technologies, inputs, and techniques of production that increase agricultural productivity are developed through agricultural research (Maiangwa, 2010).

2.8.6 Agricultural Co-operatives.

According to Agricultural Marketing co-operatives maintain higher levels of income among the smallholder farmers (Chambo, et al., 2007).AMCOS also, have the advantage of accessing cooperative education and business development capacity building. It gives opportunity members to access credit easily to get easily. Also, it enables leadership training. By participating in various co-operative activities such as annual meetings and election season for their leaders farmers will have an opportunity to exchange views and get marketing information from experts such as cooperative officers and extension officers who attend the meetings as invited guests or resource persons (Chambo, et al., 2007).

2.9 Constraints analysis in productivity.

In the current literature review, a major limitation discovered facing agricultural sector development in Tanzania is Low production. Production is a result of multiple factors starting from seed, input supply like fertilizer and pesticide, watering, harvesting, drying and other processing by farmers themselves and other stakeholders including traders and processors (MAFSC, 2015). According to MAFSC (2015), it has been stated that Agricultural service delivery through public research, extension, and training are still inadequate both in terms of manpower and budget allocation despite Government's effort. This leads to low access to new knowledge and technology by farmers, and the poor adoption rate of improved technology (MAFSC, 2015). According to Obasi Obasi, et al. (2013) agricultural productivity show that age, level of education, years of farming experience, farm size, extension contact, fertilizer use, planting materials and labour use are the main determinants of agricultural productivity in the Tanzanian (Obasi, et al., 2013). It is important to note that productivity is not an absolute measure, but rather a reflection of the ratio between inputs and outputs. (McMahon, 2019).

CHAPTER 3 : RESEARCH METHODOLOGY

The methodology of this research focused on the study area, research design, research framework, data collection and data analysis. The study used both qualitative and quantitative data.

3.1 Research strategies.

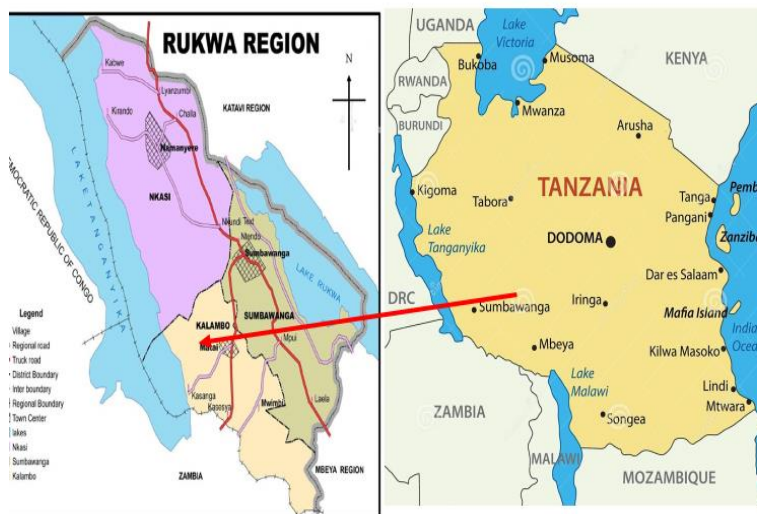
Desk research used as a strategy to collect quantitative data whereby secondary data collected from MAFC, FAO Stat, Regional Administrative Secretary (RAS), Agriculture census reports of 2012/2013, literature, books, journal articles, proceedings and official statistical data from Agriculture Rural Development System.

3.1.1 Research method.

The interview was the main research method used to ask the question of smallholder farmers and key informant. Semi-structure close-ended Questionnaire and checklist were used as a tool of guide to collect information from the key informants. Focal group discussion used to get the detailed first-hand reliable information about the topic. Desk study used to get the secondary data about the subject matter. The significance of the sector attempted to establish production levels; production data analysed to understand trends. Data triangulated by looking at different sources and assessing variations.

3.2 Study area.

Kalambo is a most potential district for agriculture in Rukwa region in Tanzania. It is the most potential district for sunflower production out of four districts in Rukwa region. Also, a sunflower is the first cash crop in the district. During the study, four wards selected based on the good production potential of sunflower in the area. The research will be done among the best four potential wards for sunflower production in the district namely Msanzi, Lyowa, Matai B, Mkowe, these wards are the best four sunflower producer in the



Source: <http://www.kalambodc.go.tz/> retrieved on May 2019

the District has one Constituency, 5 Divisions, 23 Wards, 111 Villages (KDC, 2015). It is estimated that the Kalambo District Council has 4,715 sq. km, of which 504 sq. km is water and 4,211sq km is Land (KDC, 2015). According to the Census of housing and population conducted in August 2012, Kalambo District Council has a population of 207,700 people, of which 107,226 are female and 100,474 are Males. Kalambo District Council has 336 hamlets and 41,617 households (NBS, 2012). It is estimated that Kalambo District Council has a total land area of 1,040,560 Acres, out of which 788,990 Acres (75.82% of the total land area) are suitable for Agricultural production. Actual cultivated land is estimated to be 304,560 acres, equals to 38.60% of the land suitable for agricultural production. Uncultivated land is about 484,430 acres, which is equal to 61.40% of the land suitable for agriculture (KDC, 2015). There are about 71,142 farmers (men 45,531 and women 25,611) in Kalambo District (KDC, 2015).The mean annual maximum temperature is

district. The research study will be done in Kalambo district council, Rukwa region Tanzania. District formed on 23, December 2012 and officially started operating on 2015. The district is still new since it has been inaugurated. The head office of Kalambo District Council is in Matai, which is 56km from Sumbawanga town;

between 24°C and 27°C and the minimum temperature is 13°C and 16°C. Eighty per cent (80%) of farmers in people are employed in agriculture farming.

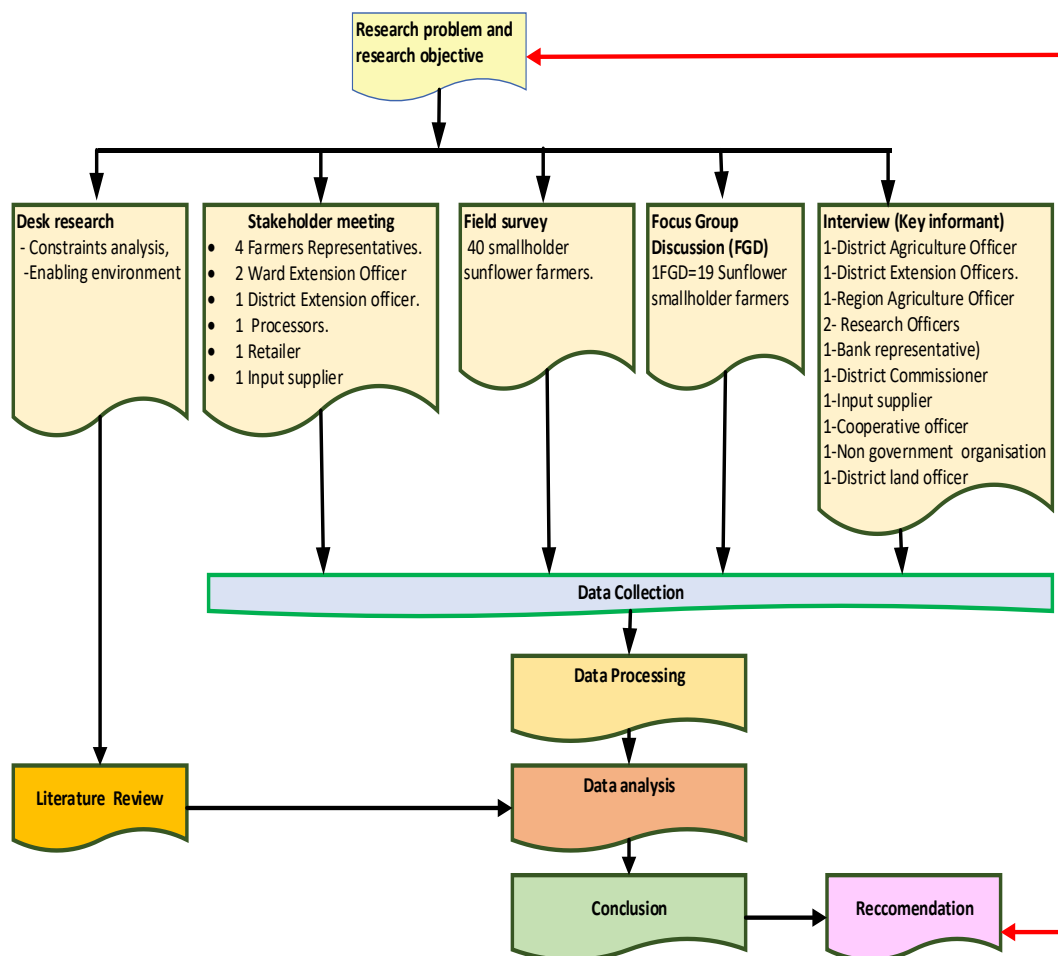
3.3 Research design

This study used both qualitative and quantitative approaches based on the empirical data which have been collected. Primary data collected from the survey and interview, stakeholder meeting, focus group discussion and secondary data obtained from desk research (Verschuren & Doorewaard, 2010).

3.4 Research framework

The research framework formulated based on research objectives and the research problem. It displayed the steps used to attain the research objective.

Figure 6: A Research framework



Source: Researcher, 2019

3.5 Data collection and processing

Data were collected through desk research, Stakeholder meeting, survey, focal group discussion and interview key informants and after collection, all data will be processed. Research tools and methods have been described below in detail.

3.5.1 Desk research

Desk research was done through the collection of data from the literature that was needed to establish preliminary information for the research. The detailed information of the core concept and dimensions and chain context was studied. The sources of this, literature journal articles, international and national reports from internet websites, a report from the agriculture department and Agriculture Research Institute, ARDS, District reports, Books and other related recent publications.

3.5.2 Stakeholder meeting.

During the stakeholder meeting, current value chain was developed in order to understand the actors involved in the chain, stakeholder gaps, and challenges facing the different stakeholders in the sunflower oilseeds value chain at Kalambo district council. The meeting was involved different stakeholders within a chain, four (4) Smallholder farmers representatives, four (4) ward extension officers, one(1) District extension officer, one (1) Retailer, one(1) processor, 1 input supplier. Each ward, one smallholder farmer was selected as a representative. Participants were informed and communicated three days before the day of the appointment. The main agenda of the meeting was clearly explained to the participants to keep them updated about the research studies. The questions were prepared and controlled by the checklist. The discussion within a meeting was conducted in an interactive way to make sure every stakeholder participates and contribute his opinions and views during the discussion. Also, all ethical dilemma such as transparency, the confidentiality of the information, consent statement was taken into consideration. Travelling cost also has been reimbursed to all participants. Within a discussion, the following research sub-questions were answered “What is the current sunflower value chain map of Kalambo District council, who are the stakeholders in the sunflower value chain in Kalambo district, their roles and interrelationships, Constraints facing smallholder farmers, stakeholder gaps in the value chain was discussed. The stakeholder meeting held at the Matai ward office meeting hall on 3 July 2019.

3.5.3 Survey.

A survey carried out to collect primary data through structured questionnaires which were designed to form one (1) strata of forty (40) SHFs. Before the beginning of the interview, detailed clarification about the research topic and the questionnaire was clearly defined to smallholder farmers. The survey questionnaires were proofread, pre-tested and piloted to identify questions that don't make sense to respondents (smallholder farmers). All non-sense questions were removed from the list of questions. Also, all questionnaires that might lead to biased answers were removed. Closed questions were introduced to smallholder farmers. The contents of the survey questionnaires to smallholder farmers are structured based on the aspect of the conceptual framework. The selected Sample size interviewed in order to get the primary data. A researcher and two enumerators were responsible to ask questions to respondents and fill in the questionnaire. Structured Closed-ended questionnaire was used to collect information from smallholder farmers. The survey was focused to get detailed information from the SHF's on the issues of sustainability production practices, type of farming systems, Availability and efficiency use of Agro inputs (seeds, fertilizers and herbicides), Land tenure, GAP practices, availability and accessibility of Extension service, finance accessibility services ,market access, opportunities in sunflower subsectors, challenges and Opportunity , and recommendations from smallholder farmer in order to improve productivity and production of sunflower seeds. The questionnaire translated into the Swahili language in order to simplify communication between the researcher and respondents.

Table 2: Shows Survey research strategies

Strategy	Number of respondent Respondents	Number of enumerators	Type of questionnaires	Questions Responeded
Survey	40 Smallholders sunflower farmers	2	Structured Close-ended questionnaires	Land tenure, GAP practices, Extension services, finance services, market access, opportunities in sunflower subsectors, challenges and Opportunity, and recommendations from smallholder farmer in order to improve productivity and production of sunflower seeds

Source: Researcher, 2019

3.5.4 Focus group discussion (FGD).

FGDs was prepared for qualitative data collection. Participants were sampled by non-probability/purposive sampling. Three(3) participants were selected from each ward whereby one (1) farmer selected from one village(1) and made a total of 12 participants. The sample selected based on gender, age, farm size and types of occupation. A topic and subject matter were introduced and clear clarified to the participants before the beginning of a discussion. A discussion was very interactive among the participants. The interview was used as a guiding tool during the discussion. Open-ended questions were used during the discussion rather than straight forward questions and answer format semi-structured. Questions were guided with a checklist and instruments were revised before the fieldwork began. The instruments were translated into the Swahili language to the Kalambo community area. Also, during the discussion more probing questions were asked to participants to get detailed information and reliable data. The discussion was well monitored to make sure every participant fully participates. A researcher acted as an observer/guider during a discussion. Researcher responsibility was to guide and took notes and followed the checklist to make sure all questions are answered and responded correctly during the discussion. During the ongoing of FGD focus group discussion, all data were summarised in the notebook and voice clips were recorded. All ethical dilemmas were taken into consideration.

Table 3: Geographical distribution of focus group discussion.

Region	District	Wards	Village	No of Villages	Number of respondents
Rukwa	Kalambo	Msanzi	Katuka	1	1
			Nachula	1	1
			Msanzi	1	1
	Kalambo	Lyowa	Namlangwa	1	1
			Singiwe	1	1
			Matai A	1	1
	Kalambo	Matai	Kisungamile	1	1
			Kateka	1	1
			Matai B	1	1
	Kalambo	Mkowe	Mbuza	1	1
			Mkowe	1	1
			Ilimba	1	1
Total		4	12	12	12

Source: Researcher, 2019

Table 4: Selection criteria for FGDs respondents

Criteria	Criteria
Occupation	Smallholder farmer (<5acre)
Age	Above 18years
Gender	Both male and Female
Mentality	Mentally fit
Farm size	Less than 5acres

Source: Researcher, 2019

3.5.5 Interview (Key informants)

Total of nineteenth (19) key informants were interviewed such as government stakeholders, political leaders and representatives from Non-government organisation, financial institution, research institution will be interviewed as key informants, Such as District Commissioner, DAICO, Regional Agriculture Officer, Researcher, Financial institution(NMB bank, District Extension officer, NGOs, Cooperative officer. Selection of the key informant was done based on the professionalism and expertise of their work. Face to face interview was conducted by the using semi-structured questionnaire which was guided by the checklist.

The aim of conducting interviews with key informants was to get first hand primary data, also to find out their role in the sunflower chain, local policies and bylaws for the sunflower value chain to support smallholder sunflower farmers and subsector, challenges and constraints facing SHFs, financial services, governments supports, sustainability practices, infrastructure opportunities in sunflower subsector, recommendations and strategies on how improve the sunflower production and productivity at Kalambo district in order to increase value and bargaining power of sunflower oils seed in the domestic and global market. Before and during interview all ethical dilemmas were taken into consideration to ensure all information from respondents were protected and confidentiality measures were set up to protect anonymity. During the interview, checklists were used as a guiding tool.

Table 5: Overall primary and secondary data collection

Type of Data	Research Strategies	Objective	Data collection tool	Respondent
Secondary data	Desk study	To review the literature on core concepts, dimensions and chain context.	CABI, Green I, Report, journal, Books, ARDS, Internet	Researcher
Primary data	Survey	To collect quantitative data	Closed-ended structured questionnaire	40 smallholder farmers involved in sunflower production and 2 enumerators.
Primary data	Focus Group Discussion	To get primary information	Semi-structured questionnaire and checklist	12 smallholder farmers involved in sunflower production.
Primary data	Stakeholder meeting	To get primary information about the current value chain	Semi-structured questionnaire and checklist	4 -Ward Extension Officers,4- Farmers representatives,1- Retailer,1 -District extension officer,1- processor,1- input supplier.
Total				12
Primary data	Interview (key informants)	To get first-hand information about the sunflower value chain	Semi-structured questionnaire and checklist	Key informant 1-District Agriculture Officer. 1-District Extension Officers. 1-Region Agriculture Officer. 2- Research Officers. 1-Bank representative). 1-District Commissioner. 1-Input supplier. 1-Cooperative officer. 1-Non government organisation. 1-District land officer.
Total				11

Source: Researcher, 2019

3.5.6 Sample selection and size

Purposive sampling technique was used to select wards in the district. Msanzi, Matai, Lyowa and Mkowe were selected as a representatives area of study in the district out of the 23 wards. Three villages per ward were selected and made a total of 12 villages. Selection of villages was done based on their potentiality of the sunflower production. Randomly sampling technique was required to develop a sampling frame from the list of smallholder sunflower farmers. Names of SHF's were picked from the Agriculture Rural Development System(ARDS). The selected names smallholder sunflower farmers were counter checked via communication with village executive officer (VEO) for approval of presence in a particular village. A sample of ten (10) smallholder farmers were randomly selected from each ward. Since all sunflower SHFs had an equal chance to participate in research. The names have been written down on paper, put it in a vessel and ten pieces of paper was hand-picked. The smallholder farmer whose names appeared on paper were selected and hence making a total sample size of 40 respondents of smallholder farmers from all four wards.

Table 6: Data Analyses

District	Ward	Village	Number of Respondents	Sampling strategy of respondents selection	Sampling strategy of wards and villages selection
Kalambo	Msanzi	Katuka	10	Random sampling	Non-probability (Purposive)
		Nachula			
		Msanzi			
	Lyowa	Namlangwa	10	Random sampling	Non probability (Purposive)
		Singiwe			
		Matai A			
	Matai	Kisungamile	10	Random sampling	Non probability (Purposive)
		Kateka			
		Matai B			
	Mkowe	Mbuza	10	Random sampling	Non-probability (Purposive)
		Mkowe			
		Ilimba			
Total	4	12	40		

Source: Researcher, 2019

3.5.7 Data analysis

The quantitative data were collected through survey questionnaires entered and processed by using the Statistical Package for Social Sciences version 25 (SPSS). Descriptive statistical tool method was used to describe data in Tabular description, graphical description, and statistically description. In Tabular description (Table), graphical description (graphs and charts) and statistical commentary. (discussion of the results) . Ground method theory was applied to analyse qualitative data. This was done through the organized data which were collected and coded. Then SWOT(Strength, Weak, Opportunities, Threats) and PESTEC (Political, Environmental, Social, Technological, Economic, Competitive) were used from the text obtained from the ground method theory.

Table 7: Description of analysis

Strategy	Purpose	Analytical tool
Desk research	Value Chain Analysis	Literature review, PESTEC, SWOT.
	Policies Sustainable production practices. Market access Constraints	Literature review, Problem tree.
	Enabling environments.	Literature review.

Interview	Qualitative data analysis from the key informants.	Grounded theory.
Survey	Quantitative data analysis from the respondents collected through closed-ended questionnaire.	Statistical Package for Social Science(SPSS version 25).
Focal group discussion	Qualitative data information from SHFs through discussion.	Grounded theory.
Stakeholder meeting	Qualitative data from stakeholder that will help a researcher to depict the current value chain of sunflower of Kalambo district	Chain mapping.

Source: Researcher (2019)

3.5.8 Limitation of the study

During the field survey, some smallholder sunflower farmers did not want to speak with a researcher. The reason is that several times most of the different researchers went in their village area and do research and never gave feedback results. Therefore, from these challenges, the researcher explained the purpose of doing the study and the impact and benefit of the research study to smallholder farmers. Moreover, a researcher has been assured smallholders sunflower farmers that, a report will be available and shared back with them which will include the proposed recommendations hence will help them to improve the sunflower productivity and production to their local areas.

Smallholder sunflower farmers and some of the stakeholders demanded seating allowance during the study. On this case, a researcher had been committed to cover only the cost of transport and some refreshment drinks and bites. Also, the truth and reality of the research study have been clearly explained to respondents to understand the real situation (cost and expenses) of the study. Finally, the problems were solved.

Before the fieldwork, I was expected to meet with farmers during the morning for the whole fieldwork period, but during the fieldwork, it was difficult to meet with them during the morning since because it was harvesting season. Most of the harvesting activities conducted during the morning. A researcher tried to find a convenient time in order to meet with respondents in their respective area. When I was asking SHFs about the production of sunflower oilseed yield per acre for the past two years, it took time to respond since most of the farmers don't keep a record of their yield production. Also, most of the farmers had no awareness of the international unit of standards, normally during the market transaction of oilseed they use plastic tin.

Fund disbursement from the employer. it was the biggest challenge during the research studies. The employer failed to cover the cost of the research study because all financial systems all over the country have been closed until the end of August 2019 since it was the end of financial year where they were putting new budget in the system of transaction called EPICOR. Therefore, no transaction could be possible to be done during the time. But as a researcher covered all the cost and expenses of the research study such as cost of fuel, transport, stationeries and finally I managed to accomplish fieldwork as per the action plan.

Lastly, the language barrier was also a problem: Some farmers preferred to use local language (Fipa tribe) and other preferred Swahili. The researcher was able to listen and understand their local language but to speak was a bit problematic, nevertheless, the information was sufficient for the research study.

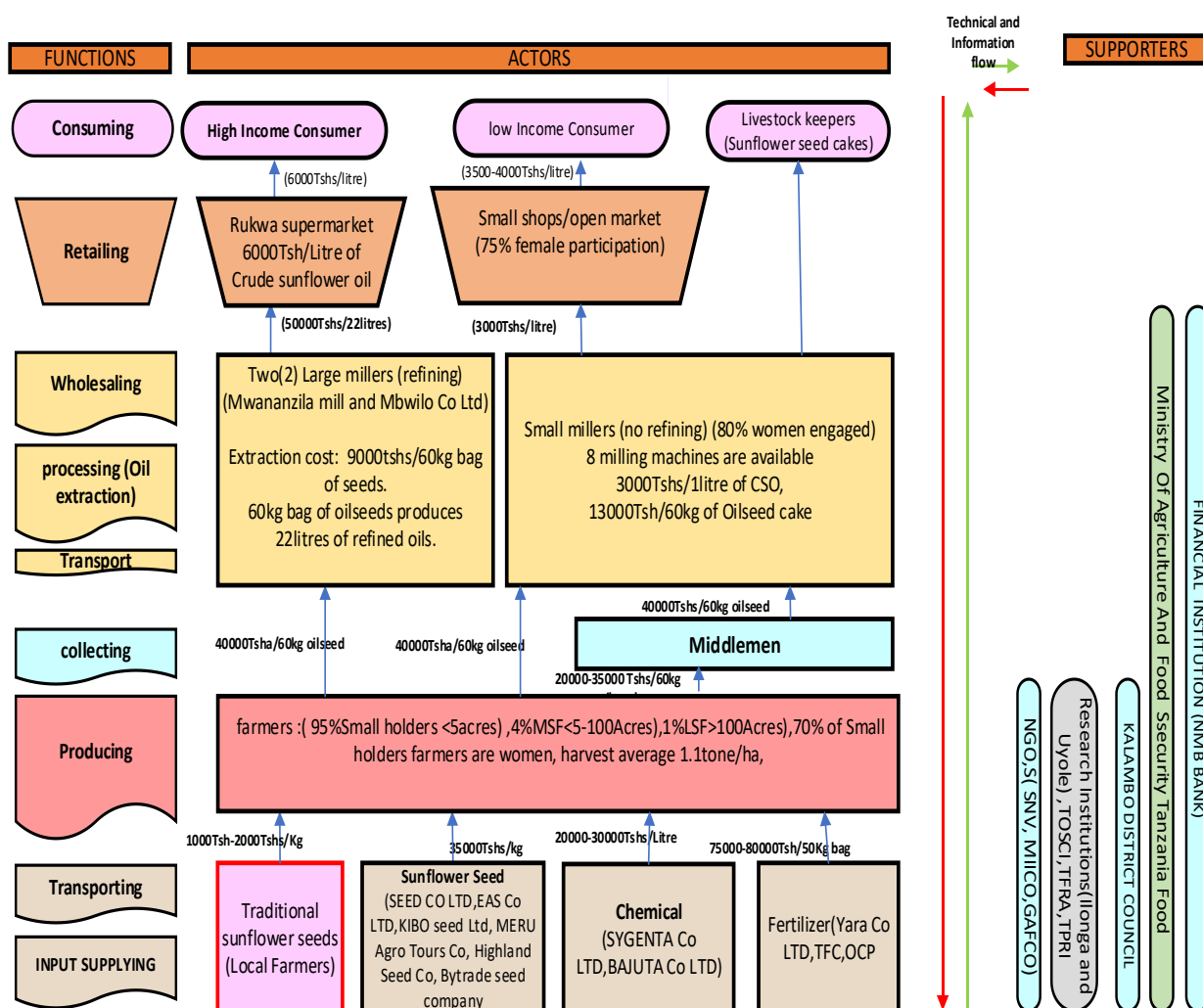
CHAPTER 4 : RESULTS

This chapter includes the findings of the interviews with DAICO, District Extension Officers, Region Agriculture Officer, Research Officer, Bank representative(NMB), District Commissioner and Input suppliers. As well findings from a survey with Smallholder sunflower farmers about the challenges and opportunities for improving the sunflower oilseeds productivity and production among the smallholder sunflower farmers and enabling environment on sunflower oilseeds subsector at Kalambo district.

4.1 Current value chain

During the meeting, different stakeholders were involved (appendix 20). Three different channels of sunflower oilseeds were pointed out. The first chain was farmers selling sunflower seed through middlemen then to small processors, to consumers. Price for one bag with 60kgs is 35000tsh/60kgs, second chain SHFs sell oilseed to small processors for 40000tsh/60kg, retailer and finally to consumers. Third chain farmers selling sunflower seed direct to large millers for 45000tshs/60kg, retailer and consumer. Figure 9 shows the current value chain map Kalambo district council. The main actors in the Sunflower oil value chain grouped under the input suppliers, producers, processors, wholesalers, retailers and consumers depending on the functional level they operate in. Below is a brief description of these actors.

Figure 7: Current value chain map of Kalambo district council



Source: Field survey data, 2019

Input Suppliers: Reliable supply and quality of inputs are essential for the efficient production of quality sunflower seeds for improved productivity. Key inputs for production include certified seeds (quality and availability of sufficient volume), tools and farm equipments, fertilizer, pesticides, labour, land and capital. Most of the farmers use farm-saved seeds and few of them buy certified seed from seed stockist and recycled in subsequent season. These certified seeds are sources from the Agricultural Seed Agency (ASA), agro-dealers and privates seeds companies including YARA, Meru Agro Tours Ltd, TFC, BAJUTA, Syngenta and Highland Seed Co Ltd.

The producers: production is dominated by smallholder farmers, which accounts for 95 % of the production. They are characterized by small plots of land of less than five acres, and most often lack mechanized farming techniques, however, 70% of the smallholder farmers are women. Also, Medium-scale farmers with 5–100 acres of land make up 4 % of the sector and usually rely on rented farming equipment including, tractors for ploughing. Only 1 % of Kalambo sunflower producers can be classified as large-scale farmers. These are the only ones who also own their own mechanized equipment and tools and cultivate more than 100 acres of land.

Processors/sunflower oil extractors: Processors obtain the sunflower seeds via traders or directly from the farmers themselves but depending on the volume of production and logistics requirements. The availability of crushing equipment is considered inadequate in Kalambo district council. There is various type of processing in the District. However, all processors in Kalambo district are facing the problem of using poor technology of sunflower oilseed extraction. A processor can only crush the seeds without refining; crush and complete first refining, or crush and complete first and second refining. A processor can also only provide the crushing service, with the oil and cake handed back to the trader or farmer who will sell it directly. Processing / extraction in Kalambo district is done by Both big oil miller (Mwananzila Combined oil mill) and Small millers over 50% small scale processors scattered of the district called Matai town. Small scale processors producing crude sunflower oil account for 80% of total sunflower oil production. Eighty percentage (80%) are women who are employed in this activity as wage workers. The small-scale processors account 70 % of the total sunflower seed produced in the district. Mwananzila and Mbwilo Oil Company also process 20% in the district. The remaining 10% of the sunflower seeds produced are not processed into sunflower seed oil but are used in fly and eating a snack. There are several activities involved in the processing sunflower seeds: Winnowing, threshing, extraction and refining. The extraction capacity and rate and the quality of oil extracted are highly dependent on the level of technology used in the extraction process (Mwananzila oil company crushes 60kg of oilseeds/6minutes). What determines the final use of the extracted and refined oil is its test, smell, and colour, purification. Small mills have the capacity of extracting an average of 60kg/20minutes.

Manufacturers: The Sunflower oil seed sub-sector in Kalambo Rukwa in Tanzania, includes one different market of home consumption. In the district, whole oil extracted by Mwananzila oil mills company is used for home consumption, however, the oils extracted meet the manufacturing industries criteria such Mohamed Enterprise Tanzania Limited (METL) company. On the other hand, more than 80% of the oil produced by the small scale processors are used in home consumption as vegetable oil.

Wholesalers: In the Sunflower seed oil value chain in the Kalambo District council, the whole selling role is played by traders and manufacturing companies distributors. According to Kalambo District statistician, 75% of traders in the district are women. In the district, there are traders who only buy and transport the unprocessed fresh sunflower seed directly from farmers and then sell to processors, middlemen in and outside the district. Similarly, there are traders who also only trade either processed cooking sunflower seed oil to Retailers in and outside the district.

Retailers: Retailing is done by retailers and small shops located all over the district but where most the retailing is done is in the free open market along the road in town including Rukwa supermarket, 75% of the retailers involved are women.

Consumers: All the 207,700-people living in the district represent the consumers for the sunflower oil value chain because sunflower seed oil is used in most of the foods used by the district residents.

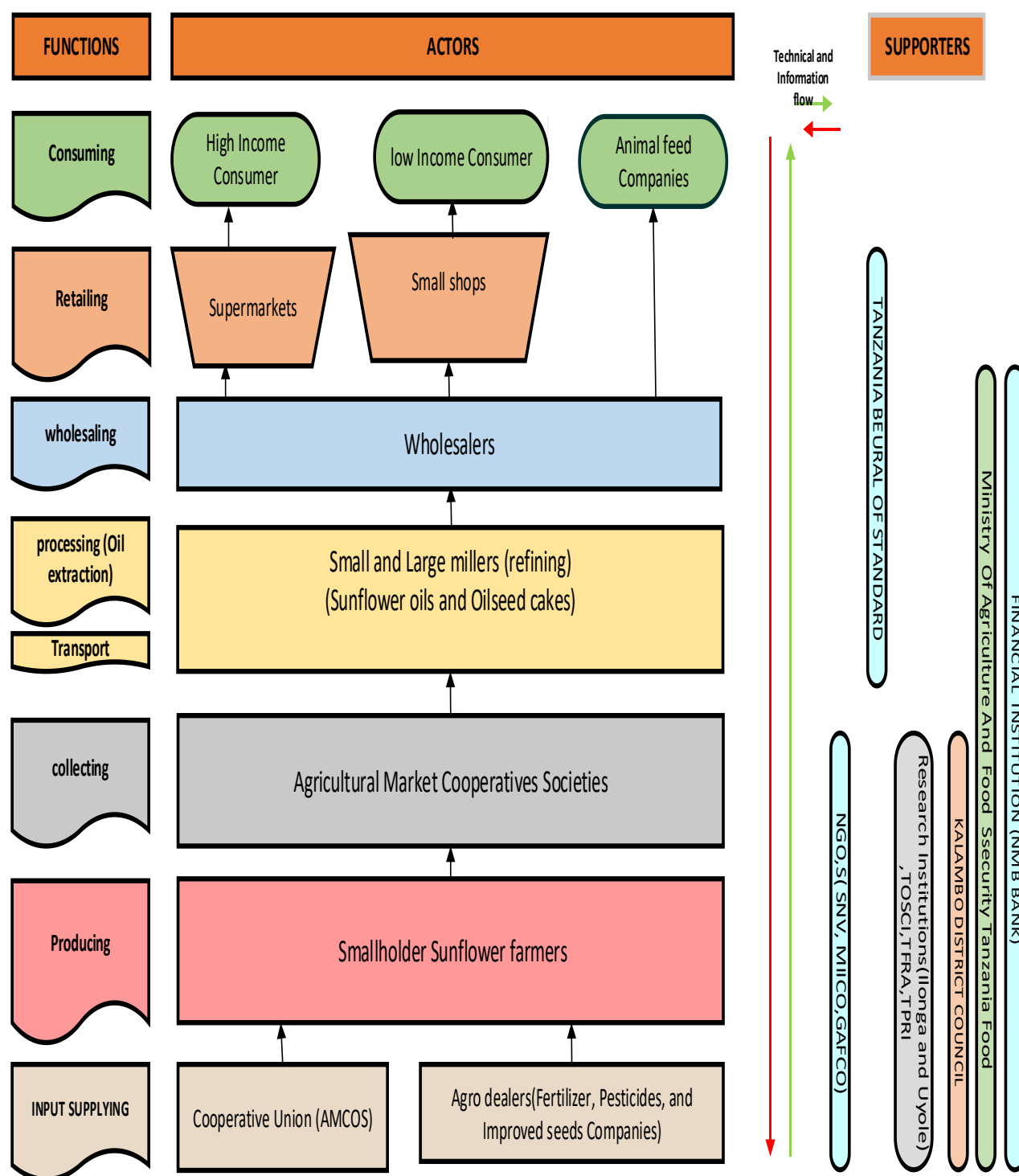
The Supporters Stakeholders: Department supports the chain through extension services and the coordination of the implementation of the sub-sectors developmental projects and programmes. The National Microfinance Bank-Kalambo branch provides financial services to actors especially processors, traders, and retailers. Tanzania Agricultural centre Research Institute (TARI-Ilonga centre) located Eastern zone of the Country. It is producing improved seeds and technical backstopping to the value chain. Tanzania Official Seed Certification Institute (TOSCI), provide sunflower seed certification service as seed regulators. SNV-Netherland development Organisation provides Agriculture capacity building to farmers, MIICO-Development Agency is responsible for the promotion of Agricultural Initiatives and Marketing of Agro-products.

Information flow: As indicated (Figure 7), information flows vertically among the actors at different functional levels within the chain and information also flows from supporters to actors in the chain. This information can be qualitative or quantitative. When it comes to sunflower oil the quality attributes that both producers, processors, marketers and consumers seek to achieve are low free from odour smell, good colour, no impurities, low moisture content, and good flavour. This determines the final value of the product, they work together in a coordinated effort by exchanging information to achieve this. Also, some of the equipment to check these attributes like the level of cholesterol is not readily available and actors use their experience to determine it which is not always perfect. The quantitative information in the chain is all about the volume and market price information. The volume produced determines the prevailing price of the commodity as this is evident in the changes in price during the minor and major season. As shown in the chain map technical and financial information movement in the horizontal direction from the supporters to the actors and sometimes from actors to supporters.

4.1.1 Proposed value chain map

This subchapter shows the proposed value chain map of sunflower crop in Kalambo which was discussed during the stakeholder meeting. It was proposed to include the element of cooperative union at input supplying function. Also, Agriculture Market Cooperative society(AMCOS) included at collecting function in the chain. This will enable individual smallholder sunflower farmers to collect their oilseed together through AMCOS before selling their oilseeds to the processors, hence collectively bargaining power will adhere(Figure 9).

Figure 8: Proposed sunflower value chain Map



Source: Field survey data, 2019

4.2 Stakeholders in the sunflower value chain and their roles and interrelationship

The institutional framework of different sunflower respondents was identified and analysed according to the chain functions and their supporting roles in sunflower subsector developmental activities in Kalambo district council Rukwa region. In this study, the respondents who were interviewed are classified as Producers (farmers), processor, retailers, Government/public services, research institutions, farmers union, NGO, and financial institutions (Table 8).

Table 8: Stakeholder analysis for sunflower subsector in Kalambo district council

Stakeholder	Function/Role	Challenges
TARI Ilonga Centre	<ul style="list-style-type: none"> Mandated by Tanzania government as Agriculture Research Institute for Sunflower subsector research. Production of breeder seeds which are supplied to private and public seed companies for massive production of certifies seeds. 	<ul style="list-style-type: none"> Lower capacity of seed production
		<ul style="list-style-type: none"> A longer distance between the Institute and seed companies
		<ul style="list-style-type: none"> Under-resourced.
Agro input supplier (Fertilizer Chemical) such as Yara-Tz, Tanzania Fertilizer Company, High land seed, Syngenta	<ul style="list-style-type: none"> Authorised by the government to supply Agro inputs to the farmers Supplying Inputs to the sunflower producers 	<ul style="list-style-type: none"> Lower capacity Fertilizer supply especially during the season of production. Some Agro dealers selling adulterated seeds (unimproved seed).
Tanzania organisation seed Certified Institute	<ul style="list-style-type: none"> Mandated by the Tanzania Government Official Institute for regulating certified seeds. 	<ul style="list-style-type: none"> Lower capacity for doing seed inspection. No seed inspector in Kalambo district.
Tropical Pesticides Research Institute	<ul style="list-style-type: none"> Mandated by the Tanzania Government Official Institute of pesticide regulations. 	<ul style="list-style-type: none"> Lower capacity for pesticide inspection. No authorised chemical Inspector Kalambo district. Some Agro dealers selling chemicals which are not certified.
Tanzania Fertilizer Regulatory Authority	<ul style="list-style-type: none"> Mandated by the Tanzania Government official institute of fertilizer regulatory authority 	<ul style="list-style-type: none"> Lower capacity for doing fertilizer inspection due to the absence of government gazetted fertilizer inspector. Some Agro dealers selling adulterated fertilizers.
Smallholder farmers	<ul style="list-style-type: none"> Farmers are the back born of the sunflower value chain since are the implementers of the discovered technologies in the field to produce sunflower oilseed which is the main product needed to make the all chain well and alive. 	<ul style="list-style-type: none"> Low bargaining power. Less financial support. Land tenure issue makes unavailability of land. Middlemen take more shares in the chain. Lack of GAP standards. Poor extension services. Unstable price of the sunflower seeds and oil.

	<ul style="list-style-type: none"> Collaborate with another stakeholder like Kalambo district, Agricultural, NGO's, Agriculture researchers, farmers and other farmers in developing sunflower production. 	<ul style="list-style-type: none"> Use of traditional seeds. low adoption of extension services. Lack of awareness of agricultural cooperative union. Use of low technology during farm operation such as land preparation Pest such as birds, they eat sunflower grain before harvesting. Unavailability of improved certified seeds. The available improved seed is very expensive .e.g. Hysun 33 the price is 75000tsh/2kg. Capital/fund is a problem. Delay of improved seed during the sunflower season. Poor tendency of applying fertilizer to sunflower crop. Improper use of plant spacing. Since most SHF's use ox plough during farm preparation, therefore, they use incorrect spacing during planting. Most of the farmers are not get access to extension service. Presence of adulterated Agro inputs such as fertilizer, sunflower seeds. Poor perception of the sunflower crop amongst smallholder sunflower farmers. They believe sunflower crop depletes soil nutrients. Most farmers are not organised in a producer organisation(POs). Most of the farmers use local traditional sunflower seeds aa a source of planting material. Most of Smallholder sunflower farmers believe GAP standards are complicated to obey since takes time and costly. Pests and diseases are problems such as fungal diseases and caterpillars. Untimely planting. Some smallholder farmers take sunflower crop as an extra crop and not potential crop.
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		<ul style="list-style-type: none"> No stable price on sunflower seeds since the price is controlled by middlemen and traders.
Small scale processors	Extraction oils from the fresh sunflower seed produced by farmers.	<ul style="list-style-type: none"> Limited technology on measuring the quality of their oil produced. Like cholesterol content, purity percentage of the oil, moisture content. Poor refining method of vegetable oil. Poor hygienic condition.
		<ul style="list-style-type: none"> The extraction efficiency of the machinery used is very low. During refining process may cause burning of oil.
Large processors	Processing quality sunflower seeds and supply quality cooking oils The company does extraction and refining of sunflower oil produced.	<ul style="list-style-type: none"> Availability of Land for expansion is an issue because it has been installed in between the residential area of the other people. Capital is also a to expand the business like buying another machine.
		<ul style="list-style-type: none"> Some farmers sales dirty fresh sunflower seeds which contain impurities, inadequate of fresh sunflower seeds from outsourcing.
Traders	Wholesaling function by buying processed sunflower oil from small scale processors, transport and then sell it to retailers in and outside the district.	<ul style="list-style-type: none"> Shortage of packaging and handling during distribution. Limited technology on quality measurement of sunflower oil like cholesterol (free fatty acid) content, moisture. contamination of the oil by using Sodium chloride.
Retailers	Sell the final product that is produced in a sunflower oil value chain which is sunflower oil and another byproduct like Oil cakes.	<ul style="list-style-type: none"> Price fluctuation of the product Inadequate packaging and labelling of the product. Lack of the needed equipment to check for quality such as the amount of free fatty acid, and moisture content of produced oils. Contamination of oil by using Sodium chloride.
Consumers	To consume the Sunflower oil and Oil cake for feeding livestock	Traceability and product information customers missed.

Extension officers (Agriculture Department)	<p>Implementation of agriculture policy. To train farmers. Provision of extension services to farmers. Extension officers are guiders to smallholders farmer to make sure that all the released technologies are being utilized in the field to their maximum for better and quality yield.</p>	<ul style="list-style-type: none"> • Under-resourced. • shortage of Agricultural extension officers at the village and ward level. • Shortage of Working facilities such as Motorcycles. • Shortage of fund due to a small budget approved to the central government. • The Value sunflower value chain is not well developed. • No clear policy on sunflower subsector. • No specific budget allocated for sunflower subsector development. • No subsidy for the sunflower crop. • No properly market information system such as price information.
Financial Institution (National Microfinance Bank- NMB)	<p>Provide financial support in terms of credit facilities and incentives to the innovation of the agricultural sector. Providing training for capacity building and strengthening the networks among stakeholders.</p>	<ul style="list-style-type: none"> • Delay in loan repayment by farmers. • Lack of trust among the customers(farmers). • Misallocation of loan fund among the farmers who are taken a loan from the bank. • Most of the farmers' failure to fulfil loan criteria such collateral.
Non-government organizations (SNV, GAFCO, MIICO)	<p>Link farmers with the stakeholder in the sunflower chain. Providing training on farmers</p>	

Source: Field survey data, 2019

4.2.1 PESTEC analysis

The study area was also analysed Politically, Economically, Technologically, Environmental, and cultural as shown on the table below.

Table 9: PESTEC analysis

PESTEC Analysis of sunflower Oil sub sector in Kalambo District council-Rukwa region	
Political	<ul style="list-style-type: none"> • Absence specialised bank of agriculture investment.
	<ul style="list-style-type: none"> • Under resourced of TOSCI.
	<ul style="list-style-type: none"> • Under resourced of Kalambo District Agriculture department.
	<ul style="list-style-type: none"> • Under resourced of Ministry of Agriculture.
	<ul style="list-style-type: none"> • Inadequate of Rural Infrastructure.
	<ul style="list-style-type: none"> • The underperformance of Agriculture Research Institute(TARI-Ilonga and TARI - Uyole)
Economical	<ul style="list-style-type: none"> • The high cost of processing machinery.
	<ul style="list-style-type: none"> • The high cost of Agro inputs especially sunflower improved seeds and fertilizer.
	<ul style="list-style-type: none"> • The high interest rate of Loan
	<ul style="list-style-type: none"> • Unmet demand for crude sunflower oil.
Sociological	<ul style="list-style-type: none"> • Land tenure issues
	<ul style="list-style-type: none"> • Presence of Aging farmers population.
	<ul style="list-style-type: none"> • Youth rural Migration
Technological	<ul style="list-style-type: none"> • Use of Uncertified Sunflower seeds(local traditional seeds).
	<ul style="list-style-type: none"> • Use of inappropriate processing technique.eg addition of salts into crude oil during refining processes.
	<ul style="list-style-type: none"> • Use of Inefficiency milling machine
Environmental	<ul style="list-style-type: none"> • Less cultivated area.
	<ul style="list-style-type: none"> • Sunflower oil Adulteration
Cultural	<ul style="list-style-type: none"> • Uncertain product quality
	<ul style="list-style-type: none"> • Low yield of sunflower oilseed.
	<ul style="list-style-type: none"> • Unmet local demand for Crude Sunflower oil.

Source: Field survey data, 2019

4.2.2 SWOT analysis

During the field research, the study undertaken by Kalambo district council in order to identify its internal strengths and weaknesses, as well as its external opportunities and threats. The following results were highlighted below as shown on the table.

Table 10: SWOT analysis.

	POSITIVE S	NEGATIVE S
	STRENGTH	WEAKNESS
INTERNAL	<ul style="list-style-type: none"> • The district has a suitable climatic condition for sunflower production 	<ul style="list-style-type: none"> • Use of unimproved seeds and farming methods (95% small scale farmers)
	<ul style="list-style-type: none"> • The district has available farmlands 	<ul style="list-style-type: none"> • Insufficient training and monitoring of seed oil processors by Tanzania Fodd and Drug Association.
	<ul style="list-style-type: none"> • Sunflower oil seed provides more jobs per acre. 	<ul style="list-style-type: none"> • Issue of Land tenure.
	<ul style="list-style-type: none"> • Sunflower has the lowest requirement for inputs such as fertilizer, seeds compared to maize. 	<ul style="list-style-type: none"> • Use of inefficient milling machinery and methods (90% small scale millers).
		<ul style="list-style-type: none"> • Inadequate government's support to Sunflower Subsector.
		<ul style="list-style-type: none"> • Local demand for Sunflower oil is still very low.
EXTERNAL	OPPORTUNITIES	THREATS
	<ul style="list-style-type: none"> • Ready market to the local level. 	<ul style="list-style-type: none"> • Inadequate financial or investment incentives to smallholders farmers.
	<ul style="list-style-type: none"> • Export market opportunities. 	<ul style="list-style-type: none"> • Increasing importation of sunflower cooking oil from other countries.
		<ul style="list-style-type: none"> • Dominating of the ageing population.
	<ul style="list-style-type: none"> • There is export potential- by sunflower grown in Tanzania. 	<ul style="list-style-type: none"> • Sunflower adulteration.
	<ul style="list-style-type: none"> • Supply of seeds of high value improved varieties. 	<ul style="list-style-type: none"> • Insects and pests.
	<ul style="list-style-type: none"> • Refining of crude sunflower seed oil. 	<ul style="list-style-type: none"> • Competition from edible oils- imports
	<ul style="list-style-type: none"> • Value addition such as processing, packaging. 	<ul style="list-style-type: none"> • Fluctuating market prices of sunflower seeds .
	<ul style="list-style-type: none"> • Presence of difference agricultural stakeholder such as BRITAIN, AGRA, SAGOT, GAFCO, Save the Children, KAESO. 	<ul style="list-style-type: none"> • Inadequate knowledge by sunflower farmers.
	<ul style="list-style-type: none"> • The district plans to establish a sunflower processing unit at Kalambo district council. 	

Source: Field survey data, 2019

4.3 Field survey with smallholder sunflower farmers.

4.3.1 Basic information of the respondents.

Sunflower smallholder farmers were the respondents of this study. The information about the characteristics of the respondents provides insight understanding of the smallholder farmers who were selected randomly for this study.

4.3.1.1 Gender and age respondents.

The results indicated that out of 40 interviewed respondents, 28 respondents (70%) were Male, and 12 respondents (30%) were female.

Table 11 : Gender and age respondents (N=40).

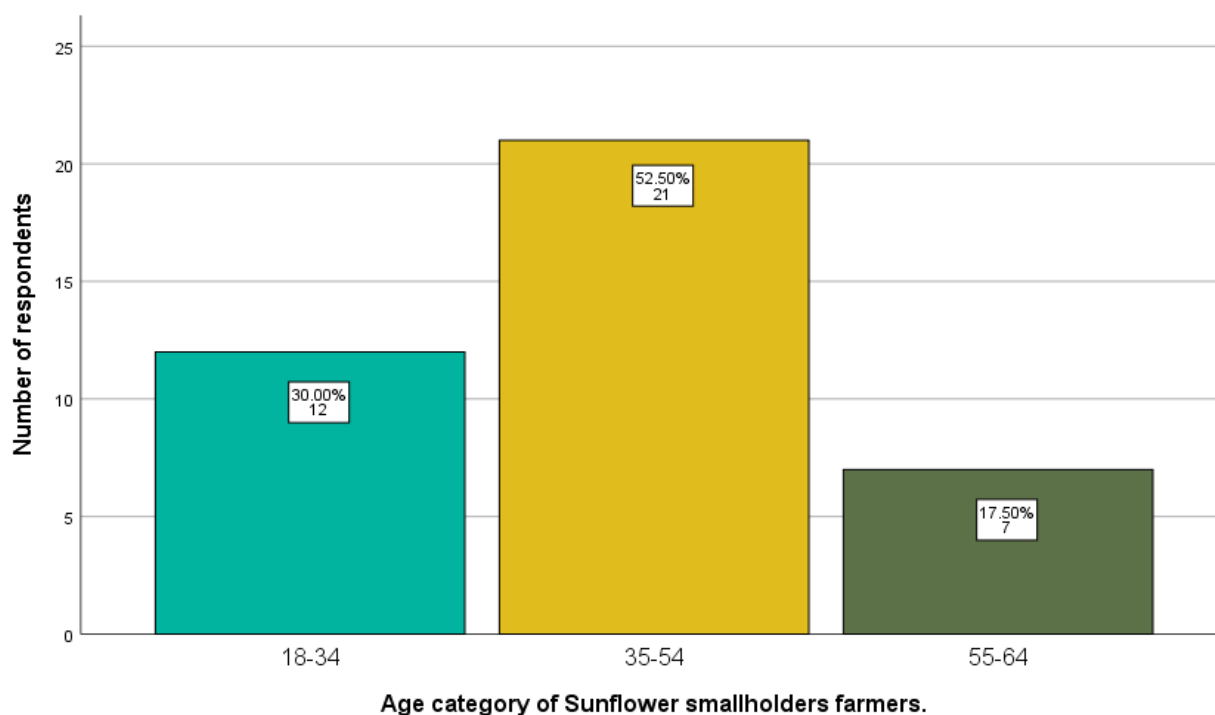
Variables	Frequency	Percent
Valid	Male	28
	Female	12
	Total	40
		100

Source: Field survey data 2019

4.3.1.2 Age categories.

The total of 40 smallholder sunflower farmers was interviewed. Age category of 35-54 years encountered for 52.5%, while those with age 18--34 age was 30% and remained group had between 55-64 years proportional of 17.50% (Figure 9).

Figure 9: Age category of smallholder sunflower farmers



Source: Field survey data, 2019

4.3.1.3 Education level of the respondents.

Education level of the respondents was in four categories levels as primary school education, secondary school education, diploma education, degree education and a group of those never went to school. However, no respondents attained diploma education, degree education and never went to school. The majority of the respondents (30 out of 40) belonged to the primary school education level which is equal to 75 %. Only 25% (10 out of 40) of the respondents had Secondary school level of education (Table 12).

Table 12:Education level of the respondents.

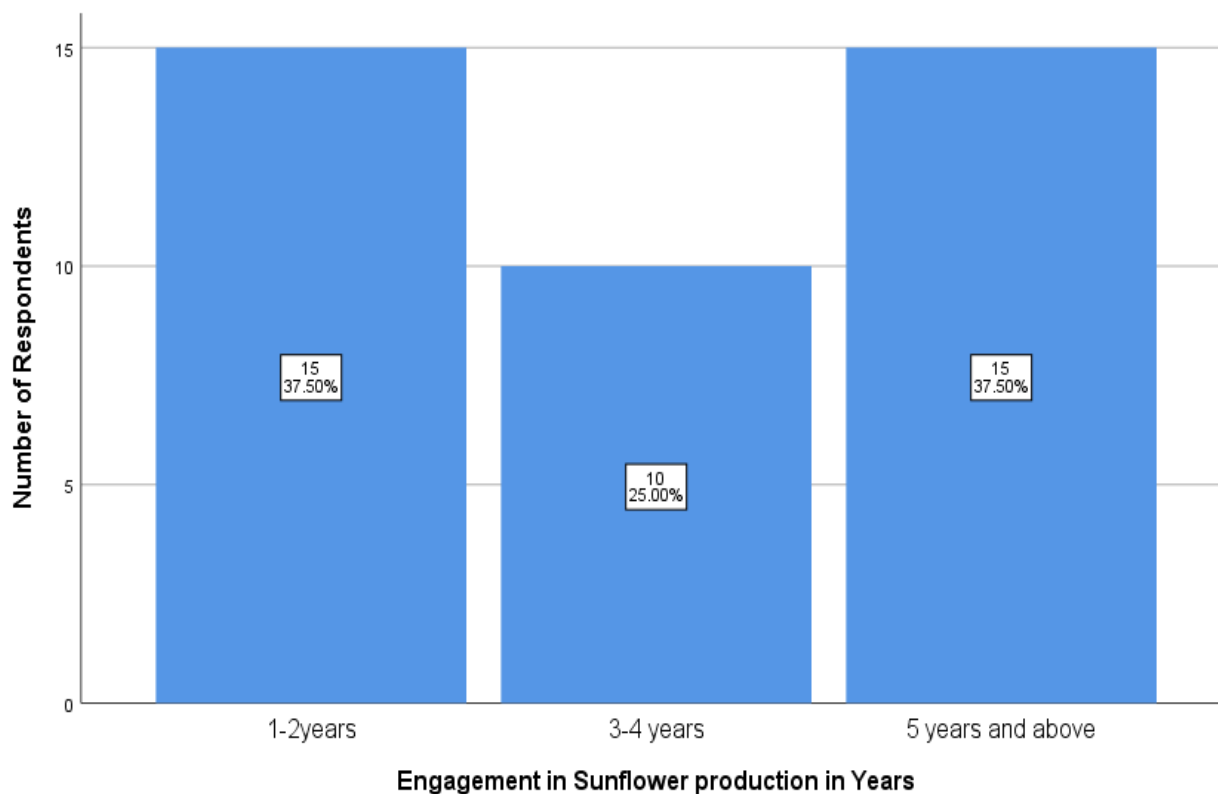
Variables		Frequency	Percent
Valid	Primary school education	30	75
	secondary school education	10	25
	Diploma education	0	0
	Degree education level	0	0
	Never been to school	0	0
	Total	40	100

Source: Field survey data, 2019.

4.3.1.4 Experience in sunflower production

The study indicated that more than 62.5% of the smallholders farmers stated that they have been growing sunflower for the past 5 years while 37.5% grown the crop for more than 5 years (Figure 10).

Figure 10: Experience in sunflower production

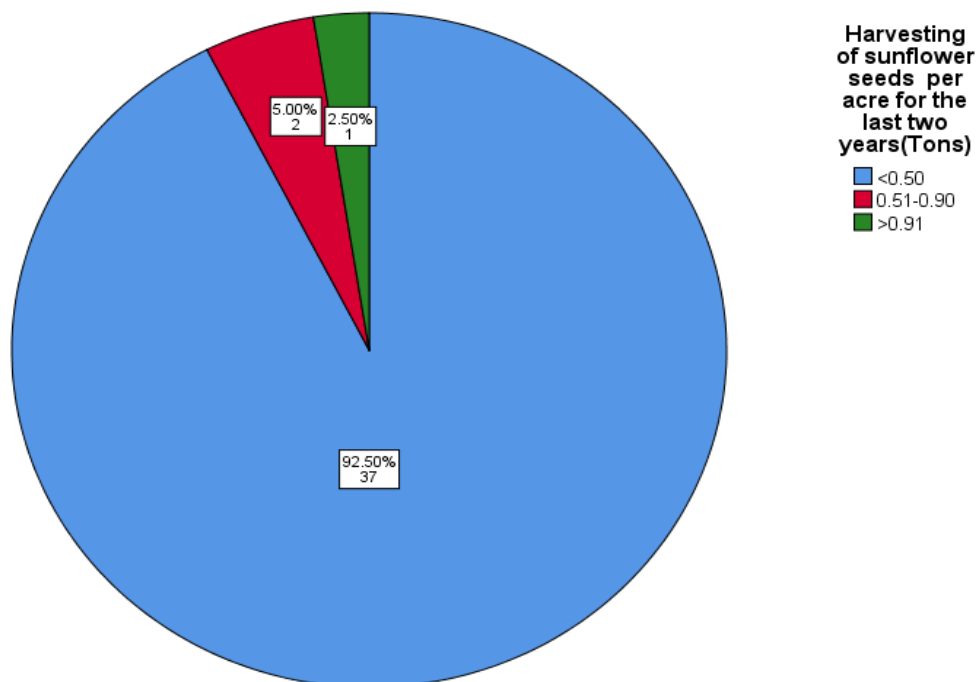


Source: Field survey data, 2019.

4.3.1.5 Production of sunflower oilseed for the last two year (in Tons).

The results indicated that 92.50% of the respondents harvested less than 0.5 tonnes of sunflower for the last two years and 5% of the respondents harvested between 0.5-0.9tons of sunflower oilseed and only 2.20% of the respondents harvested more the 0.9 tonnes because they used improved variety of sunflower (Figure 11).

Figure 11: Production of sunflower per acre (Tons)



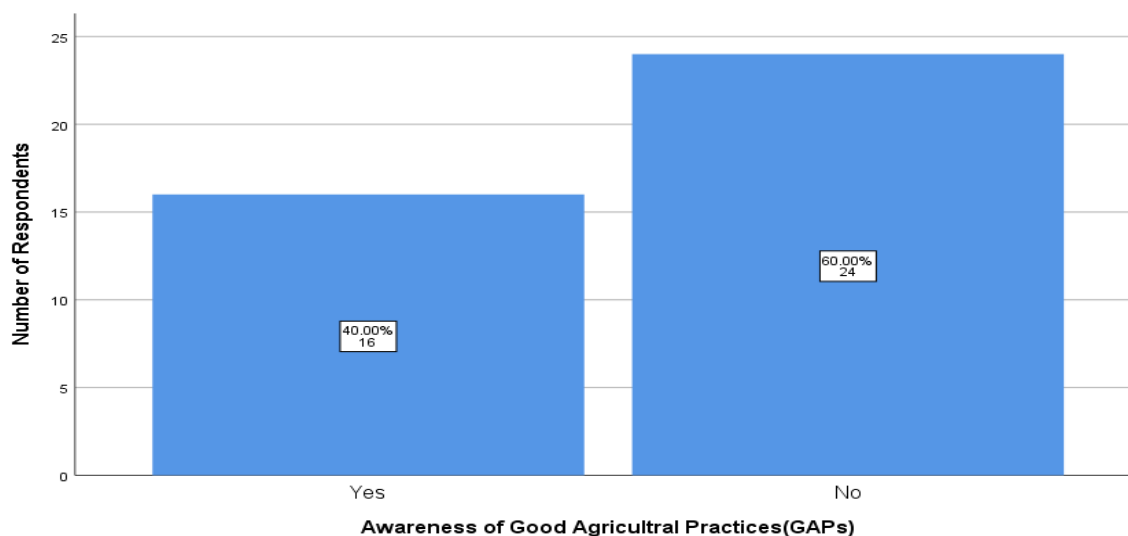
Source: Field survey data, 2019

4.4 Sustainable production practices to increase sunflower production

- **Good agriculture practices (GAPs)**

The study indicated that 60% of the smallholder sunflower farmers grow sunflower without being aware of good agriculture practices standards and only 40% was aware of the stated practices for better improvements (Figure 12).

Figure 12: Awareness of good agricultural practices (GAP).

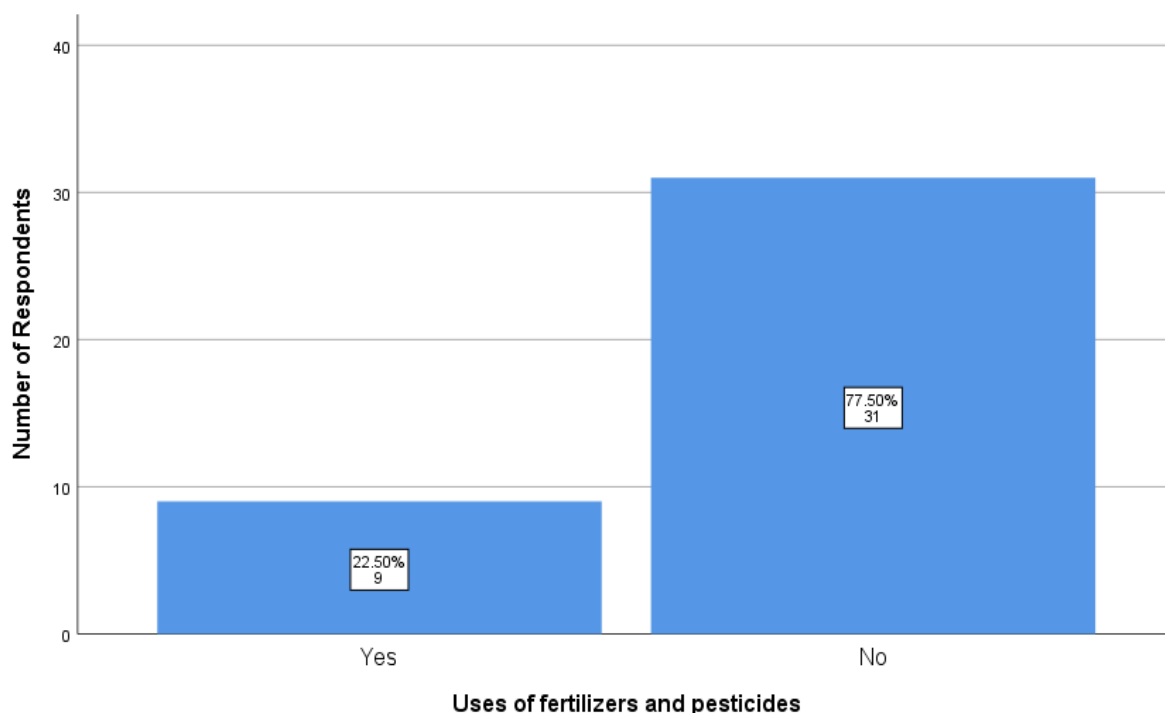


Source: Field survey data, 2019

- **Efficiency use of agro inputs (fertilizer and pesticides)**

During the field survey, 77.5% of Smallholder sunflower farmers responded are not using agro inputs such fertilizer and pesticide in sunflower crop farms while 22.5% use fertilizer and pesticides. Among the 9 respondents who were responded they use fertilizer, most of them use organic fertilizer more than inorganic fertilizer (Figure 13).

Figure 13: Uses of fertilizer and Pesticides



Source: Field survey data, 2019

- **Equipment used for land preparation(N=40).**

During the field research study, technology has been studied based on the farm tools and equipment of which smallholder sunflowers farmers are using for a farm. Farm equipment technology was divided into three types such as an Ox plough (100%), Tractor and hand hoes. It has been observed that all 40 respondents are using ox plough technology for land preparation. None of the sunflower smallholders farmers are using neither hand hoe nor tractor for the land preparation (Table 13).

Table 13: Equipment used for farm preparation.

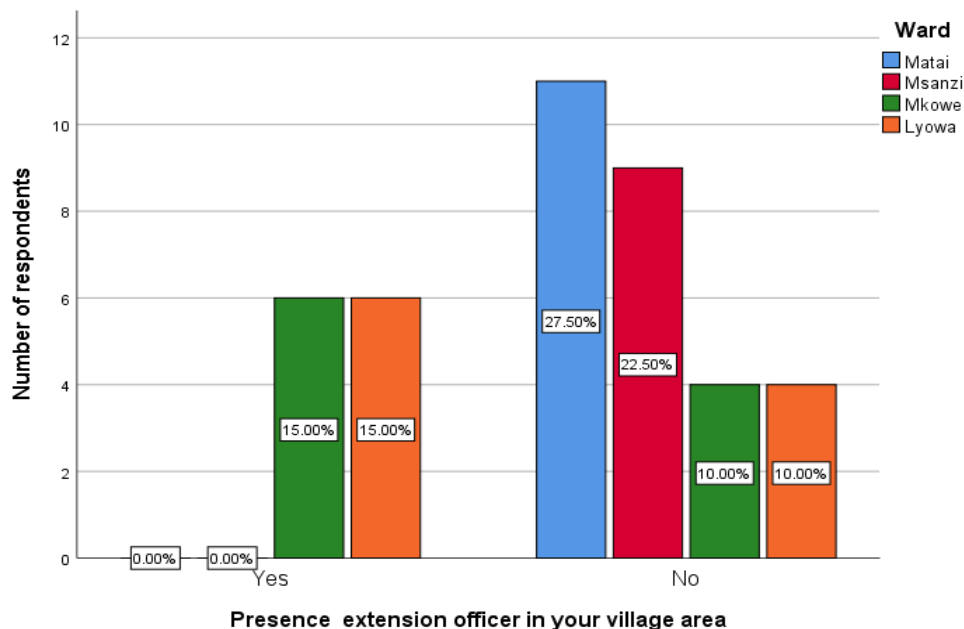
Variables	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Ox plough	40	100	100	100
Tractor	0	0	0	0
Hand hoe	0	0	0	0

Source: Field survey 2019.

- **Availability of agriculture extension services**

The results indicated that 30% of respondent had extension officers in their village area and 70% of respondents had no extension officers in their village area. Some of the villages, extension officers are present but still, the productivity is low (Figure 14).

Figure 14: Availability of extension services

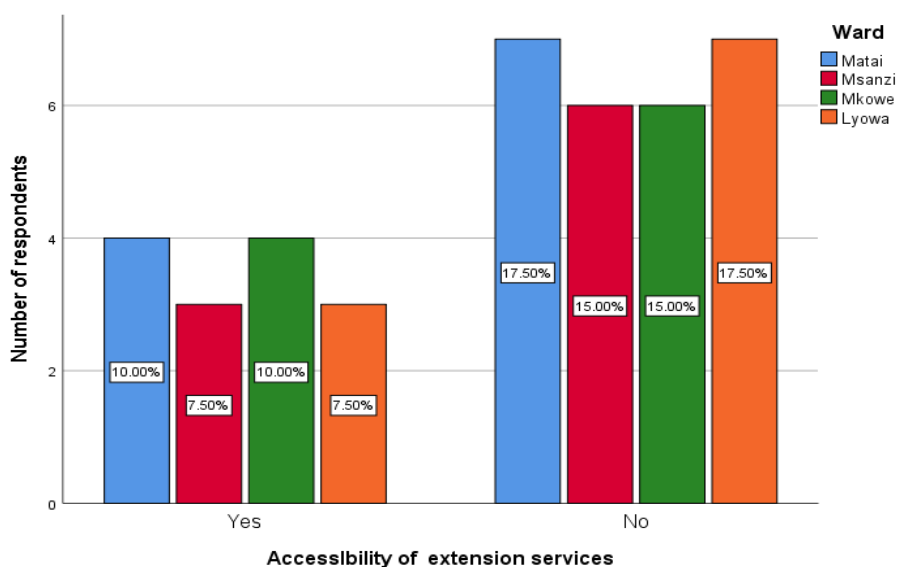


Source: Field survey 2019.

- **Accessibility of extension services**

The research study indicates that 35% of the respondents access extension services and 65% of the sunflower smallholder farmers have no access to extension service. Lyowa and Matai showed the highest percentage of the respondents responded to have no access to extension services (Figure 15).

Figure 15: Accessibility of Extension officer

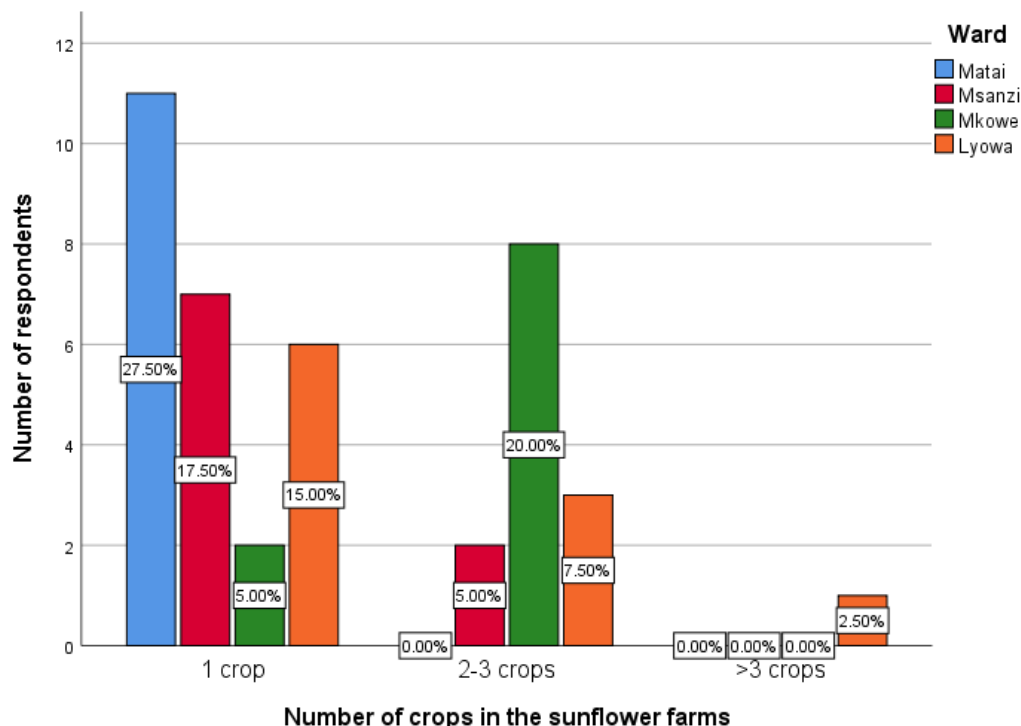


Source: Field survey data, 2019

- **The number of crops mixed in sunflower farm.**

The results indicated that 65% of the interviewed smallholder sunflower farmers are not mixing sunflower crop with any other crop in the same farm while 32.5 % of the respondents mix two (2) to three (3) crops in the sunflower field(mixed cropping) and 2.50% of the sample respondents are practising mixed cropping with more than three crops in the same sunflower field (Figure 16).

Figure 16: The number of mixed crops in sunflower farm.



Source: Field survey data, 2019

- **Results from the focal group discussion.**

During the discussion with smallholder sunflower farmers, it was revealed that most of the farmers practice mixed cropping. For example, Sunflower and maize, finger millet and Beans, Groundnuts in the same field. Also, farmers who don't mix sunflower crop with other crops in the same field were believing that sunflower depletes soil nutrient which can suppress the growth of the other crop.

- **Interview with District, Agriculture, Irrigation, Cooperative Officer .**

Head of agriculture department of Kalambo was interviewed on the issue of how the sunflower smallholder farmers can increase their production through sustainable practices. He stated that irrigation practice is one of the major aspects of sustainable practices in order to increase the production and production of sunflower. However, in Kalambo district there is three ongoing irrigation scheme project which is still incomplete due to the lack of fund (Katuka, Singiwe and Ulumi irrigation schemes). Some of the sunflower farmers practice irrigation by sourcing water from Kalambo river. These farmers are able to grow sunflower throughout the year. The majority of the farmers are still depending on rain-fed farming. He insisted that once the irrigation schemes will be completed then it will help most of the sunflower growers in the district.

4.4.1 Summary of the findings on the sustainable production practices done by smallholder farmers to their production:

- During the field survey, it was grasped that most of the farmers trying their best on the sustainable practice measures in order to increase productivity and production of the sunflower oilseeds. But, still, the majority of farmers are not well equipped with knowledge of the GAP standard. Under GAPs, the following issues were identified: poor timely planting, incorrect use of plant spacing, use of farm-saved seeds, poor weeding, failure of using fertilizer and pesticides for growing sunflower.
- It was noticed that some farmers use agro inputs but generally, still, there is an inefficient use of agro input such as fertilizer and herbicides. Some smallholder sunflower farmers apply pesticides when pest attack is above the economic threshold level, also they do not apply fertilizer on the right crop stage.
- **Poor accessibility of extension services:** Most farmers do not get access to extension service. This is due to a deficit of government of extension, poor relationship between Kalambo district council and other stakeholders, agro-dealers and private agricultural companies.
- **It was noticed that SHFs do not practices crop rotation, poor mixed farming:** This was noticed due to the most of farmers plan sunflower crop for more than 5 year years in the same piece land, also some farmers practise mixed farming, but they do not mix the sunflower crop with the other compatible crop. For instance, sunflower crop is mixed with beans, finger millet together with maize in the same field.
- **Irrigation system:** It is one of the major sustainable practices to increase sunflower production. During the field study, it was noticed that irrigation is a major issue facing sunflower smallholder farmers especially during the offseason of the sunflower crop. Most of the smallholder sunflower farmers depend on rainfed farming. Also, some farmers during the off-season are sourcing irrigation water from Kalambo river.

4.5 Market accessibility contribution to the production potential of sunflower.

- **market information (price).**

During the field survey study, the findings revealed that all 40 respondents getting access to market price from traders and middlemen. None of them gets access to market price information of sunflower seeds or oils from District office, cooperative union, or media. This implied that farmers are voiceless to decide on their products price, therefore, traders and middlemen are the price controller of sunflower seeds and cooking oils.

Table 14: Source of the market price of sunflower seeds.

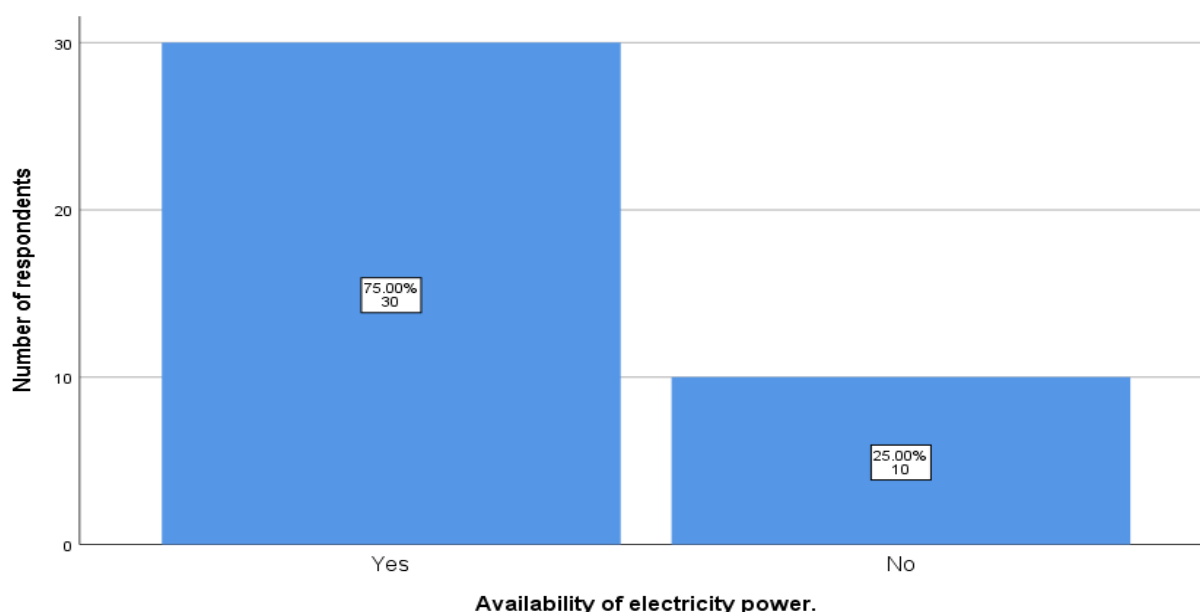
	Variables	Frequency	Per cent
Valid	District Office	0	0
	Cooperative union	0	0
	Media	0	0
	Traders and middlemen	40	100

Source: Field survey data, 2019

- **Availability of electric power.**

The study indicates that 25% of the respondents have no access to electrical energy in their village area and 75% of the smallholder sunflower farmers are getting access to electric power(Figure 17).

Figure 17: Availability of electricity power



Source: Field survey data, 2019

- **Price of sunflower oilseed.**

The study indicated that 28 (70%) of the respondent sells sunflower seeds at the price of 501Tshs-700Tshs per kilogram while 12(30%) of the smallholder sunflower farmers responded that they sold their sunflower in form of seeds for the price of 301Tshs to 500Tshs per kilogram (Table 15).

Table 15: Price of sunflower seed per kilogram (Tshs)

	Variable	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	301Tshs-500Tshs	12	30	30	30
	501Tshs-700Tshs	28	70	70	100
	Total	40	100	100	

Source: Field survey data, 2019

- **Price of sunflower oil per litres (Tshs).**

The study found that 31 (77.5%) of the respondent sold sunflower cooking oils at the price of 3001Tshs-4000Tshs per litre while 9 (22.5 %) of the smallholder sunflower farmers have been responded that they sell sunflower oilseeds between the price of 2501- 3000tshs per 1litres.

Table 16: Price of Sunflower cooking oil per litre(Tshs)

	Variable	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2501Tshs-3000Tshs	9	22.5	22.5	22.5
	3001Tshs-4000Tshs	31	77.5	77.5	100
	Total	40	100	100	

Source: Field survey data, 2019

- **Distance from farm to a residential area.**

During the field survey, it has been observed that 32.5% of smallholder sunflower farmers responded that the distance from their residential area to their farms are less than 5km and 55 % of SHF's responded that the farm distance is more than 10km from their residential area (Figure 18). Distance affects production especially through its impact on access to sunflower markets. Also, change in distance reflect increases in the transportation cost of produce. This implies that transportation cost of produces for those farmers whose their farm located more than 10 km will be higher than those whose farms are located less than 10km from their residential area.

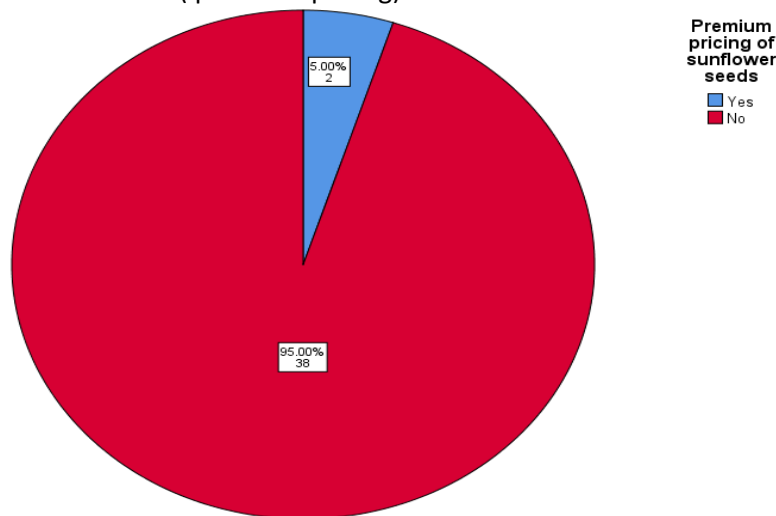
Figure 18: Distance from farm to farmer's residence

Source: Field survey, 2019

- **Promotion (Premium pricing).**

The study indicated that 95% of the smallholder sunflower farmers do not sell their produce at a premium price after producing good and quality sunflower oilseeds. Only 5% of the respondents sell their produce at a premium price(Figure 19).

Figure 19: Promotion (premium pricing)

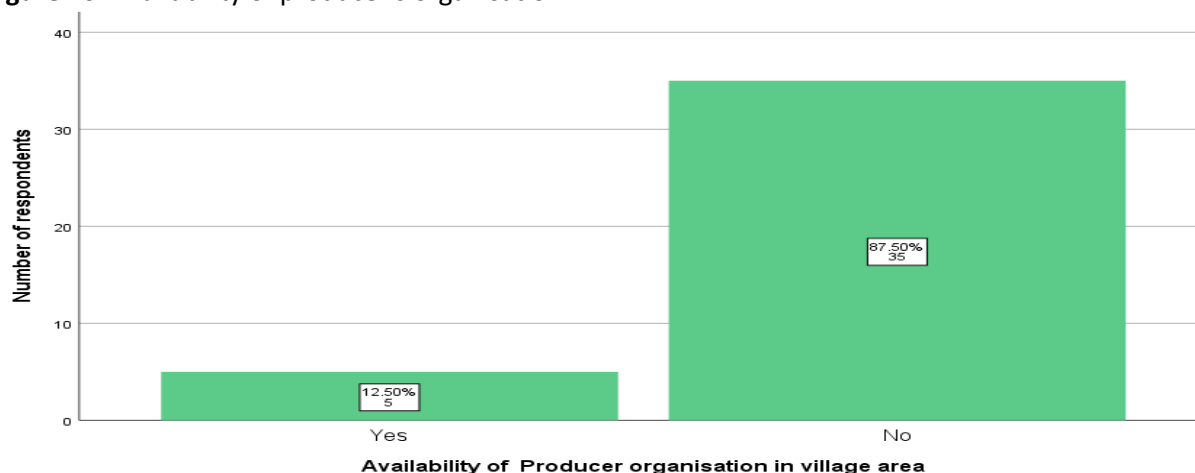


Source: Field survey data, 2019

- **Availability of producer organisation (AMCOS) in the village area.**

The field survey indicated that 87.5% of the respondents who have been interviewed stated that, there is no any producer organisation in the villages and only 12.5% of the respondents stated that there is available producer organisation in their village area (Figure 20). However, those farmers groups and producer organisation are not registered at the district level and one of the respondents engaged already in the producer's organisation in their village. Since it is known that producers organisation helps to mobilise farmers collective self-help action aimed to improve their economics and social situation and that of their communities. Producers organisation were perceived to have the ability to generate resources from their members. Also, producers organisation organises farmers into a group to integrate them in the transfer of technology, production, and marketing, planning, implementing and monitoring of different project on rural development, agriculture and allied sector development, natural development etc. Therefore, producer organizations affect the productivity and production of sunflower.

Figure 20: Availability of producer's organisation.

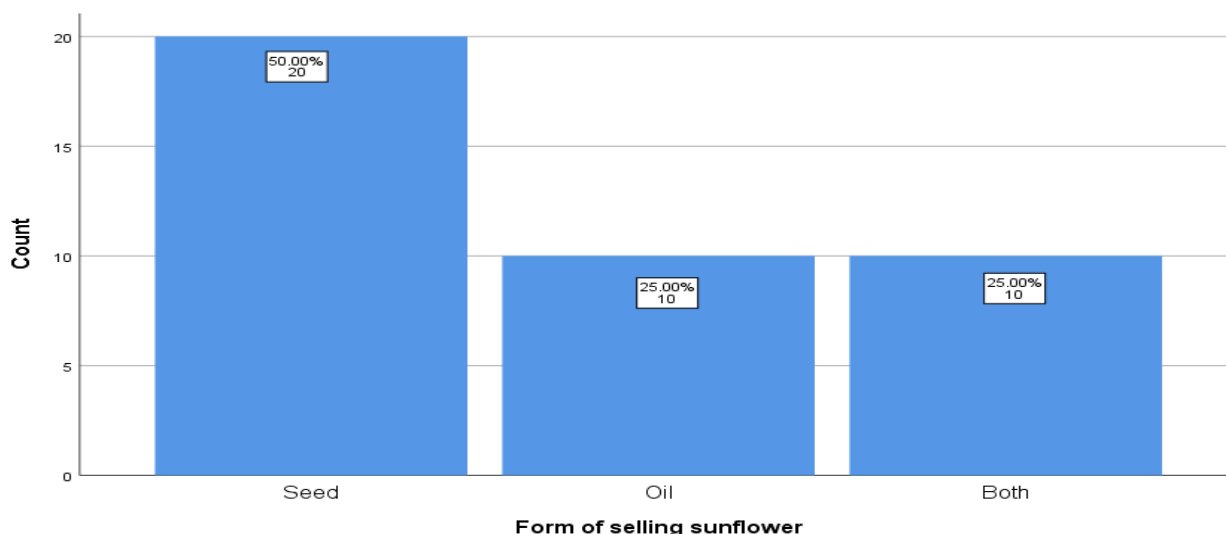


Source: Field survey data, 2019

- **Value addition** (Form of selling sunflower oilseed).

The study indicated that only 50% of the smallholder sunflower farmers are selling sunflower in form of seeds and 25% of the farmers selling sunflower inform of cooking oils and 25% of the respondents are selling both seeds and cooking oil (Figure 21). This implies that Most sunflower smallholder farmers do not add value to the product. Since more farmers are selling fresh seeds and some of them are processing into cooking oil. And it is known that processing is a part of value addition and value-added product adds a percentage of increased financial value to the product and has the effect of improving the incomes of the local farmers. It allows the farmer to focus on the consumer while producing and through meeting expectations, it can create a loyal market around the product and also value-added product increased bargaining power.

Figure 21: A Form of selling sunflower



Source: Field survey 2019)

4.5.1 Summary of the findings on market accessibility contribution to the productivity and production potential of sunflower.

Market accessibility contribution assessment was done through the field survey. Sunflower farmers were asked different questions in order to answer the research sub-question. As a researcher, these are the key issues that were grasped during the field research.

- Inaccessibility to sunflower farms due to poor infrastructure such as road, a mobile communication network.
- Absence of a producer's organisation.
- Lack of value addition skills. Example processing, packaging and labelling.
- Smallholder sunflower farmers access price information from the middlemen and traders which is normally low.
- Price of the sunflower cooking oils per litre is higher than the price of sunflower oilseed per kilo.
- Smallholder sunflower farms are allocated far distance from their residential area.
- Farmers are not Sell their sunflower oilseed at a premium price since it is not applicable neither oilseed nor cooking oil.
- Lack of sunflower producer's organisation in most of the villages in Kalambo district.
- Since the majority of farmers sell sunflower in the form of oilseed rather than cooking oil, this shows value addition skills are not clearly known amongst the smallholder farmers on processing aspect.

4.6 Constraints and challenges facing smallholder sunflower farmers in Kalambo District

4.6.1 Results from the survey with smallholder sunflower farmers.

- **Type of sunflower planting material used by farmers.**

The study indicated that 90% of the respondents are using farm saved seeds, and only 7.5% of the respondents are using improved seeds which has more production (Table 17). Also, only 1% of the total interviewed respondents use both improved and farm saved seeds.

Table 17: Type of sunflower seed used by smallholder farmers.

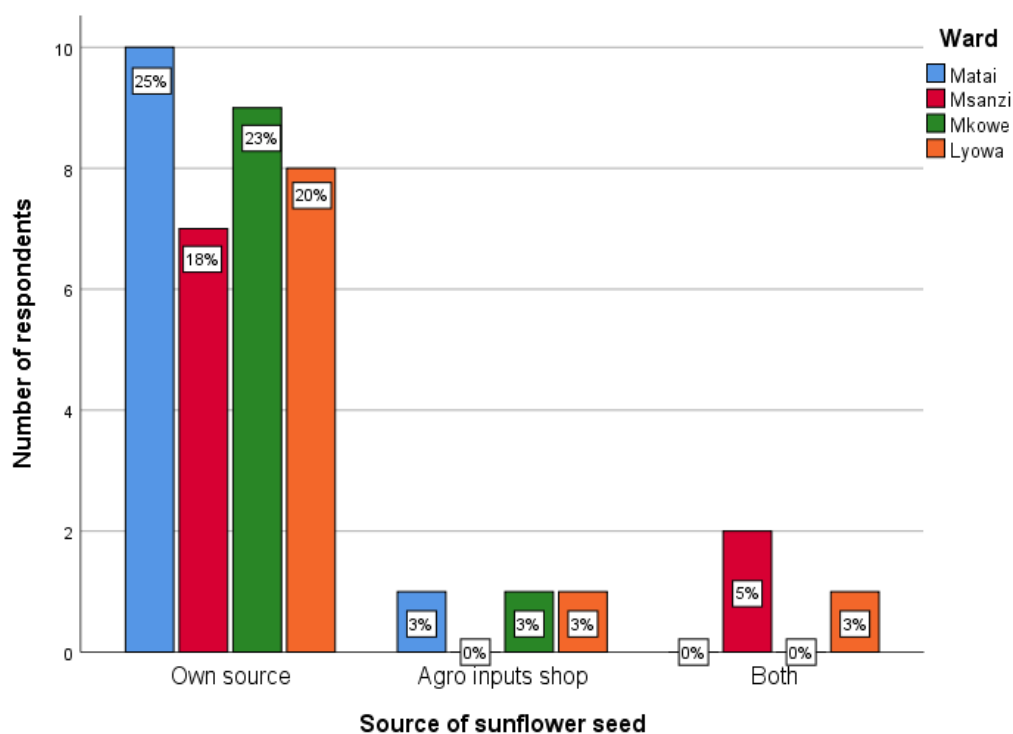
Variables	Frequency	Percent	Valid Percent	Cumulative Percent
Valid				
Improved sunflower seed	3	7.5	7.5	7.5
Tradition sunflower seed	36	90	90	97.5
Both	1	2.5	2.5	100
Total	40	100	100	

Source: Field survey data, 2019

- **Source of sunflower planting material. (seeds)**

During the field study, it showed that 86% of respondents use their sunflower planting material from their own source (farm saved seeds) of the previous harvest, 9% of smallholder farmers bought sunflower seed from the agro inputs shops, 8% percentage of the smallholder farmers use both sources own seed source and agro input shop (Figure 22).

Figure 22: Source of sunflower planting material

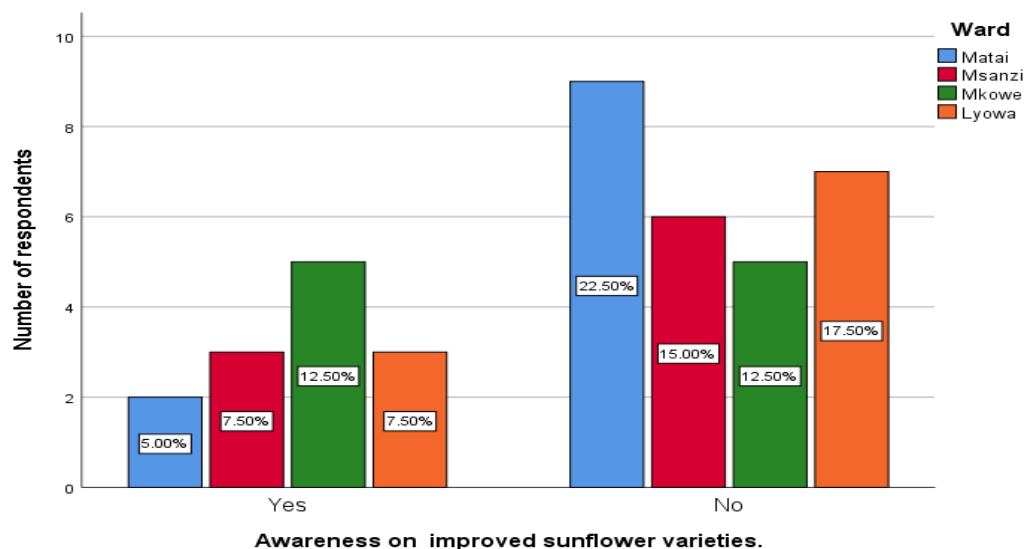


source: Field survey data, 2019

- **Lack of awareness on the use of improved sunflower seed.**

The study indicated that 67.5% of the smallholder sunflower farmer is not aware of the use of improved sunflower while 32.5% of the smallholder sunflower farmers are aware of the use of improved sunflower seeds(Figure 23).

Figure 23: Awareness of the use of improved sunflower seed

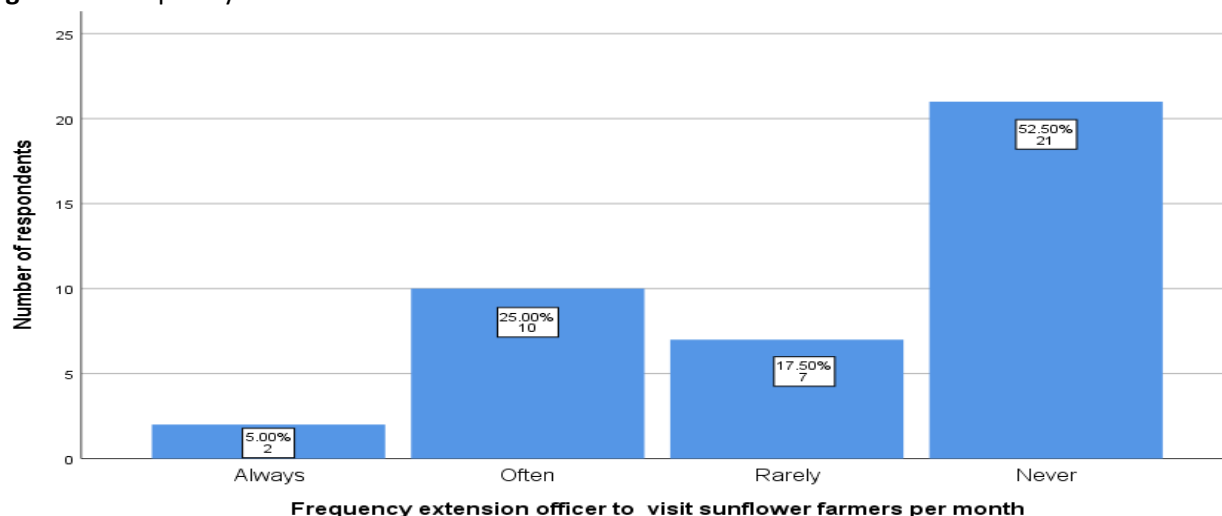


Source: Field survey data, 2019

- **Frequency of extension officer to visit smallholder sunflower farmers.**

The results indicated that out of 40 respondents interviewed, 52.5% of the respondents have never been visited by extension officers, 10% of the respondents are visited often by agricultural extension officer, 7% of the smallholder sunflower farmers are visited rarely, 5% of the smallholder farmers are always visited by agricultural extension. This implies that however most of villages extension officers are available, but they are not playing their role and responsibilities to visit and help farmers to solve different farm problem and challenges. Frequency of extension officers to provide extension services to smallholder sunflower farmers is a major constraint that affects the productivity and production of sunflower oilseeds.

Figure 24: Frequency of extension officer to visit smallholder sunflower farmers

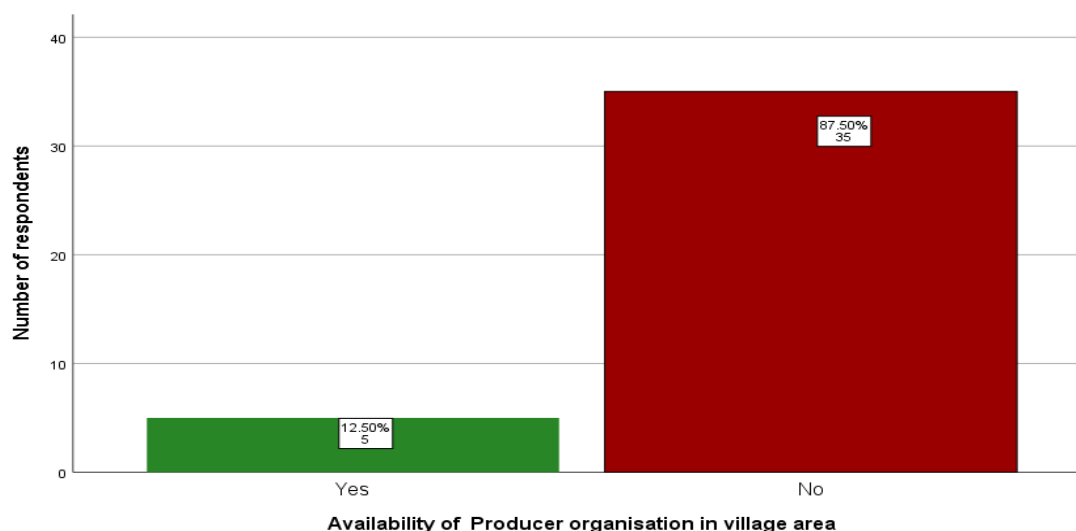


Source: Field survey data, 2019

- **Farmers producers organisation**

The study showed that 87.5% of the sunflower smallholder farmers stated that in their village there is no any producers groups in their village area. Also, 12.50% of the respondents stated in the area of their village there is the availability of a producer group in the village area (Figure 25).

Figure 25: Availability of producers organisation

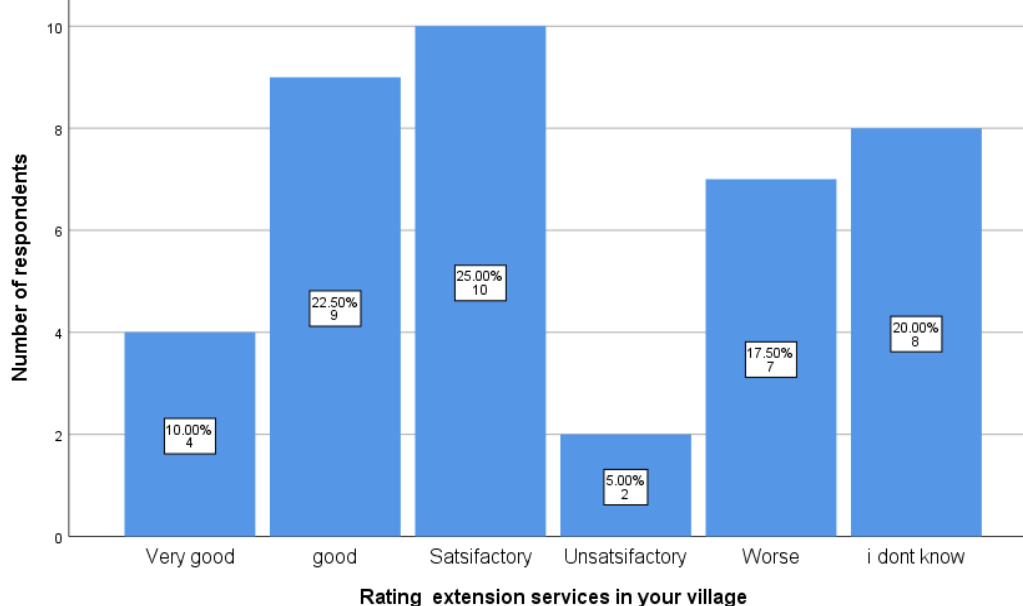


Source: Field survey data, 2019

- **Rating of agriculture extension services**

The study indicated that 10% of the respondents are satisfied with the extension service, 22.50% of respondents said the agriculture extensions service is good, 25% of the respondents are getting satisfactory with extension service, 17.50% responded that the agriculture extension is worse, and 20.00% of the respondents are not aware and the rest they don't know (not aware) about agriculture extension services.

Figure 26: Rating of Agriculture extension services

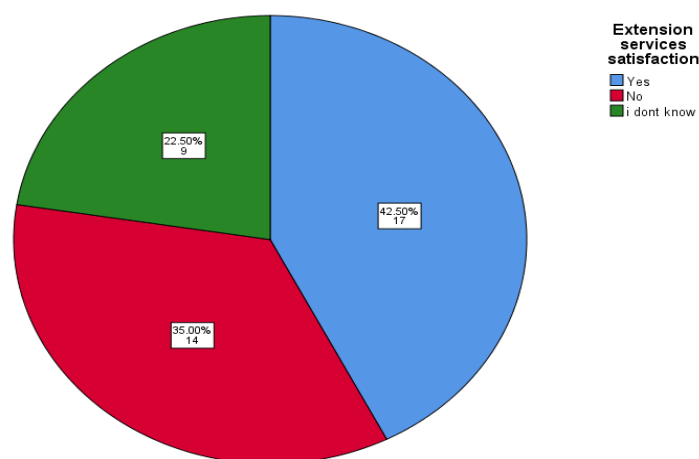


Source: Field survey data, 2019

- **Agricultural Extension service satisfaction**

The field survey study indicated that only 17 (42.50%) are satisfied with agriculture extension service out of the 40 respondents interviewed. About 35% of the respondents are not satisfied with the agricultural extension service and the rest are not getting satisfied with agriculture extension (Figure 27). This implies that despite agriculture extension officers are available to some villages, still difficult to smallholder sunflower farmers to access extension services.

Figure 27: Agriculture extension service Satisfaction

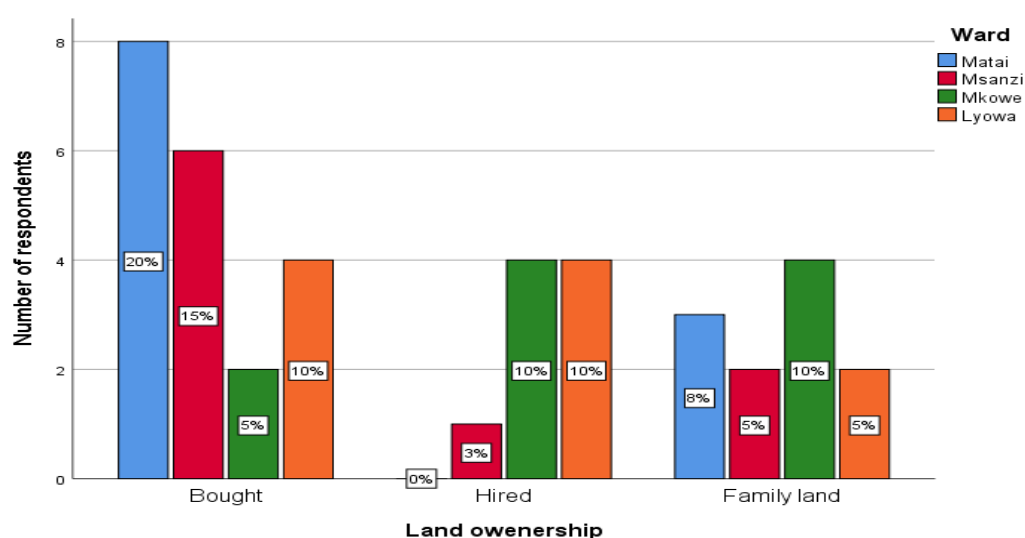


Source: Field survey data, 2019

- **Land ownership**

The findings of the of this study revealed that the majority of smallholder sunflower farmers bought land(50%), own hired land (23%), and the rest smallholder sunflower farmers own family land (28). As shown in the figure 12 below the results shows In Matai (20% bought land, 0% hired,8% family land), Msanzi (15% bought land,3%hired lands,5% family land), Mkowe (5% bought,10% hired land,10% family land), Lyowa (10% bought land, 10% hired land,10 family land).

Figure 28: Land ownership



Source: Field survey data, 2019

4.6.2 Results from Focus Group Discussion

The group discussion conducted in a very interactive way. The discussion contained women and men. Focus group discussion was done in Msanzi Ward Executive Office where the main agenda was to discuss the main constraints facing smallholder sunflower farmers. The session took two hours to accomplish the task. The difference limitations were pointed out by farmers.

- Use of farm saved planting material: Farmers using local traditional sunflower seed of the previous season as planting material. The reason is local seeds are easily available in their local village area, the price of tradition seeds is very cheap. The price of local tradition seed 1000Tshs/1kgs in their community area that leads to getting low productivity and production.
- Untimely availability of improved sunflower planting material: Farmers stated that despite the small amount improved planting material supplied in the district, but still during the season are not available in agro inputs shops.
- The low adoption rate of smallholder sunflower farmers to form and join into farmers groups organisation.
- Poor good agriculture practices: Through a discussion, it has been discovered that most of the farmers are following the GAPs procedures. They normally doing untimely planting, untimely weeding, also they don't use fertilizer and pesticides on their sunflower farms.
- Lack of awareness on the use of pesticides and fertilizer on the sunflower crop. Most of the farmers are not applied fertilizer and pesticides on the sunflower field in sense of believing that it has the ability to fertilize by itself, therefore the use of fertilizer on sunflower field is a wastage of money.
- The wrong perception about sunflower crop among the smallholder sunflower farmers: SHFs on sunflower stated that sunflower crop depletes more soil nutrient than any other crop like beans and maize.
- Presence of pest and diseases; A certain species of caterpillar and cutworms during the flowering stage plant affected especially the head part. Also, birds are sucking the tender oilseed during the milking stage of the sunflower.
- Low prices of sunflower seeds.
- Lack of collateral to comply with bank criteria.
- Unavailability of producers organisation groups in their villages.
- Lack of GAP standards.

4.6.3 Results from the Interview

- **Input supplier**

The trend of farmers to use improved certified sunflower seeds and fertilizer: According to Input supplier, Mr Paulo Wilson Kayange stated that improved varieties of sunflower are 8000Tsh/Kg (Kenya Fedha varieties) and DAP fertilizer for 72000Tsh/50kg. Therefore 60 % of smallholders farmers are not using improved varieties seed because the price of imported sunflower seed is expensive compared to the income of the smallholder farmers. Smallholder sunflower farmers prefer traditional seeds because of low price and easily available for them. Furthermore, he said 40% of smallholder farmers use improved seed, they are aware of improved seed but the distribution of seed and fertiliser still insufficient. For example, last season he ordered two tons(2 tons) of improved seeds from the seed company, but he got only 0.35Tons (350kg) which was not enough to farmers. Due to that scenario, it shows that the demand for sunflower seeds was higher than the supply that might lead farmers to use tradition seeds due to the unavailability and insufficient of the improved seed in time.

Challenge and constraints: The main challenges facing sunflower farmers are; the wrong perception of the use of improved seeds and fertilizer on the sunflower farm. Some farmers believe that no need for fertilizer application on sunflower crop because the crop is fertilizing by itself. Therefore, the use of fertilizer is wastage of money. Unavailability of agro-inputs shops among the villages in the Kalambo District, long-

distance travel more than 100kms from their villages to Matai centre which headquarters of the district in order to access improved seed and fertilizer.

- lower supply capability of sunflower improved seed from the seed supplier (Research centres).
- Low financial bases of the agents distributing the seed and fertilizer.
- Delay in delivering seeds and fertilizer from the supplier to the village area due to the poor condition of infrastructure. Example last agriculture season of 2018/2019 most of the farmers use traditional seeds because the sunflower seed and fertilizer delivered late and at the insufficient amount.
- Due to the delay of Agro inputs to farmers, the trust and good relationship between himself as an input supplier and customer may loose and sometimes misunderstandings happen.
- The low production capacity of sunflower seed producers.
- He stated most farmers ignored GAPs practices such as timely weeding, timely planting, time manure application, time pest and disease control. Therefore, it is very difficult to achieve good production.

- **Interview with Research Institution**

Contribution of research institution to sunflower subsector: During the interview, A researcher from Ilonga Agriculture Research Institute Mr Ally Mbwando was interviewed about the contribution of a research institution to Sunflower subsector. He responded that Research institute (especially Ilonga station as a mandated station for sunflower research), there is a large contribution of about more than 70% because the most used and preferable seed variety of sunflower by farmers throughout Tanzania is coming from Ilonga. Furthermore, he stated Sunflower is like an orphan crop since most of the seed companies didn't show an interest to invest on it except for recent years after government started to promote it as a strategic crop to the national economy. Also, another research officer from Uyole Research Institute Miss Agnes Nduguru stated that as the research institution their main role is to generate and Disseminated sunflower technologies both varietal and non-varietal such as Good Agricultural Practices(GAPs), Good Post Harvest Handling(GPHH), Entrepreneurship on Farming as a business.

The trend of farmers to use Improved sunflower seeds: According to a researcher from ARI Ilonga Mr Ally Mbwando he stated according to the seed orders they are receiving from smallholder farmers for the demand for improved and quality seed from our station, it shows that there is an increase of use of improved seed by farmers though he couldn't tell the exact figure of the amount of seed sold.

Sunflower varieties released: Only one variety of sunflower released by Ilonga and they do not have any other variety expected to be released soon because of many challenging circumstances. The name of the released variety is called Record and it's the only variety of sunflower which is performing better in Tanzania for many years.

Challenges and constraints: A researcher from ARI Ilonga stated that Lack of proper and enough support to research institutes which in turn affect the rest components of the value chain in sunflower. If no new varieties and updated technologies released to challenge changing the environment and consumer demand by the research institute, then the all value chain gets affected. Furthermore, another researcher from Uyole Institute Ms Agnes Ndunguru mentioned that Seed availability and accessibility, Poor production technique(limited GAP), Sunflower seed loose viability fast due to poor storage facilities, Limited number of sunflower varieties and Pest and disease are the most constraints and challenge that affect the productivity and production of sunflower seed among the smallholder sunflower farmers in southern highland region especially in Kalambo -Rukwa region.

- **Interview with District Commissioner.**

According to Kalambo District commissioner, Julieth Binyura stated that the major challenges and constraints facing Kalambo farmers are poor timing period of planting sunflower. Most of the smallholder sunflower farmers starting growing sunflower during late season. For example, last season

the production of sunflower was not good due to unpredictable weather, unavailability of improved seeds in the Kalambo community area during the agricultural season, High price of fertilizer, High price of sunflower Seed such as Hysun 33 was 35000Tsh/kg.

- **Interview with Cooperative Officer**

The trend of cooperative society in Kalambo district council: The cooperative officer interviewed was Mr Wallace Kiama who has been dealing with cooperative societies and producers organisation for the past 35 years in different regions. He said that Kalambo has a number of cooperative societies and farmers group; including 7 Cooperative Union (Muzia AMCOS and Kanyeke AMCOS, Mkusa AMCOS, Mkali AMCOS, Matai AMCOS, Nachiambo AMCOS, Mpulo AMCOS). There are 18 Savings and Credit Cooperative Societies (SACCOs). He said according to the Tanzania Cooperative act of 2002, it stated that cooperatives are very important for the development of many smallholder farmers in Tanzania. However, many successes and failures have been seen in various cooperatives. Kalambo district has a total of 25 cooperatives union, but only 7 cooperatives are dealing with Agriculture crops. And also, in Kalambo, there are no any AMCOS which deals with sunflower chain rather than maize crop and beans. Therefore, he insisted that cooperative union are very important since it simply the accessibility of agro-inputs services, increase collective bargain power, being in a cooperative is very easy to get the quality product.

Challenges and constraints: This Cooperative officer stated that the biggest challenge and constraints facing smallholder farmers is low capital, poor infrastructure such road network which brought difficulties to farmers to access different agricultural service, political factors due to high frequencies of policy changes, unstable laws and regulations regarding to cooperative union, desert, high dependency ratio of farmers, lack of knowledge and education among the members of the farmers group, most of farmers lack entrepreneurship skills, lack of economic activities, most of the farmers are concentrate on the production of sunflower in the chain while there is another opportunity in the chain such as processing of sunflower, value addition, retailing activities, low technology of farmland preparation. Most of the farmers are using ox plough during the land preparation which covers a small area of production. Government interference: cooperative officer stated that some of the government leaders make confusion to smallholder farmers. For example, all cooperative officer in Tanzania have been told to educate smallholder farmers about the warehouse receipt system, but some of the government leaders misled farmers to ignore the warehouse system. The poor performance of some cooperatives contributes to low acceptability of new initiatives to form cooperative societies. Lack of professionalism among the cooperative leaders; Most of the cooperative leaders are not professional to a different leadership position in the cooperative union. Lack of trust between the cooperative union and another stakeholder such as financial institution. For example, MUZIA AMCOS collected loan of 300million Tanzania shillings from the NMB bank but failed to repay back the loan to the bank.

- **Interview with Bank Institution**

During the field study, Mr Allen Saro who was interviewed as a bank institution representative. He stated for the past 10 years National Microfinance Bank (NMB) has been continuing to support the agricultural sector by providing loan to farmers. This came after realizing that more than 85% of Tanzanians are involving in agriculture activities. Normally loans are not provided to farmers as an individually, but loans are provided to farmers group, cooperative union and not an individual farmers in order to minimize the risk of loan repayment. Bank provides a loan of Agro inputs for buying fertilizer, pesticides, Overdraft facilities loan for construction of warehouse and working capital loan for purchasing Machines, tractors. In order for the farmers to access loan the following criteria should be complied such as, business proposal plan, at least 3years experience on the particular activity is required, Interest is 13%, Farm size should be more than 20hactares as a Collateral, sale agreement should be clearly shown, active registered account, also cooperative union should not be less than 20 members, farmers should be in a registered group, Cooperative union should have recruited professional staff to minimize risk, such staffs like accountants,

cooperative officer. He further said Last 2 year two cooperative union in Kalambo district had been given a total of 500MillionTshs (MUZIA AMCOS, KANYELE AMCOS). But unfortunately, finally, the returns of the Loan were a problem because some of the leaders from the cooperative had disappeared with some funds. And also, most of the cooperative union deals with purchasing maize grains and sunflower seeds and sell to the National Food Reserve Agency(NFRA).

Challenges and constraints: The most challenge facing smallholder sunflower farmers include; delay of loan repayment within the period, fluctuation of market price of the produce, Lack of trust among the leaders, Misallocation of loan, Weather and climate changes are not guaranteed, failure most of the farmers do not comply with loan criteria, most farmers are doing subsistence farming , Cooperative are not well organised, poor education level among the members of cooperative union,

- **Interview with District Agriculture Irrigation Officer**

Challenge and Constraints: The challenges and constraints that facing sunflower subsector especially department and smallholder farmers were; No allocation budget for sunflower subsector in various activities like the provision of training to farmers, provision of capacity building of extension officer, establishment of demonstration plots and Farmer's field school, most of the farmers are not aware with cooperative union, lack GAPs knowledge. Also, despite high demand for sunflower oil and potentiality of the crop but some farmers still have a poor perception about the crop, they believe that the crop depletes the soil nutrient. Most of the farmers are using unimproved sunflower seeds and are not using fertilizer on sunflower production. Others are, poor technology use among the smallholder farmers and processors, lack of entrepreneurship skills, lack of market information, Unstable market price of the farmers produce, farmers are voiceless on an arrangement of the product price, price is arrangement dominated by traders and middlemen. Lack of working facilities such as motorcycles, a small number of extension officer in the district, a small budget for an agricultural operation. Shortage of extension staffs at the ward and village level. Out of 103 villages, there is a deficit of 65 extension staffs.

- **Interview with sunflower seed processor**

During this session, Erasto Swaye stated that most some of the farmers extracting sunflower seed into cooking oil without refining because of they more cooking oil per one bag of sunflower seeds. Example 1bag of sunflower seed (60kg) giving 20-24 litres of cooking oil and the price of one litre between is between 3000-3500Tshs.

Challenges and Constraints: A small processor stated that challenges that are facing processors are the use of poor technology machine which causes inefficiency, low price of milling cost (6000tsh/Bag) and challenges facing farmers are poor hygienic condition, poor understanding about the advanced technology of sunflower seed extraction, lack of entrepreneurship skills among the smallholder farmers, poor refining technology due to of boiling of sunflower oil. 70% of the processors in Kalambo district are small processors, No advanced technology of oil extraction.

- **Interview with Regional Agriculture officer (Oils crops)**

Constraints and Challenge facing Smallholder sunflower farmers: Challenges that have been highlighted are Unavailability of improved certified seeds, high price of improved certified sunflower seed .e.g. Hysun 33 the price is 75000tsh/2kg, Lack of GAP knowledge among the smallholder sunflower farmers, Capital/fund is a problem also, Delay of improved seed during the season made some farmers to use traditional seeds, No tendency of applying fertilizer to sunflower crop, Presence of adulterated Agro inputs such as fertilizer, sunflower seeds, Most of farmers they believe sunflower crop deteriorates the land fertility, Absence of farmers producers groups, Most of the farmers still using local traditional, Pest and disease are the problem such as fungal disease and caterpillars, poor adoption of GAPs Knowledge among

the farmers. Since the sunflower crop is very potential in Kalambo district as a cash crop but some small producers are still considered sunflower crop as an extra crop after maize and beans

- **Interview with District Commissioner.**

District commissioner Ms Julieth Binyuka, she stated that sunflower crop is among the most important cash crop in Kalambo district however this subsector facing a lot of challenges including smallholder farmers themselves. Production of sunflower is very potential in Kalambo district council due to its high local demand for sunflower cooking oil. The local demand for sunflower cooking oil is not yet satisfactory due to the low productivity which led to low production of cooking oil. The following are challenges facing smallholder sunflower farmers and sunflower subsector; unpredictable weather due to high rainfall during the planting season of sunflower crop, the high price of improved planting material and fertilizer, unavailability of agro input service to Kalambo villages, presence of adulterated agro-inputs, low production of sunflower planting material. Furthermore, she stated that most of the farmers in Kalambo district do not tend to use fertilizer and pesticides on sunflower crop, but they use on another crop such as maize, and beans. Also, said since the cooperative union and producer group simplifying to access loan from the bank, agriculture extension services but most of the farmers in Kalambo are not aware with the importance of cooperative unions such as AMCOS and producers organisation. There are very few farmers group but unfortunately, are still unidentified because the group are not registered and identified at the district level. Also, the low production capacity of improved sunflower seed from companies is a problem which led unavailability of improved seed in Kalambo community areas. Also stated that the majority of the small processors are working at their backyard and not oriented to Good Hygienic Practices (GHP).

- **Interview with small processors**

The processor interviewed was a woman, her name was Marry William, she has been doing this business of sunflower processing for the past 10 years. She always bought sunflower seeds from the village area and processing into cooking oil. She said the price of 1 bags of sunflower seed(60kgs) is 60000Tshs and after been processed she get 19-25litres of sunflower cooking oil. She said the most challenges that are facing is the unstable price of the sunflower cooking oil, some customers do not like unrefined cooking oils, use of poor technology of refining sunflower oil, lack of capital, lack of refinery machine for sunflower seed extraction.

- **Interview with a large processor**

The processor interviewed has been doing the processing of oilseed from the past five years. He normally uses a refinery machine to extract cooking oil. He stated that most farmers are agro-processors. They grow sunflower and processing into cooking oil. But the biggest challenges facing smallholder and processors lack fund which constraining farmer in production, lack entrepreneurial and agribusiness skills, GAP knowledge, use of local traditional sunflower seed of their previous season which led them to get a small harvest per their unit area. Also, himself as a processor is facing some challenges as a large processor. One of the challenges he has undergone is shortage of sunflower oilseed, especially offseason. Sometimes the mill stopped because oilseeds are not available.

4.6.4 Summary of findings on the Constraints and challenges facing smallholder sunflower farmers

After speaking with smallholder sunflower farmers during the field survey, conducting Focus group discussion, interviewing key informants during the field research study, the different finding and results were obtained. These are the main key issues were grasped on the challenge and constraints facing smallholder sunflower farmers.

- Most of the farmers using farm-saved seeds as planting material.
- Wrong perception of farmers toward the sunflower crop. Most farmers believe sunflower crop depletes the soil nutrients.
- Lack of GAPs in knowledge and skills.
- Lack of awareness on the use of improved sunflower seeds.

- Poor accessibility of smallholder farmers to extension services.
- Lack of agribusiness skills and entrepreneurial skill.
- The high price of improved sunflower seeds.
- Poor technological use of sunflower oilseeds extraction technology.
- Shortage of extension staffs leading to low extension services to smallholder farmers
- Lack of accountability to some extension officers.
- Adulteration of Agro inputs such as fertilizer, pesticides and planting material.
- Limited access to loan by farmers due to high interest rate (21%) and collateral, short loan repayment period (1year).
- Lack of mutual trust between smallholder sunflower farmers and other stakeholders (agro-dealers).
- Shortage of Working facility such as Motorcycle.
- Poor sunflower farm management especially SHF's who owns hired land.

4.7 Current policies

- **Interview with District Agricultural, Irrigation and Cooperative Officer (DAICO)**

Bylaws and regulations that support sunflower subsector in the district: The head of the agricultural department interviewed Mr Mrango Nicholas, he has been heading the agriculture department since the inauguration date of the Kalambo district as a new district. He stated that at the moment agriculture department of Kalambo district is implementing the agriculture policy of the year 2013. Agricultural policy of 2013 has not pointed out clearly about individually agricultural crops, but it has clarified in general about all agricultural crops. Also, furthermore he said despite sunflower being a cash crop but there is no specific board of crop like another cash crop such as cotton, cashew nuts, coffee, sugarcane.

Budget allocation: District agriculture officer stated that there is no budget allocation specifically sunflower crop. Normally every financial year the budget is allocated for various agricultural operation and activities and not for a specific crop like sunflower only, but the policy stated for all agricultural crops. He stated that the last 10 years Agriculture sector was very active in performing their responsibility because all district in the Tanzania country was funded by USAID through District Agriculture Development Programmes, but the programme phased out. Therefore, the office has left with only own source of fund which is insufficient to run the different agricultural operations.

- **Interview with district Commissioner**

Current policy supporting sunflower subsector: Kalambo district commissioner stated that there is no clearly defined policy specifically for sunflower subsector only, but there is an agricultural policy which states all agricultural crops in general. However, the sunflower crop is among the cash crops in Tanzania after Coffee, Cashew nuts, Cotton, Tea, but it has not yet included in the Tanzanian board of Cash crops

- **Interview with Regional Agriculture Officer.**

Current Policy of sunflower: During the interview with Mr Sapiens Rugeimkamu, he stated that currently there is no clear policy which supports sunflower subsector but there is a policy which supports the all agricultural sector for all crops in general which is National Agriculture Policy 2013. However, since the year 2010 up to 2013, there was an agro input voucher policy that was targeting to boost staple food crop such as maize and rice but not a sunflower. It was done through agro input voucher system where smallholder farmers provided fertilizers inputs for a loan, though it was insufficient since was offered for one acre only.

4.7.1 Summary of findings on current policies of sunflower subsector.

During the field research study, Head of Agriculture Department of Kalambo district, District commissioner and Rukwa region agriculture officer were giving the response about the current policies that support sunflower subsector. After a long discussion, as a researcher, the following key issues were grasped.

- Despite sunflowers potential subsector in Kalambo district. But from information gathered it became apparent there is no clearly defined policy which supports sunflower. However, there is a general National agriculture policy for the year 2013 which support the agricultural all crops including sunflower. Also, after going into detail on looking Agriculture National Agriculture policy of 2013, it was realised that the text contents of the policy were too general explained.
- There was no budget allocation for sunflower since the past 3 years. Budget is allocated only for Maize and beans.

4.8 Measures to improve productivity and production sunflower oilseeds in Kalambo districts

- **Views from inputs supplier**

During the interview, input supplier suggested that the following should be done in order to improve the productivity and production of sunflower seed among the sunflower smallholders farmers: The capacity of sunflower seed production should be improved among the seed producers, Agriculture education especially GAPs knowledge should be provided regularly to farmers, Agro inputs especially seeds and fertilizer should be available earlier during agriculture pre-season of sunflower. This will help farmers in order to buy Agro inputs earlier before the start of the season. Agro inputs should be plenty available throughout the season.

- **Views from seed processors**

Continuous regular training should be provided to farmers about the potentiality of the sunflower crop, Mobilization of farmers to establish a cooperative union that will enable them to access a loan, Agro inputs services should be provided up to the village level. To improve interrelationship with other agriculture stakeholders to help farmers such as GAFCO, SNV, MIICO, Agro inputs price should be affordable such as that of improved sunflower seed and, fertilizer. Despite the high cost of Hysun 33 as improved seed, but it should be promoted since it has shown good performance in Rukwa regional, therefore it should more produced and easily available to all Kalambo communities.

- **Views from District Agriculture, Irrigation and Cooperative Officer (DAICO)**

Mr Mrango Nicholas suggested that in order to mitigate the challenges and constraints facing smallholder sunflower farmers the following measures should be done: Enough budget should be allocated to ensure that it covers all activities regarding sunflower, training to smallholders should be given regularly to farmers about the potentiality of the sunflower crop. Extension officers should be recruited in order to serve other villages, farmers should be trained about entrepreneurship skills, the district council should establish the system of public advertisement about the price different crops through media such radio and Newspaper. Since the Sunflower crop has been given priority as a cashew crop, the government should make a strong policy that will support sunflower subsector such agro input voucher policy that will enhance farmers to access agro input loan and paying back after harvesting. Smallholder sunflower farmers should use an improved certified seed such as Hysun 33 that has shown good performance in Kalambo district council. However, the price is very 1kg/35000Tsh.

- **Views from a financial institution**

According to NMB representative, he suggested that in order to assist smallholder sunflower farmers to improve productivity and production, education on the agribusiness farming should be provided regularly, extension services including on GAPs knowledge should be provided to ensure good production of the sunflower. Smallholder farmers should be taught about entrepreneurship skills regularly, Government should return the agro-inputs voucher system in order to ensure the availability of agro inputs to farmers.

- **Views from a cooperative officer**

The cooperative officer stated that in order to improve productivity and production of sunflower o sunflower seed among the smallholder's farmers through the cooperative unions the following should be taken into consideration: Creation of a conducive environment in order to help smallholder farmers. e.g. provision of agro-inputs subsidies, Registration should be done to the cooperative union which have good capability in terms of good capital, skills, professional, A loan should be easily accessible to farmers, Regular

training and education about marketing skills should be provided among the smallholder sunflower farmers, Entrepreneurship skills should be provided to smallholder farmers, Improvement of infrastructure such as warehouse buildings, the road should be well improved in Kalambo district.

- **Views from District commissioner**

However, the production of sunflower crop is very potential in Kalambo district, the following measures should be taken in order to improve the productivity and production which will increase the bargaining power and value of their sunflower production in a domestic and global market. The research should be done by the Agriculture research institution on the sunflower varieties which tolerate the waterlogged condition. Also, the agro inputs shops should be available at the village level, therefore the seed companies would be supposed to supply up to at the village area. Due to the presence of agro input adulteration by some of the agro inputs company, inspection should be done regularly by Mandated institutions (TOSCI and TFRA). Since the available sunflower oil in Kalambo district is not refined, it would be a good opportunity for business people to do an installation of advanced milling factory at Kalambo district. The processor and farmers should be taught about the entrepreneurial skills on the value addition skills in order to improve the packaging and labelling of the sunflower oils. Kalambo district council together with other agricultural stakeholders such as SNV, Britain, GAFCO should focus on strengthening farmer's capacity to negotiate by capacitating them to form an organized group that will increase the collective bargaining power of their product.

4.8.1 Summary of findings on the measures to improve productivity and production sunflower oilseeds in Kalambo districts

Based on an interview with District Commissioner, Cooperative officer, Financial Institution representative, DAICO, Seed processor and Input supplier. The following were grasped as measures to improve the productivity and production of sunflower.

- GAP standards and skills should be provided smallholder farmers regularly.
- Improved sunflower seed should be available in the right time during the right growing season.
- Sensitization and harmonisation to SHFs to formulate Producers organisation.
- Awareness creation on the use of improved sunflower seed, use of fertilizer and pesticides on sunflower farm.
- Farmers should consider the sunflower crop as a cash crop and not as an extra crop.
- Due to the shortage of extension staffs, the government should recruit more extension staffs in order to improve the extension services to farmers.
- Agribusiness and entrepreneurship skills should be provided to smallholder sunflower farmers.
- Farmers should be linked with other stakeholders such as NGO, Agro dealers in order to get access to extension services.
- Market information such as the price of sunflower oilseed should be provided to farmers.
- Farmers Should be taught Value additional skills such as processing, packaging and labelling.
- Market infrastructure should be well improved.

5.1 Discussion

This chapter presents discussions of based on the results obtained from the data collection on the field survey and interviews in Kalambo district. Moreover, it relates and compares the different situation on the basis of related literature reviewed in the previous chapter. Researcher own experience is also used to analyse the findings.

Coordination among the stakeholders: The study shows that the sunflower sector is not new at Kalambo district council because already stakeholders are performing various roles to boost sunflower subsector activities, but their roles are not clearly stated as indicated in Figure 7. There are overlapping functions and inefficiency in carrying out sunflower production activities. During the stakeholder meeting, the research findings revealed that limited coordination amongst stakeholders has contributed to slow progression in the sunflower subsector developments. It is known that coordination among the stakeholder gives helpful to align efforts and make sure all stakeholder benefited from good practices and also it helps stakeholder to share challenges and successes in the value chain.

Also, research findings revealed that there is no backward and forward linkage from each segment in the sunflower value chain. Similarly, as noted by (Kombe, et al., 2017), reported that some of the most basic backward linkages, which create value addition in sunflower, include the application of modern mechanization, improved seeds, fertilizers, pesticides and herbicides. Also, access to credit enables farmers to produce and supply enough sunflower products.

Good agriculture practices standards: GAPs have an impact on productivity and production of sunflower oilseed. Field survey results of the study showed 60% of Smallholder farmers are not aware of GAPs standards and 40% are aware of GAP standards (Figure 12). However, it was noticed that the majority of smallholder sunflower farmers have inadequate GAP standards. Though it is known GAPs enhance sustainable land use and water use, capacity building, for better crop healthy.

Producer's organisation (POs): During the study, the results revealed that 87.5% of the respondents reported the absence of farmers group into their villages, also 12.5% responded the presence of producer organisation in their village area (Figure 25). It is known that, once smallholder sunflower farmers are well organised together, enhance the collective bargaining power of their product. Similarly stated by (Michaleka, et al., 2018) that POs can help farmers to improve their productivity and profitability through strengthening their bargaining position in the supply chain, by better responding to changing consumer preferences (environment, food quality) or by reducing their transaction costs of input and output market access. Also, farmers groups or cooperatives union is the example of vertical integration. Due to associating in producers' groups, farmers are to obtain advantages in the form of production and transaction costs reduction and to become active participants on the market (Sikoraa, et al., 2015) as he quoted from (Chlebick, 2011; Koftun, 2014;).

Technology innovation: The study shows that lower capacity of sunflower seed production, the Long distance between the research institute and Farmers, lack of fund and working resources, lack of technological innovation has been a challenge the agriculture research institute for sunflower (ARI Ilonga and Uyole). It has been reported by (Ghose, 2014) which revealed that technological innovation has a key role to play in increasing agricultural production and strengthening food security, agricultural research and development) sector have failed to garner sufficient consideration till now.

Efficient use of agriculture Inputs: Also, a research study revealed that agro inputs dealers are the key to increasing sunflower productivity. Most of the sunflower seed companies facing the problem such as lower supplying capacity of agro inputs like improved sunflower seeds, fertilizers and pesticides. This is because Agricultural inputs definitely have a huge potential to scale-up and unlock sunflower agricultural

productivity. Based on the field survey results (Figure 13) shows 77.5% of the respondents are not using the agro inputs and 22.5% are using agro inputs (Chris, 2014).

Market information.: It has been seen that 100% of smallholder farmers where interviewed responded that they get the price information of their produce from the middlemen and traders (Table13). According to (KIT & IIRR, 2008) It is a challenge situation for smallholder farmers to obtain reliable information on the supply, demand and price and any other relevant information. Information on the price becomes essential to smallholder farmers when they can use it.

Availability and accessibility of extension services: Lack of enough extension services can lead to poor agronomic practices hence productivity and production can be affected. During the study, it has been revealed that 65% of SHF's not access to extension service and 35% get access to service. Also 70% of respondents declared that no availability of extension officer in their villages and 30% of the respondents stated that extension officers are available in the village(Figure15). However, most of the extension workers are not accountable in their duties accordingly. Extension agent especially Government extension officers have been ill-informed about providing the necessary training and assistance to SHF's that can help boost their oilseed productivity and production. Also, similar reported by (Semercis & Kaya, 2014) that Poor accessibility and unavailability of extension services has the negative impact to productivity and production to sunflower oilseed , also similar stated by (Lee, 2017) in Mbale Uganda that extension services have a positive contribution to sunflower farmer's productivity and hence increase production.

Unaffordability of getting credit/loan: Loans are very important in sunflower farmers because it has power on improving the farming, especially on improving the quality by buying the inputs and tools to make the sunflower farming to be easier and yield more product and hence increase the income. The findings show that most of smallholder sunflower farmers don't have access to loans because they lack collateral. Also, some farmers said the loan's interest is high and repayment back period of the loan is very short. Similarly supported by (Misaki , et al., 2016) , shortage of farming inputs, transport infrastructure, access to credit, and interest rate of financial institutions are the problem facing SHFs.

Market Infrastructure such as road, electricity, telecommunication: The findings of the study indicated that 75% of the smallholder sunflower farmers access to electricity and 25% of SHF's have no access to electricity (Figure17). road infrastructure has an impact on productivity and production of sunflower since it simplifies communication between SHs and another stakeholder, simplifying access to extension services, access to agro inputs. Similarly evidenced by (Kydd & Dorward, 2004) most of the rural area in developing countries, by virtue of the reality often exhibit poor telecommunication hence affect the market of agro input becoming thin and also flow of marketing information became thin. Also revealed by (Burwell, 1987) that growing importance of electricity in recent years derives in large part from its use for operating sunflower milling machine, delivering irrigation water, for producing agricultural chemicals, and for raising livestock. Agricultural practice and technology have moved from an agricultural system dependent on electricity. Since Burwell,1987 stated the use of electricity for agricultural production has grown to 54 billion kWh annually equalling 22% of the primary energy used for agricultural production.

Pest and disease control: During the research, study results indicated that pest and disease has an impact on the productivity and production of sunflower oilseed. The results during the focus group discussion indicate that most smallholder farmers do not apply pesticides on the sunflower farm. Also similarly reported by (Siddique, et al., 2001) pest attack has negative affects the yield of sunflower because of decreases the yield per unit area.

Price of agriculture inputs: Finding during the FGD and interview indicates that improved sunflower seed such as Hysun 33 which its performance has been well proofed at Kalambo District area. The price of the hysun varieties is 35000Tsh/Kg. One acre of sunflower requires 2kgs of Hysun seeds. During the discussion, some of the farmers have been used hysun seed during the last season of sunflower production. Furthermore, the price of fertilizers such as Diammonium Phosphate(DAP), Nitrogen Phosphate

Potassium(NPK), Sulphate Ammonium(SA) is 80000Tshs/Bag. Price of agro inputs has an impact on sunflower productivity and production.

Value addition skills such as processing packaging and labelling, sorting: Most sunflower seed processor sells the oil like a commodity in unidentifiable containers without proper labelling, also most of the farmers do sorting improper. Impurities and other unrequired kinds of stuff in oilseed have been seen during the research study after visited one of the processing millers. Therefore, it is a challenge among the most agro processor. There was also hardly any market segmentation, promotion or advertising effort. It is imperative to notice that most oil mills need to develop a marketing concept for increasing their sales. Also Based on results it is revealed that 50% of the smallholder sunflower farmers interviewed sells sunflower in form of oilseeds and 25% sell sunflower in form of oils, and 25% sell in form of both seeds and oils (Figure 21).

Adoption rate on use improved sunflower seed: The results indicate 67.5% of smallholder sunflower farmers are not aware of use improved sunflower seeds,32.5% are aware of the use of sunflower improved seeds (Figure 23). Most of the smallholder sunflower farmers are using the local tradition seeds due to unavailability improved sunflower seed in their community .area and other farmers said improved varieties are very expensive and the rest are not aware with the difference between the improved seed and traditional seeds. It is known that the use of improved varieties has a positive impact on sunflower production. Also similarly stated by (Anandajayasekeram, et al., 2007) that many communal areas of farmers, adoption of improved varieties and better management practices is low.

Perception of smallholder sunflower farmers toward the Sunflower crop: Good perception toward the crops has an impact in productivity and production of sunflower. The findings from this research indicated most of the farmers have the wrong perception of sunflower crops because they believe sunflower crop depletes soil nutrient as a result cause soil infertility. The majority of the smallholder farmers don't have a tendency of using fertilizer and pesticide because they are believing that sunflower has the ability to provide nutrient by itself. On this case, it has a connection with results revealed on a percentage of smallholders sunflower farmers who are applying fertilizer and pesticides lower(22.5%) than farmers who are using not fertilizer and pesticides(77.5) (Figure 13).

Government Policy: Findings revealed that for many years sunflower has been treated as an orphan crop till recent years when the government started to promote it as a substitute crop for vegetable oil production so as to reduce the cost of importing vegetable oil. Good government policy has a big impact on the sunflower productivity and production, this finding evidenced by (Konyali, 2017) that sunflower oilseed should be supported by the government with premium applications such as input subsidies and tariff quota applications in order to boost the subsector. But there is no clearly defined policy specifically to support a subsector. However, there is Agriculture Sector Development Programme phase (ASDP II) policy that has been initiated and developed as a part of implementation agricultural activities, also "Kilimo Kwanza" (Agriculture first)2009, aimed at commercialising agriculture and improving cultivation methods of smallholders farmers to supplement agribusiness and ensure self-sufficiency in food supply. SAGCOT (2010), a Public Private Partnership to put "Kilimo kwanza" (Agriculture First) into action and catalyses responsible private sector investment in Tanzania southern region by promoting clusters of the agricultural farming services business.

Market access: There is limited market knowledge provided to the local farmers and producers interviewed, most of it travelling by ear and Mouth through middlemen. No official channels conducting market information have been found during this study. This is an issue that has been voiced both by farmers and processors. For farmers, this is especially an issue when selling the sunflower seeds as most informants claimed that the processors, traders and middlemen are the ones who set the price. Since the farmers in the study area are not coordinated that's why is not easy access to market information which lowers their bargaining position. As most of the sunflower seed and oil is sold locally all actors in the value chain are aware of what the end-product will be and what it will be used for. Regarding market orientation, that is, knowledge on what the end user will want from the product, the farmers interviewed seem to have

knowledge concerning this whereas the producers are to a greater extent in the dark concerning the market orientation of the sunflower cake which in turn causes a lack of market access

Land Policy: During the field, the study revealed that Some of the smallholder sunflower farmers own bought land, other farmers own hired land and other farmers are own family land. Also, it has been discovered that most of the farmers who own hired land are not doing proper agronomic management practices on land since farmland owns for temporarily not permanent, therefore they don't take care to proper management of land, smallholder farmers who own family land have been facing the different land conflict which affects their productivity and production sunflower oilseed. According to the Tanzania Village Land act No 5 of 1999 and 2001, clause 5 stated that land can be owned by Tanzanian citizen only and not a non-Tanzanian citizen. Therefore, the Tanzania national village land act does not give opportunities for Non-Tanzanian to own land. This is constraining factors affecting the production and productivity of the sunflower oilseed since it depresses agriculture investors to invest in the agricultural sector especially in the sunflower industry sector. Also, District Land officer stated that Land conflict in Kalambo communities is the most serious constraining factor among the most of sunflower farmers.

Local Budget: The finding indicates that's Despite the presence constraints affecting the production and productivity of sunflower subsector. Kalambo district continued to prepare a budget in order to facilitate various agriculture operation. However, there recent there is no specific budget to boost sunflower subsector. The budget prepared for the financial year 2019-2020 is inadequate compared to the number of required agricultural activities to be implemented. Also, similarly (Reddy, 2017) stated that there is a need to increase budget allocation to high-value agriculture growth of these sectors such as horticulture crops including sunflower. Furthermore, stated that increase allocation of more budget increases infrastructures, agricultural markets, warehouses with modern technology so that the sector will increase productivity.

Cropping systems : Cropping system is an essential system that has impact in productivity and production of sunflower oilseeds. Based on the results and finding it has revealed that most of the sunflower smallholder farmers do monocropping since they don't mix with any crop together with sunflower on the farm. Some of the SHFs practise mixed cropping. As it has revealed in the field survey results, 65% of the SHF's grow single crop (sunflower), 32.5 % grow sunflower with other 2-3 crops in the same farm, 2.5% sunflower grown together more than three crops (Figure 16). When cropping system is done by following the procedures like species consideration, feeding habit of the crops it increases the use efficiency of nitrogen reduces nitrate leaching from groundwater and also improves soil structure and soil fertility (Nafziger, 2010).

5.2 Reflection as a researcher:

The study gave me a chance to conduct research in my work station. I was very passionate about my research on improving productivity and production of sunflower oilseeds among small scale sunflower farmers: a case study of Kalambo District Council in Tanzania. There were some challenges and added experiences during the research study. I would like to reflect upon the difficulties and limitations faced during the research period and lesson learnt during the research study.

My study journey began with research proposal development, it was not easy to handle the critical feedback and comments from my supervisor. I changed the research topic, problem statement, objectives and research questions severally. This was prompted by a lack of coherence between research questions and problem statement. I finally managed to get the green light that allowed me to travel to Tanzania for data collection.

The research was done in the southern highland region of Rukwa, Kalambo district, Tanzania. The research study built my capacity for innovative ability to carry out independent research, critical thinking, skills in project management, leadership, communication, problem-solving and competence during research. During the pilot testing with my colleagues' staffs in my organisation, I came to realise some of the questions was non-sense questions and some of the questions were needed to be readjusted. Finally, it was done.

During data collection, I made appointments with farmers and key informants before the commencement the exercise of data collection, though it was challenging for me as some of the respondents did not keep the appointment. But as a researcher, I tried to manage the situation by finding a convenient time for them to participate in the research. Statistically, I used random sampling to get smallholder sunflower farmers for the field survey and also used the non-sampling method (purposive sampling) to get the key informants for the interview. I selected my study areas in the district based on the potentiality of sunflower production through purposive sampling. Data was collected through desk study, stakeholder meeting and interviewing key informant and Focus group discussion key informant in order to get data for qualitative analysis. During the FGD, interviewing key informants and stakeholder meeting, the questionnaires were guided by a checklist. Also, a field survey was done to smallholder sunflower farmers by filling a questionnaire for the purpose of getting pre hand information for quantitative analysis of the research study. Furthermore, qualitative data were transcribed by recording and writing in the notebook, quantitative data was processed through SPSS version 25. During analysis of data by using SPSS I got statistic challenge since many of the variables were nominal variable, therefore it was challenged to develop some statistical graph which could be more presentable by using ordinal variable.

Methodologically, in my proposal, one of the tools of data collection was interview where I was interviewing different key informants. But during my field research work, I realised some of the key informants were not included in my research proposal. However, during my data collection, they provided useful and reliable information about the research topic. For example, Regional cooperative officer, Research officer from ARI Ilonga, Mwananzila Milling company, a large processor and District Land officer.

In my research proposal, I had selected Katete ward as one of the study areas due to its potentiality on sunflower oilseeds production. After meeting the departmental agriculture head during entry meeting, he suggested replacing Katete with Mkowe ward which is more potential in sunflower production, thus I changed from Katete to Mkowe.

During FGD only 12 people were invited to participate, but surprisingly other smallholder sunflower farmers who were not invited also came and joined in the discussion. Therefore, Number of participants in FGD increased from twelve in number as per proposal to nineteenth in a number of participants. However, each farmer participated very well on the subject matter. This brought the understanding that smallholder sunflower farmers have many constraints on the production and productivity of sunflower oilseeds.

Based on the research results obtained from the field, I realized that 90% of the results obtained more or less justified the problem statement of the research topic.

Before I travelled for data collection, I expected my employer to take care of my field expenses. However, it was not covered because government transaction system closes at the end of the government financial year. I had to spend my own money in order to incur the field expenses ranging from fuel, fare reimbursement for farmers and stationery. It was not easy to incur those cost and expenses, but I thank God since I discovered exercise was very important for my research development as well as for my country especially the smallholder sunflower farmers in Tanzania. I decided to spend some money sourced from my business account that helped me to meet the research cost and expenses. Finally, it was successfully achieved as required.

Also due to my position in my organization as agriculture officer, some farmers were thinking that I was there to solve their own problem especially like provision of pesticide for coffee crop, collection of other SHFs were thinking that I was a right person to listen to their right village to collect and solve their problems in their village area, this was a little bit challenge during my fieldwork. As a researcher, transparency was a tool to guide me wherever I got any challenge during my field research. Also, some of the respondents were thinking that my fieldwork research study funded by OKP scholarship including cost and expenses to pay respondents. Initially, I was surprised to see some of the extension officers at ward and village level also were not giving me cooperation until they get paid.

My research study was done during the harvesting season of sunflower, beans, maize and other crops in my district. Therefore, it was a little bit challenge to meet with farmers on time since most of them were engaging in harvesting their crops. Therefore, as a researcher, I tried to find the convenient time that did not interfere with their time schedule, I managed to reach every respondent as required.

Also, during my research, smallholder sunflower farmers were unwilling to speak with me with the reason that several different researchers had come to their village to do research and finally they never got feedback on the results. But I explained the research purpose and the impact of the research study was to the benefit of the smallholder sunflower farmers. Moreover, as a researcher, I assured them that the report would be available and shared back to them via Ward Council Meeting and Village Council meeting at respective wards and villages and we will seat together as a team and discuss the main highlighted key issues and the proposed recommendations to see the way forward to plan for implementations.

During my research farmers demanded full seating allowance. In this case, as a researcher, I committed to cover only the cost of transport and some refreshment. Also, I was transparent to explain the reality of my field research studies and finally everyone understood the real situation of the research. Thereafter I got good cooperation from the different respondents. Furthermore, when I arrived at the work station, the head of the department gave me an official assignment that was very difficult to work on it since I had limited time for my research. Therefore, I took the time to express myself finally he understood.

Lastly, the language barrier was also a problem: Some farmers preferred to use Fipa language and other preferred Swahili. I was able to listen and understand their local language but to speak was a bit problematic, nevertheless, the information was sufficient for the research study. All challenges, that I faced during the research study equipped me with confidence and widened the horizon of my thinking in research and academic writing skills. In future, there are certain things I must improve including time management.

6.1 Conclusion

Considering the results and findings and in relation to the objective of the study, that is to identify constraints of production and productivity by smallholder sunflower farmers in order to recommend the possible ways for improving the productivity and production by smallholder sunflower farmers in the Kalambo District Council which will increase the bargaining power and value of their sunflower production in a domestic and global market.

This chapter grants the conclusion about the constraints for improving sunflower oilseed productivity and production among the stakeholder sunflower farmers and current enabling environment on sunflower oilseed subsector.

6.1.1 Challenges and opportunities for improving the sunflower oilseeds productivity and production among the smallholder sunflower farmers in the district.

- Based on the current value chain of sunflower in Kalambo district, it was revealed that farmers sell their sunflower oilseeds through different channels at a different price from each channel. This shows there is no connection link where farmers can be get connected together in order to increase collective bargaining power that will help to sells their oilseeds together at a good price. Also, since the price is different from each channel in the value chain, therefore there is no stable market price of sunflower oilseed in the market. Also, there are key supporters in the chain such as Ministry of trade, Tanzania Bureau of the standard are not actively engaged in the sunflower value chain. Therefore, the chain is poor developed and uncoordinated.
- In the current value chain at the input supplying function, shows some farmers supplying local traditional seeds to the smallholder sunflower farmers seeds. Most farmers buy local seeds because of the cheap price (2000Tsh/Kg) and readily available all the time in their community area. Since it is known that traditional seeds have a negative impact on productivity and production of sunflower oilseed. Therefore, from this study and findings shows there is low adoption rate on the use of improved sunflower oilseed.
- In the current value chain of Kalambo district, it was revealed that middlemen and traders are the controllers of the price of sunflower oilseed. Therefore, more value share is taken by middlemen and traders than smallholder sunflower farmers.
- Various stakeholders are involved in the chain such as input supplier, research institution, sunflower smallholder farmers, processors, NGOs, financial institution. And each of the stakeholders has a role to play sunflower in the value chain. But it has been revealed that most of the stakeholder failed to perform their roles effectively due to the different challenges they have undergone. The big challenge noticed was lack of capital (fund) to most of stakeholders. And it is well known that funds help to develop technology innovations, facilitate different performance of activities among the stakeholder in the chain. Therefore, lack of capital (fund) reduced the performance of the role and function of some stakeholder in different activities. Also lack of professionalism among the stakeholders, lack of trust, poor relationship among the stakeholders reduced performance.
- Despite smallholder sunflower farmers tried to try to engage in different sustainable practices in their sunflower farm in order to increase productivity and production but still, the productivity and production of sunflower still declined. There are main key issues grasped during the field research have been identified; Farmers are using tradition sunflower seeds, poor weeding, there is no application of fertilizer and pesticide on the sunflower crop, Inefficient use of agro inputs, poor accessibility of extension services, poor mixed farming, no crop rotation, poor irrigation system.
- Based on the results and findings, it revealed the main key challenges and constraints facing smallholder sunflower farmers are; poor ideology of some farmers on sunflower crop, Lack of GAP standards, lack of awareness on the use of improved sunflower seed, poor technological use of oilseeds extraction, poor accountability of extension agent especially government extension officer, poor access to loan among the smallholder sunflower farmers due to lack of collateral high

interest rate , short loan repay back period, lack of producers farmers group which reduced collective bargain power among the SHFs.

6.1.2 The current enabling environment on sunflower oilseeds subsector at Kalambo district.

- Despite the efforts, the government try to push the development of the sunflower chain, but the crop still an orphan since there is no clearly defined policy which supports sunflower subsector.
- Market access is an aspect that was looked at during the fieldwork. This is an essential element in the sunflower value chain. During the field, it was revealed that smallholder sunflower farmers of sunflower face challenge to access market. These are the challenges that noticed as the key constraints under market access; poor infrastructure such as road, mobile network communication, lack of producers organisation, lack of value addition skills amongst the SHF's such package, processing, labelling, sorting and refining, lack of market information (price), long distance from farm to residential area.
- Poor coordination among the stakeholders has contributed to slow progression in the sunflower subsector developments in Kalambo district. Therefore, it is essential to understand their influence on the implementation and management of joint activities.

6.2 Recommendation

A number of limitations and challenges in improving production and productivity of sunflower oilseeds among the smallholder sunflower farmers in the selected villages in Kalambo district have been highlighted and discussed in this report. The enabling environment has also been discussed in detailed. If these constraints and challenges are not mitigated, smallholder sunflower farmers will continue to face the constraints hence could contribute more decline of production and productivity of sunflower oilseeds among the smallholder sunflower farmers in Kalambo district council.

6.2.1 Recommendations to Kalambo district council.

- I. **Formation of producer organisation:** Since the research find result shows most of the sunflower farmers are not organised in the farmers' group, I would like to recommend to Kalambo district to coordinate the formation of strong, capable, and cohesive associations or cooperatives that will increase collective bargaining power among the smallholder sunflower farmers. Example good market price of sunflower oilseeds good accessibility to agro-inputs service and training services.
- II. **Creating awareness on the use of improved seed:** Results shows most of the farmers are not aware of the importance of improved sunflower seeds. Therefore, I recommend Kalambo to organise sunflower exhibition day where the different agro input suppliers, smallholder farmers, extension officer will be linked together. Through the farmers exhibition, smallholder farmers will get education and good news about the importance of improved seeds.
- III. **Market information availability:** Since the farmers have no control over the price of sunflower oilseed, I would like to recommend to Kalambo district to make market information especially price of the sunflower oilseeds through media, extension officer, Kalambo business department.
- IV. **Kalambo should build strong relationships with stakeholders along the value chain mainstreaming:** I would like to recommend to Kalambo to build a strong relationship with other stakeholder especially input supplier and other agricultural extension agent. This will help sunflower farmers to access different services such as extension education and services, access to agro input, access to a loan
- V. **Improving extension services:** Since there is a deficit of village extension officers in Kalambo district, and I would recommend to Kalambo district to improve extension service. Agricultural extension programs have positive increase agricultural productivity through helping smallholder sunflower farmers to develop their technical and supervisory skills in sunflower subsector, therefore, the few extension officers who are provided with motorcycles should be able to serve other villages .Also Kalambo district should organise a meeting with agro-dealers in order to provide support to smallholder farmers.

- VI. **Establishing smallholder sunflower farmers exhibition:** This will be very good strategy to link farmers and other stakeholders. Farmers will be able to access different skills and knowledge through the exhibition. The exhibition would involve input suppliers such as seed supplier, fertilizer suppliers and other actors in the chain.
- VII. **Creating a strategic policy:** Due to the potential of the sunflower in Tanzania, it is time for Kalambo district council to come up with strategic support include a good policy for the sunflower as one of the strategies which will motivate even some private sector like seed companies to invest more in sunflower sector. This would be a big step toward the promotion of this crop at the maximum.
- VIII. **Providing value-adding skills, agribusiness skills, entrepreneur skills to sunflower smallholder farmers:** This recommendation will help sunflower farmers to improve the production and productivity skills on processing marketing, sorting, packaging and labelling.
- IX. **Budgetary allocation has an impact on the production and productivity of sunflower oilseeds.** It is time for Kalambo district council to allocate a special budget for sunflower by helping SHFs to secure inputs, technology and agronomic management leading to the development of the sunflower subsector.
- X. **Improving market infrastructure:** Based on the research findings I would recommend to Kalambo district to improve marketing infrastructure such as road, mobile network. This will help to connect farmers and stakeholder together to get access extension services, training agro inputs and market information.
- XI. **Land conflict management:** In order to provide good enabling environment to allow different stakeholders to invest in sunflower subsector, I would to recommend to Kalambo district to find out a solution against land conflicts .

6.2.2 Recommendation to sunflower smallholder farmers.

- I. **Eliminating poor ideology on the sunflower crop:** Since most of the farmers have a wrong perception on sunflower crop since they believe it depletes nutrient from the soils. Therefore, I would recommend considering the sunflower crop as a potential crop.
- II. **Creating awareness on the use of a calibrated weight scale:** Most of the sunflower farmers use tins and bags for weighing their sunflower oilseed before they sell. Therefore, smallholder farmers should have access to a calibrated weigh scale, as a result, the trust between farmers and traders will be guaranteed.
- III. **Keeping records:** I would like to recommend smallholder farmers to keep a record of the cost of production of sunflower. This will help smallholder farmers to predict price changes of inputs and produce from expenditures and sales records kept from previous years.

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Annexes

Annexe 1: Time Schedules for research activities

ACTIVITY	TIME																			
	May				June				July				August				September			
WEEK	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Research Proposal																				
Travel to Tanzania																				
Preparation of the fieldwork.																				
Data Collection																				
Data Analysis																				
Travel to Netherland																				
Thesis writing and Submit																				

Annex 2 :Budget

S/No	Item/Activity Description	Units	Cost/Unit (euros)	Total	Source of Funds
1	Air Fare (Return ticket, AMS/DAR/AMS), Dar es salaam - Rukwa (domestic)	1	1100	1100	Self
2	Research materials (stationeries, Data USB)	1	90	90	Self
3	Communication (telephone) –invitations and appointments	1	60	60	Self
4	Printing and photocopy	150	0.30	45	Self
5	Local Transport (Av. Distance of 110km per day) for 20 days	300lts	1	300	Employer
6	Local fare payment to interviewees	62	2	124	Self
7	Living costs (Meals)	1person	7	343	Self
	Total			2062	

Appendices

Appendix 1: Survey Questionnaire for smallholder sunflower farmers



Survey questionnaire for smallholder sunflower farmers

Date of Interview.....

Region	District	Ward	Village

Questionnaire identification

	Name	Questionnaire Number	Address/Phone
Interviewee			
Interviewer			
Date entry			

Questionnaires identification

Dear, my name is **Gothard Sammy Liampawe**, I am studying at Van hall Larenstein, University of applied science Netherland. Currently am conducting study to determine sunflower production and productivity situation in Kalambo district. You have been selected randomly to participate in the study by discussing truthfully about sunflower production and productivity in your community. In doing so bear in mind that there is no wrong answer so long as what you say is what you believe to be the truth. Your contribution in terms of ideas is vital to inform strategies to improve sunflower subsector in Kalambo District Council.

1. Personal information

1.1 Name of the Household	1.2 Sex 1. Male 2. Female	1.3 Age of respondent 1.<18, 2.18-34, 3.35-54, 4. 55-64, 5=>65)	1.4 Marital Status. 1.Single 2.Married 3.Divorced 4.Widow 5.Others	1.5 the number of household members. 1.<2 2.3-5 3. 6-10	1.6 Number of dependent household members(Below the age of 18years, students, and disabled)	1.7 ability to read and write. 1.Able 2.Unable	1.8. Level of education(years of schooling). 1.Primary school education. 2.secondary education. 3. Diploma education. 4.Degree education. 5.None

2. Sustainability practices (farming systems, technology, Agro inputs, GAP practices)

2.1 land ownership 1.Yes, 2. No (If no skip the next question)	2.2 Type of ownership 1.bought, 2.Hired, 3.Family land	2.3 Land size for Sunflower farm (Acre). 1.below 5 acres, 2. 6-10 acres, 3. above 10acres	2.4 Number of years engaged in sunflower production.	2.5 methods used for farm preparation. 1.Hand hoe. 2.Tractor. 3.Ox plough.	2.6 Number of crops in the farm 1=1crop, 2=2-3 crops 3= >3 crops.

Who is involving in sunflower production? 1.Husband Only 2.Wife Only 3.all household member.	2.7 Are you aware of GAP practices? 1.Yes 2.No (if No skip the next question)	2.8 mention 3 GAP practices that you are practising in a sunflower farm	2.9 Do you use fertilizer and pesticides? 1.Yes 2. No	2.10. Which type of fertilizer/pesticide are you using? 1.Organic 2.Inorganic	2.11 Sunflower production (t/acre) for the last 2 season. 1.<5 2.6-7 3.>8

3. Sunflower seeds availability and accessibility

3.1 Are you aware of Improved and certified sunflower seed? 1.Yes 2.No	3.2 Name the sunflower seed varieties	3.3 Type of seed 1.Improved 2.Traditional	3.4 Why do use your seed choice? 1= Easily available, 2=Cheap cost 3=Others	3.5 Why do you use improved seed?	3.6 Source of sunflower seed. 1.Own source 2.Agro inputs shops 3.Others(specify
3.7 Cost of sunflower seed per kg.....	3.8 Yield t/acre. 1.<0.2t 2.0.3-0.5t 3.0.6t-1t 4.above 1 t	Are you a member of the sunflower producer group? 1.Yes 2.No (If no response the next question)	Which benefits are you getting from your sunflower producer group?	What is the distance from the farm to home? 1.<5km 2.5-10km 2.>10km	

4. Accessibility of Extension service

4.1 Do you have access extension 1.Yes 2.No	4.2 Who offers extension service: 1.Government extension services. 2.NGO. 3.Private company 4.Agriculture cooperative 5.None (Multiple answers apply)	4.3 Do you have government extension officer in your village. 1.Yes 2.No (If No skip the next question)	4.4 frequency of visits for sunflower activities per Months. 1.Always 2.Often 3.Rarely 4.Never	4.5 In general, are you satisfied with extension service 1.Yes 2.No (If no answer the next question) 4.6 Why are you not satisfied with extension services?	4.6 How do rate extension services in your village? 1.Very good 2.good 3.Satisfactory 4.unsatisfactory 5.Worse 6. I don't Know
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5. Market accessibility and infrastructure, value addition)

5.1 In which form are you selling Sunflower: 1.seed 2.Oil	5.2 Price of sunflower seed per kg (Tshs) 1.<300 2.301-500 3.501-700	5.3 Price of sunflower oil/Litre(Tshs) 1.1500-2000 2.>2001-2500. 3.2501-3000 4.3001-4000	5.4 Where do you sell your sunflower oilseeds? 1.direct to the market. 2.Through middlemen 3.processor	5.5 do you sell quality sunflower oilseeds at a higher price? 1.Yes 2.No	5.6 electric availability in your village area 1.yes 2.No	5.7 Availability of mobile communication network 1.yes 2.No
5.8 Do you have any producer's organisation in the village area? 1.yes 2.No (if no skip the next question)	5.9 Are you a member of the producer's organisation ? 1.yes 2.No	5.10 What is the benefit you are getting from a producer organisation? 1/loan 2/training 3/None of all above 4/others	5.11 How far is the sunflower market (km)? 1.<5kms 2.6-10 3.11-20 4.21-30 5. >31	5.12 How do you get a source of market information such as the price of your sunflower seed/oil? 1.District office. 2.Cooperative union 3.media 4.Traders/Middlemen 5. Others specify.....	5.13 What constraints do you encounter in accessing market information of sunflower oilseed? 1/poor communication. 2/poor electricity 3/No stable source of market information 4/others	

6. Constraints and Opportunity

6.1 What do you think are the opportunity for sunflower farmers in this Kalambo community?

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6.2 What do you think are the limitation for sunflower farmers in this Kalambo community?

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6.3 What do you think could be done to improve sunflower productivity and production?

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"Thanks for your cooperation"

Appendix 2: Checklist for a Stakeholder meeting

1. Current sunflower value chain?
2. What are the stakeholders, roles and relationship-(Stakeholder analysis)?
3. What is the missing link in the sunflower value chain?
4. What are the constraints and challenges facing stakeholders?

Appendix 3: Checklist for Focus group discussion

1. What are the main Constraints /challenges facing small holder's farmers in Kalambo District?
2. What could be done to improve production and productivity sunflower oilseeds in Kalambo districts?

Appendix 4: Checklist for District Agriculture Irrigation, and Cooperative Officer.

1. Bylaws and regulations that support sunflower subsector in the district (**DED, DAICO &DC**)
 - Land ownership
2. Budget allocation specifically for sunflower(DED&DAICO)
 - How much Money (Tshs) budgeted for the last 2 years for sunflower subsector activities
 - Activities implemented for the last 2 years budget.
 - Capacity building for Extension officer
 - Agro inputs such as fertilizer and seeds and agrochemicals
 - Establishment of Demonstration plots, farmers field school.
 - Infrastructure improvement like roads access.
3. What are the supports /services that provided to sunflower smallholder farmers?
 - Training Services to SHFs Agriculture inputs such as fertilizers, certified seeds
 - Market accessibility(Linking farmers and Market)
 - Marketing information(price, place, product).
 - What are the main Constraints /challenges facing small holder's farmers in Kalambo District?
4. What are the main Constraints /challenges facing small holder's farmers in Kalambo District?
5. What could be done to improve production and productivity sunflower oilseeds in Kalambo districts
6. Partnership/Collaboration of Kalambo district with other stakeholders

Appendix 5: Checklist for Research Institution

1. What is the trend of smallholders farmers to use improved sunflower seeds?
2. Contributions of research institution to sunflower subsector(farmers)
3. What are the challenges facing sunflower subsector?
4. What do you think about the opportunity in sunflower sub-sector in Kalambo community?
5. What do you think could be done to improve sunflower productivity and production?

Appendix 6: Financial Institution

- what is the trend of SHFs to access loan?
- What are the criteria to access loan for SHFs from the bank?
- What are the challenges do you think most farmers are facing from not access loan?
- What do you think could be done to improve sunflower productivity and production in Kalambo District?

Appendix 7: Checklist for Inputs Supplier

- What type of Agro inputs are you selling?

- What is Price of Agro inputs
- What is the Trend of farmers to buy improved sunflower seeds?
- What are the challenges and constraints are you facing as input supplier?
- What are the opinions/Views/Suggestions to improve sunflower oilseed productivity?

Appendix 8: Checklist for Cooperative Officer

1. What is the trend and status of the Agriculture Cooperative Union (AMCOS)?
2. What are constraints and challenges facing Sunflower smallholder farmers on the aspect of Cooperative union?
3. What could be done in order to improve the production and productivity of sunflower subsector in Kalambo district?

Appendix 9: Checklist for District Commissioner.

1. What are the agriculture policies that support sunflower subsector in Kalambo district?
2. What is Budget allocation specifically for sunflower?
3. What are the supports /services that provided to sunflower smallholder farmers?
4. Constraints and challenges facing smallholder farmers?
5. What could be done in order to improve sunflower oilseeds productivity and production

Appendix 10: Checklist for Land Officer

1. What are the current Land policies that support crop production?
2. What are the challenges facing sunflower small farmers land aspect?
3. What could be done in order to improve production and productivity of sunflower oilseed?

Appendix 11: Checklist for Regional Agriculture Officer

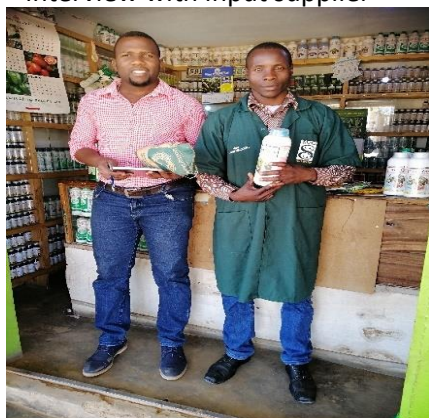
1. What are the agriculture policies that support sunflower subsector in Kalambo district?
2. What is Budget allocation specifically for sunflower?
3. What are the supports /services that provided to sunflower smallholder farmers?
4. Constraints and challenges facing smallholder farmers?
5. What could be done in order to improve sunflower oilseeds productivity and production

Appendix 12: Checklist for Processors

1. What are Constraints and challenges facing processor?
2. What could be done in order to improve sunflower oilseeds productivity and production?

Appendix 13: Photo taken during SHFs

interview with input supplier



Interview with Input supplier
(Kilimo Kwanza Company)-Matai Ward

Appendix 14: Photo taken during an interview with



Interview with SHF's -Msanzi Ward

Appendix 16: Photo was taken during interview with Kalambo District Commissioner



Interview with District Commissioner -Kalambo District

Appendix 15: Photo taken during the interview with SHFs.



Interview with SHF-Matai Ward

Appendix 17: Photo was taken during FGDs



Focus group Discussion-Msanzi Ward meeting Hall.

Appendix 18: Photo was taken during a visit to processors:



Appendix 19: Name of the respondents(Smallholder sunflower farmers from four Wards)

S/N	Name	Sex	Interview date	Ward	Village	Contact
1	Elia Claudio Masoya	Male	4/7/2019	Msanzi	Msanzi Kati	+255765746222
2	Jeminus Vital Sindano	Male	4/7/2019	Msanzi	Msanzi Kati	+255766924351
3	John Kazumba	Male	4/7/2019	Msanzi	Msanzi Kati	+255759562775
4	Jubilata Mwanakatwe	Female	4/7/2019	Msanzi	Msanzi Kati	+255769055858
5	Steven Sinkonde	Male	4/7/2019	Msanzi	Msanzi Kati	+255746101868
6	Chalres Samweli Kilegi	Male	4/7/2019	Msanzi	Msanzi Kati	+255621511917
7	Liberatus Mlowezi Joachimu	Female	4/7/2019	Msanzi	Msanzi Kati	+255746906298
8	Charles Mwanazyungu	Male	4/7/2019	Msanzi	Msanzi Kati	+255752977643
9	Anastazia Lufungilo	Female	4/7/2019	Msanzi	Msanzi Kati	+255759958532
10	Anisia Bilauri	Female	4/7/2019	Msanzi	Msanzi Kati	
11	Patrik Malidadi	Male	4/7/2019	Lyowa	Singiwe	+255754646467
12	Anita Kauzeni	Female		Lyowa	Chalamine	+255768083502
13	Veronica Nzelani	Female	4/07/2019	Lyowa	Singiwe	+255758305830
14	Tito Simuela	Male	4/07/2019	Lyowa	Singiwe	+255764719420
15	Gregory Sikumbili	Male		Lyowa	Chalamine	
16	Lucia Kusongwa	Female	4/7/2019	Lyowa	Chalamine	
17	Elkaldi Mtimuzi	Male	4/7/2019	Lyowa	Singiwe	+255762078553
18	Joseph Kusongwa	Male	8/7/2019	Matai	Kisungamile	+255755534184
19	Peter Kombe	Male	8/7/2019	Matai	Kateka	+255766723025
20	Editha Kibona	Female	8/7/2019	Matai	Kateka	+255742146210
21	Reginard Masole	Male	9/7/2019	Matai	Kateka	+255755528874
22	Thomas silalama	Male	9/7/2019	Matai	Kisungamile	
23	Ernest Gilbert Kaya	Male	9/7/2019	Matai	Kateka	+255759578151
24	Anselima silalama	Male	9/7/2019	Matai	Kisungamile	+255767977855
25	Noel Hillary Kazumba	Male	9/7/2019	Matai	Kateka	+255763070460
26	Julius Raphael Daudi	Male	9/7/2019	Matai	Kateka	
27	Emmanuel M Mwakabinga	Male	9/7/2019	Matai	Matai A	+255755775033

28	Didasi Mwanisenga	Male	9/7/2019	Matai	Matai A	+255762234300
29	Geofrey Chawala	Male	9/7/2019	Mkowe	Mbuza	
30	Fadhili Siwelwa	Male	9/7/2019	Mkowe	Ilimba	+255758020132
31	Editha Masau	Female	8/7/2019	Mkowe	Katapulo	+255768477917
32	Maria Ngua	Female	06/07/2019	Mkowe	Mkowe	+255756276078
33	Jeminus Chakupewa	Male	06/07/2019	Mkowe	Mkowe	+255758333650
34	Prisca Mlele	Female	06/07/2019	Mkowe	Mkowe	+255759081811
35	Galusi Kasomo	Male	09/07/2019	Mkowe	Mkowe	+255766988520
36	Anna John	Female	09/07/2019	Mkowe	Ilimba	+255745732034
37	Augenius mavunde	Male	9/07/2019	Mkowe	Mbuza	+255767883367
38	Meshaki Kasomo	Male	9/7/2019	Mkowe	Ilimba	+255755528874
39	Christopher muyengane	Male	10/7/2019	Lyowa	Chalamine	
40	Maria Venus	Female	10/7/2019	Lyowa	Singiwe	

Appendix 20 : Name of the respondents(Focus group discussion)

No	Name	Sex	Ward
1	Livinus Iuvanda	Male	Msanzi
2	Rosemary sindani	Female	Msanzi
3	Pius saulo	Male	Msanzi
4	Bernard kanduwa	Male	Lyowa
5	Enock kifunda	Male	Lyowa
6	Conrad kosam,	Male	Lyowa
7	Gregory Nairobi	Male	Lyowa
8	John mizimu	Male	Mkowe
9	Herman changuzi	Male	Mkowe
10	John kazumba	Male	Mkowe
11	Dismas Mwanalinze	Male	Mkowe
12	Isaya chumia	Male	Matai
13	Janeth kisimba	Female	Matai
14	Edes mamboleo	Female	Matai
15	Getruda tunduma	Female	Matai
16	Jeremiah Saulo	Male	Msanzi
17	Godfrey sawala	Male	Msanzi
18	Edes mamboleo	Female	Msanzi
19	Gasto simuyemba	Male	Msanzi

Appendix 21: Name of the respondents (Stakeholder meeting)

S/N	Name	Position	Sex	Phone number
1	Tiatu Kifyula	Farmer representative	Male	+255762066480
2	Patrick John Songoro	Farmer representative	Male	+255764472555
3	Deusi Mwanisenga	Farmer representative	Male	
4	Chalres O Mawela	Farmer representative	Male	+255769529293
5	Lema Emmanuell	District Agriculture Extension Officer	Male	+255767851717
6	Erasto Mwasomola	Acting District Agriculture Officer	Male	+255756451900
7	Jonathani Elieza	Ward Extension Officer	Male	+255752148499
8	Renatus Mahega	Ward Extension Officer	Male	+255767884868
9	Listo Bristo Mwakavale	Ngo Representatives	Male	+255768064271
9	Litso Kalokani Kibona	Ward Extension Officer	Male	+255764561692
10	Elizabeth Daud	Retailer	Female	+255768721292
11	Suzana Charles Masanja	Processors	Female	+255766249152

Appendix 22 Name of the respondents (Key informants)

	Name	Organisation	Identification Code
1	Paul Kayange	Input supplier	Key informant 1
2	Ally Mbwando	Research Institution-Ilonga	Key informant 2
3	Nicholas Mrango	District Agriculture Officer	Key informant 3
4	Wallace Kiama	Cooperative Officer	Key informant 4
5	Allen Saro	NMB bank Officer	Key informant 5
6	Julieth Binjura	District Commissioner	Key informant 6
6	Agness Ndunguru	Research Officer-Uyole	Key informant 7
7	Sapiens Rugeimkam	Agriculture officer-Sunflower	Key informant 8
8	Marry William	Small Processor	Key informant 9
9	John mwananzila	Large processor	Key informant 10
10	Andrew Luanda	NGO-Bytrade Company	Key informant11
11	Emmanuel Lyimo	District land officer	Key informant 12

Appendix 23


SPSS statistics template of field survey data-Sunflower Research.sav [DataSet1] - IBM SPSS Statistics Data Editor

File Edit View Data Transform Analyze Graphs Utilities Extensions Window Help

	Name	Type	Width	Decimals	Label	Values	Missing	Columns	Align	Measure	Role
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13	methodsforfarmpreparation	Numeric	8	2	Technology us...	{1.00, Hand...	None	8	Right	Ordinal	Input
14	numberofcropinthefarm	Numeric	8	2	Number of crop...	{1.00, 1 cro...	None	8	Right	Scale	Input
15	involvementinsunflowerproduction	Numeric	8	2	who are involin...	{1.00, Husb...	None	10	Right	Ordinal	Input
16	GAPawareness	Numeric	8	2	Awareness of ...	{1.00, Yes}...	None	8	Right	Nominal	Input
17	fertilizerandpesticidesuse	Numeric	8	2	Uses of fertilize...	{1.00, Yes}...	None	8	Right	Nominal	Input
18	usesoffertilizerandpesticides	Numeric	8	2	Type of fertilizer...	{1.00, Orga...	None	8	Right	Ordinal	Input
19	lasttwoyearsofsunflowerproduction	Numeric	8	2	how many tonn...	{1.00, <5}...	None	8	Right	Scale	Input
20	awarenessofimprovedvarieties	Numeric	8	2	are you aware ...	{1.00, Yes}...	None	8	Right	Nominal	Input
21	whichtypeofsunflowerseeddoyouuse	Numeric	8	2	Type of Sunflow...	{1.00, Impor...	None	8	Right	Ordinal	Input
22	seedchoice	Numeric	8	2	why do use you...	{1.00, easily...	None	8	Right	Ordinal	Input
23	seedsource	Numeric	8	2	what is your so...	{1.00, Own ...	None	8	Right	Ordinal	Input
24	producerorganisation	Numeric	8	2	are you a mem...	{1.00, Yes}...	None	8	Right	Nominal	Input

SPSS statistics template of field survey data-Sunflower Research.sav [DataSet1] - IBM SPSS Statistics Data Editor

File Edit View Data Transform Analyze Graphs Utilities Extensions Window Help



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27	whooffersextensionservices	Numeric	8	2	Who offers exte...	{1.00, Gover...	None	8	Right	Ordinal	Input
28	presenceofextensionofficerinyourvilla...	Numeric	8	2	Presence exte...	{1.00, Yes}...	None	8	Right	Nominal	Input
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30	satisfactionofextensionservices	Numeric	8	2	are you satsfie...	{1.00, Yes}...	None	8	Right	Nominal	Input
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34	priceofsunfloweroilperlites	Numeric	8	2	Price of sunflow...	{1.00, 1500-...	None	8	Right	Scale	Input
35	sellingoilseed	Numeric	8	2	Where do you ...	{1.00, Direct...	None	8	Right	Ordinal	Input
36	doyousellqualitysunfloweroilseedsat...	Numeric	8	2	Premium pricin...	{1.00, Yes}...	None	8	Right	Nominal	Input
37	aceessibilityofelectricitypower	Numeric	8	2	Availability of el...	{1.00, Yes}...	None	8	Right	Nominal	Input
38	mobilecommunicationnetwork	Numeric	8	2	Availability of ...	{1.00, Yes}...	None	8	Right	Nominal	Input
39	presenceofproducersorganisation	Numeric	8	2	Availability of ...	{1.00, Yes}...	None	8	Right	Nominal	Input
40	membershipofproducerorganisation	Numeric	8	2	Membership in ...	{1.00, Yes}...	None	8	Right	Nominal	Input
41	distancefromthemarket	Numeric	8	2	how far from th...	{1.00, <5}...	None	8	Right	Scale	Input
42	sourceofmarketprice	Numeric	8	2	Source of mark...	{1.00, Distri...	None	8	Right	Ordinal	Input