

**INFLUENCE OF SELECTED EXTENSION SUPPORT SERVICES ON SESAME  
PRODUCTION AMONG SMALLHOLDER FARMERS IN BAL'AD DISTRICT,  
SOMALIA**

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**“A Thesis Submitted to the Graduate School in Partial Fulfillment of the  
Requirements for the Master of Science Degree in Agricultural Extension of Egerton  
University”**

**EGERTON  
UNIVERSITY**

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## DECLARATION AND RECOMENDATION

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“This thesis is my original work and has not been presented in this university or any other for the award of a degree”

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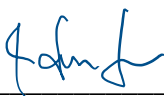
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## **DEDICATION**

I dedicate this thesis to my family for their great support to my mother Halwo Mohamed Hussein for her inspiration and to my wife Asma Abdiwahid Abdullahi for her support.

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First, my heartfelt thanks go to the Almighty God (SWT) for His grace and mercy, without him the successful completion of my study would not be possible. Also, this study would not have been conceivable without the advice, contributions, and moral support of several individuals and institutions. I wish to express my gratitude to my supervisory committee, Dr. Ombati M. Justus and Abdullahi Farah, for their guidance, suggestions, and support throughout the preparation of this thesis. I also wish to express my gratitude to the Center of Excellence in Sustainable Agriculture and Agribusiness Management (CESAAM) at Egerton University (Kenya) for the scholarship that enabled me to further my studies. Without their financial support, I could never afford to pursue this noble exercise. I am also indebted to my lecturers, especially Drs. Maurice Udoto, Miriam Kyule, Maina Stephen Wambugu, James Obara, Joel Ngeno Kipkemoi, Agnes Nkurumwa, and Mr. Simon Mutonga, for not only believing in me but also laboring tirelessly to give this work its current shape. I gratefully acknowledge the efforts of my respondents and my forum participants, who took valuable time away from their day jobs to participate in this work. I also would like to thank SATG and Bal'ad district coordinators for working well with me to collect the data and reach the target group.

## ABSTRACT

Agriculture is an important sector in the economies of most developing countries. Most people's livelihoods in sub-Saharan Africa are hinged on agriculture. The purpose of this study was to investigate the influence of selected extension support services (input, credit and market information) on sesame production among smallholder farmers in Bal'ad district, Middle Shabelle, Somalia. The study used quantitative and qualitative methods to collect data from farm households. The target population was 3098 smallholder sesame farmers in Bal'ad district. Purposive sampling and simple random sampling were used to select a sample of the respondents. With the known population size, the sample size of the study was estimated to be 148 farmers. A researcher administered an interview guide, and a questionnaire consisting of closed-ended and open-ended items was used to collect data from the respondents. The instrument was validated by researchers and experts in agricultural education and extension from the Department of Agricultural Education and Extension at Egerton University. Cronbach's alpha coefficient was used to test the reliability of the instrument, and 30 respondents from neighboring district were used for pilot testing. The reliability coefficient was estimated using the Cronbach's alpha coefficient to be 0.8051. Descriptive and inferential statistics were used for analyzing the quantitative data and thematic analysis for the qualitative data. The findings might lead to a better understanding of extension service offerings to improve sesame production in Bal'ad district. The reliability coefficient was estimated using the Cronbach's alpha scale to be 0.7885. Using T-test to check the influence of input on sesame yield gave a P-value for a t-value of -12.89, which is very close to 0. P-value is approximately 0 (or very close to it), indicating a highly significant difference between the different yields. T-test to find access to farm inputs gave a 0.74 p-value, revealing that the difference in proportions is statistically significant, meaning there is a significant difference in the proportions of access to farm inputs between the two groups. One group easily accesses farm inputs, while the other is not advantaged. T-test is used to check how access to credit influences sesame production. Results gave a P-value of 0.90. P-value was above the reliable level, equal to or greater than 0.70. There was a highly significant difference between those who interacted with banks to get credit and those who did not. Information on most farmers accessing credit was reliable.

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## **LIST OF ABBREVIATIONS AND ACRONYMS**

ASI	Adam Smith International
CARP	Comprehensive Agrarian Reform Program
CSW	Chamber of Somali Writers
DFID	Department for international Development
EFS	Extension Field Staff
EU	European Union
FSNAU	Food Security and Nutrition Analysis Unit
GAP	Good Agricultural Practice
GEEL	Growth Enterprise Employment and Livelihood
GDP	Gross Domestic Product
IBS	International bank of Somalia
MoAI	Ministry of Agriculture and irrigation
NGO	Non-Governmental Organization
PIMS	Promoting Inclusive Markets in Somalia
RQ	Research Question
SATG	Somali Agriculture Technical Group
SFDA	Sesame Farmers Development Association
SMEs	Small and Medium Enterprises
SPSS	Statistical Package for Social Sciences
UAE	United Arab Emirates
UOSPPA	Uganda Oil Seed Producers and Processors
US	United States
USAUD	United States Agency for International Development

## CHAPTER ONE

### INTRODUCTION

#### 1.1 Background of the study

In Somalia, agriculture is an important economic activity, not only in terms of meeting the food needs of the population but also in terms of generating income through crop sales and agricultural labor opportunities. The main crops are maize, sorghum, and cowpea, grown mostly for domestic purposes. Sesame and horticultural farming are mainly commercial. Here, farmers grow most of the time sesame, bananas, tomatoes, onions, peppers, cabbages, oranges, lemons, and papaya (Mohamed *et al.*, 2019).

The sesame crop is mainly grown in southern Somalia, where the main growing regions were lower Shebelle, middle Shebelle, Hiran, lower Juba, middle Juba, and Gedo. Sesame is generally referred to in Somalia as "*sisin*," and it is both widely consumed locally and exported to other countries. Sesame farmers in the whole country range from 150,000 to 250,000. They are mostly smallholders, with farms ranging between 1 and 2.5 hectares (World Bank & Food and Agriculture Organization of the United Nations [FAO], 2018). The smallholder farming system is the largest contributor to agricultural production in Somalia and is critical to meeting the growing demand for food and livelihood improvement in the next two decades (Makawia, 2018).

Sesame seeds have multiple uses in Somalia. They are widely used in Somali cuisine to enhance flavor and texture in dishes like soups and salads. Additionally, sesame oil is used in cooking and as a flavoring agent. In traditional medicine, sesame seeds are believed to have health benefits and are used in remedies. Sesame seeds also find applications in baking, livestock feed, cosmetics, industrial production, and as a valuable export crop contributing to the country's economy (Abdullahi, 2022).

Agricultural extension services are recognized as important to the smallholder farming sector worldwide. It is argued that the provision of agriculture support services can strengthen smallholder farmers' production abilities through access to advice, information, inputs, credit, markets, and related services (Msuya *et al.*, 2017).

Extension services are an important tool to transfer knowledge, provide advice, educate farmers on new technologies and practices, and foster increased crop production. Farmers use suboptimal agricultural practices due to a lack of information, knowledge,

inputs, and management (Fu & Akter, 2016). Public research and extension services emphasize poverty reduction. However, in designing agricultural extension services, constraints should be kept in mind, not only focusing on the relative efficiency gains from each type of extension but also addressing constraints that limit farmer's access to extension services (Opee, 2018).

In the Netherlands, three types of extension service providers are leading in offering farm extension services, especially for cereal, oilseed, and protein crops. These operate as: (i) economic operators on the supply chain, e.g., companies and cooperatives that sell inputs to farmers or buy their produce; (ii) private consultants; and (iii) firms commercializing agronomic modeling software to forecast the impact of crop production practices (Labarthe & Laurent, 2013).

Malawi spent 9.8% of the national budget subsidizing fertilizer and seed between 2005/2006 and 2008/2009, and these subsidies accounted for a large share of increased agricultural production since fertilizer was more affordable and accessible by most farmers (Ragasa & Mazunda, 2018).

In Somalia, the unstructured extension services are currently under the Department of Crop Production, Research, and Extension of the Ministry of Agriculture and Irrigation. Almost all agricultural extension activities have been affected by the prolonged civil war. The results of the civil war, which severely impacted agricultural production and the extension system after experts, immigrated and central researchers were wrecked, The Federal Government of Somalia is currently in recovery mode, and public institutions are being built from the ground up. However, this has not been without challenges, especially considering the profound political changes and dynamics in Somalia. The Ministry still lacks funds, human resources, and other physical resources to pursue its vision for the country (Ministry of Agriculture & Irrigation, 2021).

In 2018, a funded study identified weak institutions, lack of coordination, insecurity, persistent insurgency in the most fertile agricultural areas and dilapidated infrastructure as major obstacles to Somalia's economic development (World Bank & FAO, 2018). Lack of infrastructure, lack of access to finance and credit owing to the near-absence of viable banking, absence of public sector support institutions, and difficulty in accessing international markets are some of the major constraints on investments, and the absence of

any maintenance of infrastructure facilities for over twenty-five years has left major infrastructure facilities (Abate *et al.*, 2023).

Bal'ad district belongs to the middle Shabelle region of Somalia. It is located a distance about 36kilometers from capital city Mogadishu, covering an area of 4400 square kilometers, has a population of about 642,000, and has 82 villages. The district is crossed by the Shabelle River, and this river passes through Bal'ad town. It borders the Indian Ocean, and its length is about 70 kilometers. The district is also known for livestock, crop farmers, and fisheries (Okello *et al.*, 2018).

In this district, sesame crops are traditionally cultivated in the flood plain, riverine, and agro-pastoral areas. The sesame cultivated in Bal'ad district is characterized as being inherently low yielding and having uneven seed sizes. Above, the existing local sesame seed variety has mixed seed coat colors (white, white creamy, gray, reddish, black, etc.), which is normally not the preference of the recipient world markets. Minimum sesame color impurity is expected in irrigated areas of the district (Abdulle *et al.*, 2022).

The study focused on Bal'ad district, middle Shabelle region, Somalia, as a showcase for the influence of selected extension support services on sesame production by smallholder farmers such as farm inputs, credit, and market information. The research attempted to answer the questions that are related to the gap in accessing selected factors and addressing key constraints for Smallholder Farmers such us limited resources, financial barriers and information gap in Bal'ad district.

Sesame production reached 57,000 tons in 1982 and 1985 and 45,000–50,000 tons in 1989–90, just before the start of the civil war. The Food Security and Nutrition Analysis Unit (FSNAU) of Somalia noted that following the collapse of the country in the early 1990s, production fell to 38,133 tons in 2013, before dropping down 35,584 tons in 2014 and 28,640 tons in 2015. Also, SATG estimates that production was 60,000 tons in 2014; the sesame crop is cultivated widely in tropical and subtropical regions, and it requires annual rainfall of about 625 to 1100 mm. The sesame seed contains 48–55% oil, which is higher than other oilseeds (World Bank & FAO, 2018). This, coupled with the fact that Bal'ad district has not been studied on influence of selected extension support services on sesame production among smallholder farmers in Bal'ad district, Somalia to determine how access to input, credit and

market information influence on sesame production by smallholder sesame farmers in Bal'ad district, Somalia.

## **1.2 Statement of the problem**

Most sesame production in Somalia is undertaken by smallholder farmers with land holdings between 2 and 5 ha. The country was once one of the world leading exporters of sesame. However, 32 years of civil conflict have severely damaged the profitability of the industry. Progressively, some success has been registered since 2014, and smallholder farmers have been recording an increase in the quantities of sesame produced. However, compared to the sesame levels produced before the civil war in the 1991 unrest, the current sesame quantities produced are still lower than the expected yield, according to 57,000 tonnes before the civil war and 26,210 tonnes in 2019. In a move to increase sesame production in the country, the government has attempted to improve agricultural extension provision by allowing several agricultural extension providers and creating an enabling environment for private and non-government extension service providers to offer support services. However, production from smallholder sesame farmers remains poor and of low quality. Other factors may include recurrent seasonal droughts, floods, insecurity, and outdated farming methods. Despite high production losses and the many challenges that it faces, the country's sesame crop sector remains both viable and critical to the country's economic recovery and long-term development. There is a lack of knowledge about how smallholder farmers perceive their farming needs and how they respond to the services provided by the top-down extension system, which is a one-way flow, with experts disseminating knowledge to practitioners, like government agents teaching farmers new agricultural techniques. The study attempted to investigate the influence of selected extension support services, including inputs, credit, and market information, on the production of sesame.

## **1.3 Purpose of the study**

The purpose of the study titled "Influence of Selected Extension Support Services on Sesame production among Smallholder Farmers in Bal'ad District, Somalia" is to investigate and understand the influence of specific extension support services on sesame production among smallholder farmers in the Bal'ad District. The study aims to assess the influence of access to inputs, access to credit, and the level of access to market information on sesame production. By investigating these factors, the study aims to provide insights into

the effectiveness of extension support services and inform strategies for improving sesame production among smallholder farmers in the region.

#### **1.4 Objectives of the study**

The study was guided by the following objectives:

- i. To determine how access to input influences on sesame production by smallholder sesamefarmers in Bal’ad district, Somalia.
- ii. To determine how access to credit influences on sesame production by smallholder sesamefarmers in Bal’ad district, Somalia.
- iii. To determine the level of access to market information on sesame production by smallholdersesame farmers in Bal’ad district, Somalia.

#### **1.5 Research Questions**

The study was guided by the following research objectives:

- i. How does access to input influences on sesame production by smallholder sesame farmers in Bal’ad district, Somalia?
- ii. How does access to credit influences on sesame production by smallholder sesame farmers in Bal’ad district, Somalia?
- iii. How does access to market information influence on sesame production by smallholdersesame farmers in Bal’ad district, Somalia?

#### **1.6 Significance of the study**

The findings of this study might be of help to farmers by providing the useful information required for increased sesame production. It may also be important for public and private sesame farmers’ planners to have information about the influence of extension support services on sesame production among smallholder farmers in Somalia. On the other hand, many other farmers, such as cash crop growers, could benefit from the findings of the study. The study might be useful in providing information needed by agricultural researchers and academicians on the possible gaps in extension services that exist among sesame smallholder farmers in the Bal’ad district. In addition, the finding might be useful to providers of extension services as they formulate extension packages for Bal’ad. This study also might provide information on agricultural extension services for sesame production in the study area, which is a commonly used knowledge transfer

mechanism. The extension officers might adopt recommendations to the benefit of farmers and other actors in the sesame value chain. This study might provide information about the constraints faced by farmers in accessing extension services from extension providers in search of ways of improving sesame productivity. Various partners, including NGOs (both local and international) and the private sector, used the findings of this research to accelerate and improve the effectiveness and efficiency of their interventions. It also might help agricultural policymakers use data to develop appropriate policies and agendas for smallholder sesame farmers, both at the state and national level.

### **1.7 Scope of the study**

This study was carried out among smallholder sesame farmers in Bal'ad District in the middle of the Shabelle region. It confined itself to an investigation on the influence of selected extension support services among smallholder sesame farmers in the Bal'ad District, Somalia. The selected factors included access to input (improved seeds, agrochemicals), access to credit services, and access to market information.

### **1.8 Assumptions of the study**

The following assumptions were made in the study:

- i. The study assumed that smallholder sesame farmers in the study area were frequently and timely trained by extension service providers to improve sesame productivity.
- ii. The agricultural extension providers use effective methods of agricultural extension information to improve productivity.

### **1.9 Limitations of the study**

The limitations of the study included the following:

- i. Rampant violence and conflicts caused by Al-Shabab which sometimes occurred and lasted for days or weeks. The researcher tried and collected data at relatively peaceful times.
- ii. The respondents included some illiterate farmers. In such cases, the researcher read, interpreted and assisted in filling the questionnaire.

This study was conducted in the Bal'ad district of Somalia, so caution should be taken in

generalizing the results. Some of the farmers interviewed may have underreported the extension service and input support they received to qualify for subsidies or benefits based on poor production.

### **1.10 Definition of terms**

**Access to credit services:** This study defines access to credit as the process of borrowing resources in the form of capital that may be both monitored and in kind, regardless of the willingness to honor the repayment terms from the specific source of the farm adopted by this definition (Musyoka, 2017). In this study, the indicators for access to credit services are the availability of credit facilities and the source of the credit facilities.

**Access to inputs:** In this study, access to inputs is defined as the resources that are used in farm production, such as fertilizer, seeds, tractor hours, farming tools, and agrochemicals, while inputs are a range of materials that may be used to make agricultural production possible. In this study, the indicator for access to inputs became the farmer's ability to acquire seeds and agrochemicals. And are grants given by the service providers to farmers to reduce their production costs and improve their profit margins (Michael *et al.*, 2018). In this study, input support services encompassed improved seed varieties and agro-chemicals.

**Access to market information:** In the study, access to market information may be defined as a source of information to the market on prices and, in some circumstances, amounts of broadly traded agricultural products, as appropriate, from rural assembly markets, bulk markets, and retail markets, and the distribution of this information on a timely and periodic basis by various media to farmers, traders, government officials, policymakers, and others, including consumers (Gramzow *et al.*, 2018). This adopted this definition. In this study, the indicators for access to market information are the availability of information facilities and the source of the information facilities.

**Agricultural Extension Services:** is an organization that offers education, training, and technical assistance to individuals involved in agriculture and rural development. It aims to share knowledge and best practices, bridging the gap between researchers and end-

users through information and technology transfer (Stringer & Antwi-Agyei, 2021). However, for this study it was also investigated what extend the extension services offer the support services to the smallholder farmers.

**Agricultural extension support services:** The provision of agriculture support services can strengthen smallholder farmers' production abilities through access to advice, agricultural information, training services, inputs, credit, market research, processing, transportation of agricultural produce, and related services (Geretharan *et al.*, 2019). However, for this study, the following agricultural extension support services were investigated: access to input, access to credit services, and access to market information.

**Sesame:** Sesame (*Sesamum indicum L.*) is a flowering plant in the genus *Sesamum*. It is widely naturalized in tropical regions around the world and is cultivated for its edible seeds, which grow in pods (Langham *et al.*, 2021). This study adopted this definition and focus on quantity and income from sesame production.

**Smallholder farmers:** They are farmers with small land holdings (less than 5 hectares) and a small quantity of factors of production and scale of production (Varghese *et al.*, 2017). In this study, smallholder farmers have an average farm size of 2 to 5 hectares.

## CHAPTER TWO

### LITERATURE REVIEW

#### 2.1 Introduction

This chapter provided an overview of recent research related to institutional preparedness in extension services to smallholder sesame farmers. The review has been divided into thematic headings, which include: the evolution and importance of extension services; evolution of agricultural extension services in Somalia; sesame production on smallholder farmers; quantity of sesame production in Somalia; agricultural extension providers in Somalia; access to agricultural inputs and smallholder sesame production; credit services and sesame production; access to market information and sesame production; and theoretical and conceptual frameworks. It also gives highlights on the theoretical framework that informed this study and the conceptual framework that shows the relationship between the independent and dependent variables for the study.

#### 2.2 Evolution and importance of extension services

Beginning in the 1970s, agricultural development agencies advanced to a more integrated agricultural extension approach. Specific project development approaches were promoted to assist smallholder farmers. The most common thing was the farmer's needs, which were met by providing farmers with a coordinated range of inputs and services that included marketing, credit, transportation, fertilizer, seeds, etc. Further, general extension agents and home economists were the appropriate service providers to disseminate the requisite information to the farmers (Camillone *et al.*, 2020).

During the 1980s, there was a realization among development agencies that extension could no longer be a stand-alone strategy for agricultural improvement but must be wrapped in a broader agriculture development strategy that included support for policy reform, agriculture research, private sector growth, and rural resource mobilization. This new direction was accelerated when USAID Administrator Peter McPherson, who believed strongly in agriculture as a tool for economic development, outlined on worldwide media a new approach to agriculture extension. In addition, included in the new strategy were the following issues: Boost public extension by linking research and extension to improve the accessibility of extension support services, linking the private sector and public extension systems, applying a farming systems approach, providing direct farmer training,

facilitating farmer-to-farmer exchanges, and developing human resources. Reach rural agriculture farmers by using mass media approaches such as radio broadcasts, advertising, social marketing, and print media. Promote and stimulate the private sector's extension methods (Weiland, *et al.*, 2021).

When the farmers express great concern about their inability to access and utilize technologies. Farmers may identify problems related to access, including the collapse of technology transfer structures, poorly designed technology transfer campaigns that do not attract a critical mass of farmers, the high cost of science and technology applications, and inadequate support institutions. They may also identify areas of concern in using science and technology, including low literacy levels and technical language used in innovation and research products, sub-standard and high- priced inputs, inappropriate policies relating to agricultural development, and gender insensitivity (Schmitt, 2012).

The need to strengthen national policies and to bring in all aspects of the potential of modern science and technology through greater advocacy is crucial. Policies that seek to engage more of the private sector in addressing issues facing the poor must be developed. Governments should adopt strategies to encourage these alliances. Currently, it is recognized that the scientific community is paying insufficient attention to making inputs into policies for science. More effort by governments needs to be made to empower farmers to direct the research agenda via participatory action research, more farmer-to-farmer exchanges, farmer field schools, etc. recompense or salaries for scientists maintain smallholder farming in the province are generally low, with the result that little or no incentives exist for a career in agriculture (Triomphe *et al.*, 2014).

Institutional and educational centers need to collaborate and prevent fragmentation of the efforts through greater regional and international cooperation in science and technology. Few mechanisms to exchange and share knowledge in the region exist. Efforts should focus on how to provide the farmers with the appropriate knowledge, including technological, financial, and marketing information, to help reduce hunger and poverty. Different media and types of knowledge are required to reach and develop all sectors of agriculture. Doing so would improve the value of networking and strengthen the linkage between farmer, research, and extension partnerships. Institutions should become learning organizations that encourage "constructive subversion," meaning that new ideas and attitudes from the young should be encouraged (Akudugu *et al.*, 2012).

The importance of extending agriculture in rural development is widely recognized, particularly in developing countries where most of the population lives (Jimale, 2020a). Agricultural extension services are an important tool to transfer knowledge, provide advice, educate farmers about new technology and practices, and promote crop production. Farmers use sub-optimal agricultural practices due to a lack of information, knowledge, inputs, and management decisions (Ahmed, 2018).

Extension is a critical component in agricultural and rural development and contributes to issues such as poverty alleviation by increasing agricultural production and productivity among farmers. A major example is the Green Revolution and its performance in greatly increasing the global food supply and enhancing the food system. In past decades, extension services in most countries have changed from government to privatization, bringing on board various extension service providers (Liao, 2020).

In Ethiopia, the extension system is established at different levels. It works at the federal, regional, zonal, and district levels, as well as with development agents and household members. The advisory service for the country focuses on many issues. It deals with the governance structures, sector development, capacity building, management, and the methods of utilizing services (Wendimu, 2021).

Extension services are typically provided by the public sector, with the US establishing a national system in the 1860s. Decentralizing these services to grassroots-level departments and organizations, such as farmer cooperatives and NGOs, reduces public financial constraints and private benefits for farmers (Kubayo, 2009).

### **2.3 Evolution of agricultural extension services in Somalia**

According to Jimale (2020a), in Somalia, agricultural extension services were started in 1954, and the first agricultural research station was founded at Bonka research station in Baidoa district, found in the Bay region. After gaining independence in 1960, additional agricultural advisory centers were added to the centers in the regions of lower Juba, lower Shebelle, and the Northwest. However, private extension providers have inadequate contact with the smallholder farmers and lack of logistics and supervision support. Public and private staff is continuously trained by professional extensionist from external donors who cover the costs. The Somali government prioritized the development of skilled extension agents in the 1970s and 1980s to enhance productivity and food security.

Somaliland's extension services and agriculture output have allowed farmers to concentrate on the quality and standard of their goods. However, due to lack of knowledge and skills necessary to apply technology to make great items, the Somaliland population does not like their products since people are used to importing superior products. The rural people are pastoral and nomadic, and do not have enough knowledge and skills to apply technologies. Furthermore, Awdal and the North West regions face challenges associated with low inputs, which is a traditional challenge limiting the production of staple food under rainfall conditions (Abdulkadir, 2017)

#### **2.4 Smallholder farmer's sesame production**

Globally, the leading farmers of sesame are Myanmar, India, China, Sudan, Uganda and Ethiopia (Gebremedhn *et al.*, 2019). In the world, sesame is produced over an area of 9.4 million hectares, and annual production stands at around 4.8 million metric tons with an average productivity of 506 kg per hectare; whereas in Africa, average productivity ranges from 300 to 500 kg per hectare in pure stands, but under good agricultural production, the output reaches as high as 3000 kg per hectare. However, in 2014, India was the largest sesame seed producer, followed by Sudan. China was third in production, followed by Myanmar and Tanzania (Najeeb *et al.*, 2012).

According to Flaming (2019), Myanmar ranks among the top five sesame farmers globally primarily produced by smallholder farmers. The unique flavor of Myanmar's sesame makes it popular in Japan, Korea, and China. Success factors include quality, meeting buyer requirements, and strong partnerships. The government established the Sesame Farmers Development Association in 2017 to increase production and negotiate better prices. Additionally, SFDA members achieved grade A for the first time in 2018 for over half of the volume sold (57% of 220 MT). The government agriculture bank provides loans of \$31 per hectare that also help bolster sesame production.

In 2015, the USA imported 32.5 thousand tons of sesame seed worth about \$75.1 million and 15.6 million tons of sesame oil worth around \$80.7 million, therefore increasing the domestic sesame production in the country and meeting a critical need. With the unique mechanization characteristics of sesame production in the USA, the potential to meet more of the domestic needs and to supply supplementary global production is certainly possible. The USA production systems rely on non-dehiscent cultivars, which have their

constraints due to their nature and the requirements of the production systems. Therefore, a review of the available literature on sesame is critical to improving and expanding sesame production in the USA (Couch *et al.*, 2017).

Africa grows 15% of the world's sesame, with Sudan, Uganda, and Nigeria being key farmers (Theingi *et al.*, 2017). Jigawa state in Nigeria currently produces 300,000 tons of sesame and is considered a major cash crop, as it occupies 34% of the total land area (Makama *et al.*, 2018). The demand for sesame allows Nigeria to improve its production to meet the international demand for the commodity. Sesame yield in Nigeria is between 500 and 750kg per hectare, which is low compared with the yield of 1000kg per hectare obtained in India, the United States of America (USA), and other countries (Ilesanmi *et al.*, 2020).

In Uganda, sesame is grown in the northern and some parts of the eastern and western regions. It is a high-value-added with domestic purposes, regional, and export to the international markets. Sesame is produced by smallholder farmers, who grow it both for national consumption and as a cash crop. Moreover, the constraints of sesame marketing can be addressed through linkages between the farmers, traders, and other actors in the value chain. However, the sesame value chain is composed of many actors, such as farmers, traders at different administrative levels, transporters, small- and large-holder processors, and exporters. As a strategy to get better results, the Uganda Oil Seed Producers and Processors Association (UOSPA) was formed in 1995 as an organization of producers, processors, and other stakeholders that include traders of oilseed products (Munyua *et al.*, 2013).

In Ethiopia, smallholder farms represent about 95% of the total agricultural output. In addition to producing staple crops, smallholders produce a large share of export-oriented crops such as sesame. Sesame is an important crop for Ethiopian agriculture and is extensively cultivated; it can give reasonable yields under relatively poor climatic conditions. In recent years, it has been a significant component of Ethiopia's sesame exports (Kefyalew, 2013). However, different reports indicate that Ethiopia is among the top-five sesame-producing countries in the world, ranking fourth in 2011/2012 (Abebe, 2016). As a smallholder farmer's crop and potential export crop, it is an opportunity for smallholder farmers to produce sesame and change the available potential into livelihood improvement. Different studies showed that though Ethiopia has a potential for sesame

production, sesame farmers in Ethiopia have faced shortages of inputs for many years, poor agronomic practices, pests and diseases, weak farmer organizations, and a poor market information system (Gebremedhn *et al.*, 2019).

As reported by the World Bank and FAO (2018), the country's sesame production reached a peak of about 57,000 tons in 1982. Additionally, sesame production in the country of about 60,000 tons earned the country an estimated value of \$300 million in 2014, and sesame production fell back to about \$34 million in 2015 (SATG, 2016). In 2017, they earned \$5.62 million, and the interest was \$19.5 million for the year 2018; Somalia shipped 13,797 tons of sesame seeds in 2018. Surpassing its peak production levels of the 1980s, in which 15,000 tons (about a quarter) were exported outside the country, making export revenue of \$81.2 million, production fell back to as low as 26,210 tons in 2017. According to the Chamber of Somali Writers (CSW) (2020), the crop needs proper management up to harvesting to fetch farmers high revenue since one ton of sesame seeds goes up to \$1600 at the local market. Sesame farmers in the country range from 150,000 to 250,000, and these are mostly smallholder farmers with an average farmland ranging between 1 to 5 hectares and yields of about 0.2 tons per hectare.

Sesame production in Somalia faces several gaps and challenges including limited access to inputs, inadequate infrastructural support, limited market information, weak extension services and climate variability and pest management addressing these gaps requires targeted interventions and support mechanisms, including improved access to quality inputs, investments in infrastructure development, enhanced market information systems, strengthened extension services, climate-smart agricultural practices, and pest management strategies. These efforts can help bridge the gaps and contribute to the sustainable growth and development of the sesame sector in Somalia (Weingärtner *et al.*, 2022).

#### **2.4.1 Quantity of sesame production in Somalia**

Up to date, riverine areas in southern Somalia that normally produce off-season crops are facing many challenges. Along the Shabelle River, cereals and cash crops farming have been severely influenced by substandard rainfall highly costly irrigation, and episodic river

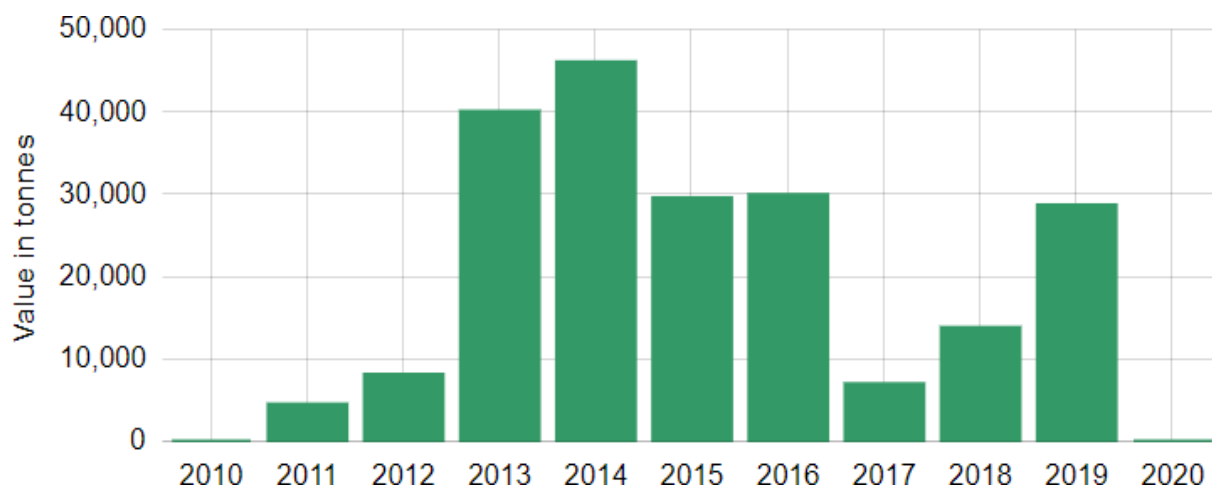
flooding due to unrepaired water canals. In July and August, for example, flooding near Jowhar in the Middle

Shabelle region damaged an estimated 24,500 hectares of cropland. As a result, off-season cash crops were inadequate to offset main and off-season cereal crop losses (Warsame *et al.*, 2021). About 80 per cent of sesame production takes place in the Lower and Middle Shabelle regions and the Middle Juba region, with much smaller, localized production in the northwestern part of Somaliland. Sesame is well adapted to the geographic and climatic conditions of these regions (Sidow, 2010). The production of sesame reached the highest level of about 57,000 tons in 1982 and 1985 before falling back to 45,000–50,000 tons in 1989–90, just before the start of the civil war. After the collapse in the early 1990s, production volumes reached 38,133 tons in 2013, before falling back to 35,584 tons in 2014 and 28,640 tons in 2015, according to the FSNAU. SATG estimates that production reached 60,000 metric tons by 2014, surpassing peak production levels of the 1980s, with 15,000 metric tons (about a quarter of output) exported (SATG 2015). It estimates the value of such production at about \$300 million (World Bank & FAO, 2018).

In 2019, Somalia exported 28,672 tons. In 2019 alone, the demand for Somalia sesame seeds has gone up, changing by 107.528 percent compared to the year 2018. Between 2017 and 2019, sesame exports moved up by 311.89%, netting the country US\$43.03 million (Wamucii, 2020). Another positive indicator is that sesame is becoming an increasingly important export cash crop based on Somali sesame is considered of high quality and commanding relatively good international prices (Jaspars *et al.*, 2019).

### Figure 1

*Production of sesame in Somalia, 2010 and 2020* Source: Rutherford *et al.* (2020)



Sesame plants require a temperature range of 25°C to 37°C throughout the growing season to achieve a higher yield. According to FAO's 2019 report, the world production of sesame surpassed 5.5 million tons in 2017, with 57% produced in Africa and 40% in Asia. The global market value of sesame was approximately \$6.5 billion in 2018. China had the highest yield in 2019, with a little over 1400 kg/ha, followed by Myanmar with above 500 kg/ha and India with over 400 kg/ha. Nigeria and Tanzania had the highest sesame yields in Africa, producing 1100 kg/ha and 1000 kg/ha respectively (Rahman *et al.*, 2018). Unfortunately, in Somalia, local sesame farmers achieve a low yield of 350-40 kg/ha due to poor seed quality (Osman & Theuri, 2016).

## **2.5 Agricultural extension providers in Somalia**

In Somalia, there are several service providers who support the extension of sesame production. These include the government, the private sector, farmer associations, and institutional or educational centers. The public sector's involvement is crucial in supporting private breeders and international organizations to conduct national trials that could potentially lead to the release of new varieties. Although the public institution is not well-equipped to support the sesame sector, international organizations, as well as local community-based organizations, have been helping the sector since the collapse of the former central government in the early 1990s. Private consulting services are limited, with most of the services being provided by NGOs (Menkhaus, 2014).

### **2.5.1 Public sector's contribution to sesame production**

Ministry of Agriculture and Irrigation of the federal government of Somalia is the leading agricultural institution in Somalia. Being a government institution, it develops policy and plays primarily a coordination role in donor-funded projects. The role of the ministry is limited due to its inability to access sesame farms and its lack of resources. Additionally, the state ministry is now operational, though it is limited to the Jowhar and Bal'ad areas. The ministry is getting actively involved in supporting the agricultural sector in the state. However, the ministry has a several technical staff with the capacity to provide extension services, but due to insecurity, the movement of the staff is limited. Despite limited resources, the ministry has organized workshops in support of the sesame sector. The inability to access farmlands and the lack of financial and human resources have limited the function of the state ministries (Jimale, 2020).

### **2.5.2 Private Sector's Contribution to Sesame Production**

The private sector is dynamic and has been controlling business in the country with little government regulation in post-war Somalia. However, all the actors in the private sector have the motivation to work towards the recovery and growth of the sesame industry in Somalia, as this helps them grow their businesses. However, for the private sector to increase investment in the sector, it requires a functional business enabling environment (in terms of good policies, laws, and regulations, financial services, and a secure operating environment), as well as improved knowledge and skills, certifications and standards, export-readiness support, and marketing and export facilitation (Elder, 2022).

There are no crop-specific policies or strategies developed to support the growth of sesame. The potential investment risks associated with the production of the crop are low and are mainly environmental issues. There are currently no public-private partnerships supporting the sector, but there are opportunities for this to happen in the future (MoAI *et al.*, 2019).

### **2.5.3 Local and international NGOs supporting sesame production in Somalia**

There are several United States Agency for International Development (USAID), EU, and Department for International Development (DFID) funded projects supporting the sesame sector in the Middle Shabelle region of Somalia. Some of the ongoing projects include Growth, Economic Employment, and Livelihood (GEEL), Promoting Inclusive Markets in Somalia (PIMS), Outreach, etc. (MoAI *et al.*, 2019). In the recent past, the ministry has partnered with several NGOs and private sector players to introduce good agricultural practices to farmers. Extension services across the country are nonexistent, apart from private companies and NGOs providing limited services. Currently, the Ministry of Agriculture is not providing subsidies and incentives to farmers due to their limited financial capacity. FAO, etc. are international NGOs, while SATG, etc. are local NGOs (EU *et al.*, 2019).

### **2.5.4. Private sectors associations and sesame production**

The Somali private sector associations such as Dalbile, Moumin Group, Dar es Salaam Seeds, etc. are not well developed and organized for improving sesame production. There are currently no active associations supporting the sesame sector. However, there are farmer associations that lobby on behalf of their members (Peterman *et al.*, 2014).

The private sector's engagement is critical, especially through research and the introduction of improved varieties as well as fostering the availability of seed production (Freudenberg, 2014) Producing sesame in the country and processing it through the use of modern treatment increases the germination rate and seed purity and reduce pest infestation during sowing, which significantly improves yields by at least 25%. Promoting the use of fertilizer, pesticides, and farm machinery helps intensify production and improve yields. Given the low adoption levels of these improved inputs and the increasing farmer's knowledge about their benefits, the input supply sector presents a great opportunity for private-sector investment (Mohamed, 2018).

According to Yusuf (2018), Somali Agribusiness Group was created in 2018 and is headquartered in Mogadishu. They are an innovative agribusiness company that specializes in trading agricultural products in Somalia and around the world, empowering local farmers to produce high-quality products and market them in both domestic and foreign markets, and connecting local farmers to the global market to obtain higher market prices for their products. Furthermore, the Somali Agribusiness Group provides their farmer partners with a professional crop management and supervision consultancy service to help them improve their production and post-harvest practices, as well as ensure that their products are produced in an environmentally sound manner in order to provide high-quality products to their customers.

#### **2.5.4.1 Financial service providers**

Due to the low return on investments and the lack of guarantee and collateral, many of the existing private sector financial services are hesitant to offer credits to smallholder sesame farmers. In the recent past, there has been growing interest by banks in supporting the agricultural sector if some of the risks are addressed. Banks such as Dahabshil, Amal, the International Bank of Somalia (IBS), Salaam, Agro Bank, and others have special financial packages to support input supply and other financial needs in the sector (MoAI *et al.*, 2019). Additionally, there are several organizations that provide technical assistance, such as capacity building and research. Over the last ten years, SATG has conducted research in the sesame sector and continues to support the sector. Several other local NGOs are also providing training to farmers. However, Agribridge and Kasmodev, among others, are new business development services that provide consultancy services to the Somali sesame sector. Oil processors only want to purchase scientifically treated, properly cleaned, washed,

dried, color-sorted, size-graded, and impurity-free seeds of a given minimum oil content (not less than 40 per cent) packed according to international standards. Usually, only seeds meeting these criteria may be exported from a producing country (Ali, 2022).

Bank loans enable entrepreneurs to step up their investment in innovative activities, adopt new methods of production, and increase the productive capacity of the economy, but unfortunately, banks don't answer the smallholder needs due to the lack of banks in the district, and difficult requirements faced by the smallholder farmers after coming to the capital city of Mogadishu, such as a guarantee for those who have an account with the bank and have more money than their collateral, high-interest rates, etc. (Ibrahim, 2012).

#### **2.5.4.2 Input suppliers**

Sesame production relies on four key input categories: seeds, fertilizers, pesticides, and farm equipment. However, limited access to financial resources and credit hinders many sesame farmers' ability to procure these essential inputs, ultimately impacting their overall productivity (Cipolla *et al.*, 2018). The companies that import seeds, pesticides, and fertilizers from China, Russia, etc. are Filsan, Moumin Group, Darussalam, Jubba Argo, etc. (European Union, 2019).

Food aid made farmers reliant on external sources if the distributed seeds were not suitable varieties. This can leave farmers with limited or no access to extension services struggling to cultivate crops and address field problems. Additionally, the need to purchase expensive inputs like seeds, fertilizers, and herbicides can further strain their resources and limit production increases (Aidaa *et al.*, 2021).

#### **2.5.4.3 Farmer associations/cooperatives**

The farmer cooperatives in Bal'ad are Arif, Ali sharaf, Moumin group and 19 Mars cooperatives cultivating 400ha, 50ha and 600ha respectively (Ibrahim & Ngina, 2019). Agricultural cooperatives play an important role in sustainability for youth employment food security and marginalized smallholder farmers. Small and medium farmers gain tangible benefits from agricultural cooperatives that lead to food security and poverty alleviation for hundreds of thousands of urban populations (Muse, *et al.*, 2023). Additionally, SATG has held an opportunity to contribute to the restoration of Somalia cooperatives in various regions of the country by providing farm machinery and inputs,

such as improved seed and agricultural chemicals, and effective training to develop their skills and the application of good agricultural practices. Almost 50 cooperatives with 5,000 members operating all over Somalia have been targeted to strengthen their production capacity and resource management competence.

Somalia Union Cooperatives Movement (UDHIS) is a confederation organization for all cooperatives in the country, which was established in 1973. UDHIS takes part in socio-economic production, which plays a major role in the crop production and economic development of this country. It serves as the voice of the cooperative movement both nationally and internationally (Swift, 2019).

UDHIS also stands as the main cooperative policy advisor for the government executes several cooperative development projects, and is mandated by law to judge and help or address the lower conflicts within the cooperative movement. In addition, the government applauded the inauguration of the current administration of UDHIS which officially came into office on February 26, 2017, but still maintained the stand that cooperatives need to compete with the business community in the free economic system. The collapse of these cooperatives is an indication that the cooperatives were not self-sustaining. Furthermore, UDHIS remains incapacitated to perform its duties adequately. Moreover, lack of government involvement and support in the affairs of cooperatives has direct effects on their stability, profitability, and performance.

The promotion of cooperatives should be considered one of the pillars of national and international economic and social development. It has been told that this farmer association was founded to increasing awareness and gives information about cooperatives among the general public, cooperative employees, and government agencies, and to establish expanded, enabling, and more uniform cooperative laws both at the state and federal levels, including in states that have stronger laws in support of cooperatives (Getnet & Anullo, 2018). UQIB's creation is a united concept of community farming cooperatives and empowers their role and participation, which was a major pillar in the economic and social development of the country (Strangio, 2012).

## **2.6 Access to agricultural inputs and smallholder sesame production**

One of the key challenges on the supply side has been the inability of smallholder farmers in the sesame value chain in the Bal'ad district to access quality agricultural inputs to

support production. These form the basis for the need for improved quality control and supporting the introduction and use of certified seeds and other inputs such as fertilizers and pesticides. To reverse the very low production of sesame production, there is a need for specific interventions by the private sector and the government to support the availability of quality inputs for improved productivity. One of the key underlying causes of low productivity, as identified in the challenges above, is a lack of training.

Furthermore, the locations of input shops in urban centers, which are far from farmlands, restrict farmers from accessing inputs for increased crop production. Inputs improve production among smallholder farmers, and these account for over 90% of agricultural production and over 95% of the total area under cultivation (Agyei & Stringer, 2021). Informed smallholder farmers can make sound choices on what type of inputs to use among a range of such inputs like improved seeds and agricultural chemicals to be applied to the farm to earn a high yield and good markets (Madukwe & Anugwa, 2020).

Lack of improved inputs and technologies and an imperfect market structure for input and output cause low productivity, but the use of modern farming techniques can lead to double productivity (Yeshitila *et al.*, 2020). Donor-funded projects in developing countries have helped to fund public extension services for decades (Ugochukwu & Chinyelu, 2020). Input suppliers help the farmers with 95% of the information they need based on their knowledge and skills obtained through discussions with representatives of fertilizer or pesticide firms, whereas extension officers provide 56% of the information required in production (Tekele, 2019).

### **2.6.1 Improved sesame seed varieties**

In Somalia, the Humera sesame variety is a favored variety on the international market, as the oil content in this seed variety average 55%, compared to 45% in the *Dunyar* variety (Bubbolini *et al.*, 2016). An experiment was done at the *Hagaa* season (July-September 2016) in Afgoi by SATG, on various varieties including *Humeera*, *Abasen*, *Setit*, *Nigerian*, the local Somali variety, and *Yemeni*. The results revealed a greater difference in plant height, with the local variety (95.25 cm) being the tallest, and the Abasena variety is the shortest (67.00 cm). On the other hand, *Humera*, *Setit*, *Nigerian*, and *Yemen* varieties were found with a height of 73.75, 82.00, 69.75, and 84.75 cm, respectively (Ismaan *et al.*, 2020). Improving local sesame seed varieties plays an

important role in sesame production and results in an increased price in the market (Seko, 2009).

Somalia also lacks improved varieties suitable for the different agro-climatic conditions. This, coupled with inadequate pest management, makes most crops susceptible to numerous pest and disease infestations, which subsequently results in reduced yields. Sesame is marketable and exported widely to Dubai and other countries around the world. However, sesame production in Somalia is below expectations. The low production is due to several reasons like low inputs and poor management, e.g., low or non-fertilization, irrigation, pest control, etc. (Ismaan *et al.*, 2020).

According to a report from the European Union, smallholder sesame farmers in Somalia are underserved in extension service, which leads to their limited access to inputs such as quality seeds, fertilizers, tractor power, credit facilities, market information, and others (European Union, 2010). The smallholder uses their own seeds due to the high cost of seeds from companies and the farmers' persistence with the low germination rates of imported seeds. The most local varieties of seeds available in this district are Dunyar, Balweyn, and Sided Dunlay, but Dunyar has better quality (Mohamed & Hassan, 2024).

### **2.6.2 Access to agro-chemicals**

Fertilizer quality is determined in terms of its physical and chemical characteristics. Furthermore, a major factor limiting the use of quality fertilizers for improved agricultural productivity is the unavailability of properly packaged and labeled fertilizers in quantities that smallholder farmers can afford (Conteh, 2020). The use of fertilizers is becoming increasingly popular among farmers, with urea being the most used. The use of DAP on some farms and other fertilizers have also been reported (MoAI *et al.*, 2019).

Traditional sesame farmers in Nigeria rarely use fertilizers due to their relatively fertile soils, and even those with poor soils are constrained by the limited access to quality fertilizers. However, soil nutrition studies in the tropics have shown that the crop performs well with the application of organic or inorganic fertilizers (Haruna & Abimiku, 2012). Fertilizer application to sesame, either in organic or inorganic form, boosts growth, results in a high yield and high seed quality, and leads to a high oil and protein content, which results in greater economic returns (Haruna, 2011).

## 2.7 Credit services and sesame production

Agricultural credit is considered one of the strategic resources for enhancing production, which may in turn improve people's living standards, especially in rural poor farming communities. Harnessing the potential of credit to stabilize and perhaps increase resource productivity and output growth in agriculture is particularly justified and key to helping farmers finance farming activities (Nzomo & Muturi, 2014).

In Somalia, despite the need for support, most smallholder farmers are very cautious of the credit systems, including the high-interest rates, though many farmers are willing to take loans to support production and marketing. Access to finances has been one of the biggest constraints for smallholder farmers because credit advances from banks are relatively new and many fear the consequences of defaulting. In addition, some banks do not have access to agricultural zones in the country (Dos Santos *et al.*, 2015).

Credit is very critical in enabling farmers to access farm inputs and hires labor for farming operations; therefore, the public sector and NGOs should provide the rural youths with credit or link them to sources of credit for improved sesame production (Agada *et al.*, 2020). Access to affordable credit can enable farmers to buy farm inputs like fertilizers for increased crop yields and income from the sale of surplus farm produce. In addition, credit is a key constraint to the use of fertilizers and other farm inputs, especially among African resource-poor farmers (Mavuthu, 2017). Farmers' access to credit reflects a positive and statistically significant increase in the level of sesame produced (Hananu *et al.*, 2015). Sesame farmers require credit, especially at peak times before harvesting time, to ensure crop management practices are executed appropriately (Ubfal & Maffioli 2010). Limited access to credit facilities is one of the factors attributed to decreased sesame productivity in Nigeria.

The formal credit institutions provide intermediation between depositors and borrowers; the lenders charge relatively low rates of interest that are usually subsidized by the government; and in the informal credit markets, money is lent by private individuals (Etonihu *et al.*, 2013). Access to credit facilities has also been allocated as the direct solution to improving investment agriculture in Africa. Credit is an important factor in agricultural production and, in many cases, maybe a limiting factor for smallholder farmers. Credit provides the means for the temporary transfer of assets from an individual or organization to one that

has not. For a credit transaction to be completed, the borrower must offer some evidence of debt commitment in return for the loan, where the loan is based solely on the borrower's good reputation, financial position, and trust. Different policies have been made and implemented in various African countries to enhance farmers' access to credit facilities (Salami & Arawomo, 2016).

To support farmers, credit access has to be improved to bolster sesame production. In addition, improve credit, market information, and training access is needed to enable farmers to acquire inputs, apply recommended agronomic practices, and have markets to sell their outputs, which improved the existing sesame production (Naik, 2016). Just like in all other value chains, the biggest constraint farmers in Somalia continue to face is accessing finances to support their production and marketing. Small-holder farmers in the state have not received financing from the private sector in over 30 years. Recently, there have been a some of banks in Middle Shabelle that offer financial packages to farmers, even though only a few farmers have approached them and/or are interested in their services (Said & Ibrahim, 2023).

## **2.8 Access to market information and sesame production**

Markets and market information access are important for the smallholder farmers' sesame production process because they inform them of market demand and changes in prices, which helps them position themselves and make sound production decisions. Market information guides farmers in planning production to meet market demand and negotiate better prices with traders (Magesa, 2014).

The Somali National Army, Al-Shabab, and militias set up checkpoints, making access for farmers to market outlets difficult and costly World Bank & Food and Agriculture Organization of the United Nations [FAO]. (2018). Market access and information are often seen as the main drivers of innovations and initiatives (Suvedi *et al.*, 2017). Sesame is grown mainly for the export market (Geneti *et al.*, 2017). Improper market identification and price information is one of the major challenges, as identified in the case of farmer organizations in India (Deka *et al.*, 2020).

A study conducted in Ethiopia showed that the sector of sesame production faces many challenges due to inadequate market outlets, limited efforts in market linkage activities, and poor market information among actors (Temesgen *et al.*, 2017). Households with

access to market information have greater productivity and food security than those with no access to markets and market information (Ragasa *et al.*, 2016). Sesame is produced for the market, and its seed is needed for oil production. The provision of market outlets encourages farmers to increase their marketable surplus and mechanize production (Longley *et al.*, 2001).

In Mozambique, a group of well-advanced farmers with access to extension services and to input and output markets are offered vouchers with a 75% discount on fertilizer prices. However, distance to market is a major contributor to the increase in input prices and reduction of product prices, which sometimes discourages farmers (de Janvry & Sadoulet, 2020). Access to market information helps farmers raise their earnings, alleviate poverty, and improve general welfare (Mulupi *et al.*, 2021).

## **2.9 Theoretical framework**

This study is premised on the extension services in the Agricultural Production Model by Huang and Lius (1994). According to Huang and Liu (1994), although farm-specific characteristics may account for such differences, some of the inputs used in the production process may also be responsible. This may occur when either the farmer has received more information, knowledge, or experience concerning one input's productivity than another or some inputs affects the productivity of other inputs indirectly. In either case, an extension may be a potential input that fulfills both of these requirements. In that respect, it is hypothesized in the proposed formulation that the number of extensions visits to the farmers for advice on different methods of input application may result in different levels of output, causing diversity in the effective use of inputs and thus, differences in input productivity.

Appropriate modeling of extension services as both an input in the production function and as a determinant of technical efficiency requires the use of a neutral production frontier. In particular, a simplified version of Huang and Liu's (1994) no-neutral frontier model is adopted. It is assumed that technical efficiency depends on the method of application of inputs and the number of extension visits, but not on the quantities of conventional inputs (e.g., fertilizer, labour, etc.) used. In this setup, technical inefficiency stems from farm-specific characteristics and from the intensity of extension visits. The advantage of this formulation is that it combines both the production- and efficiency-

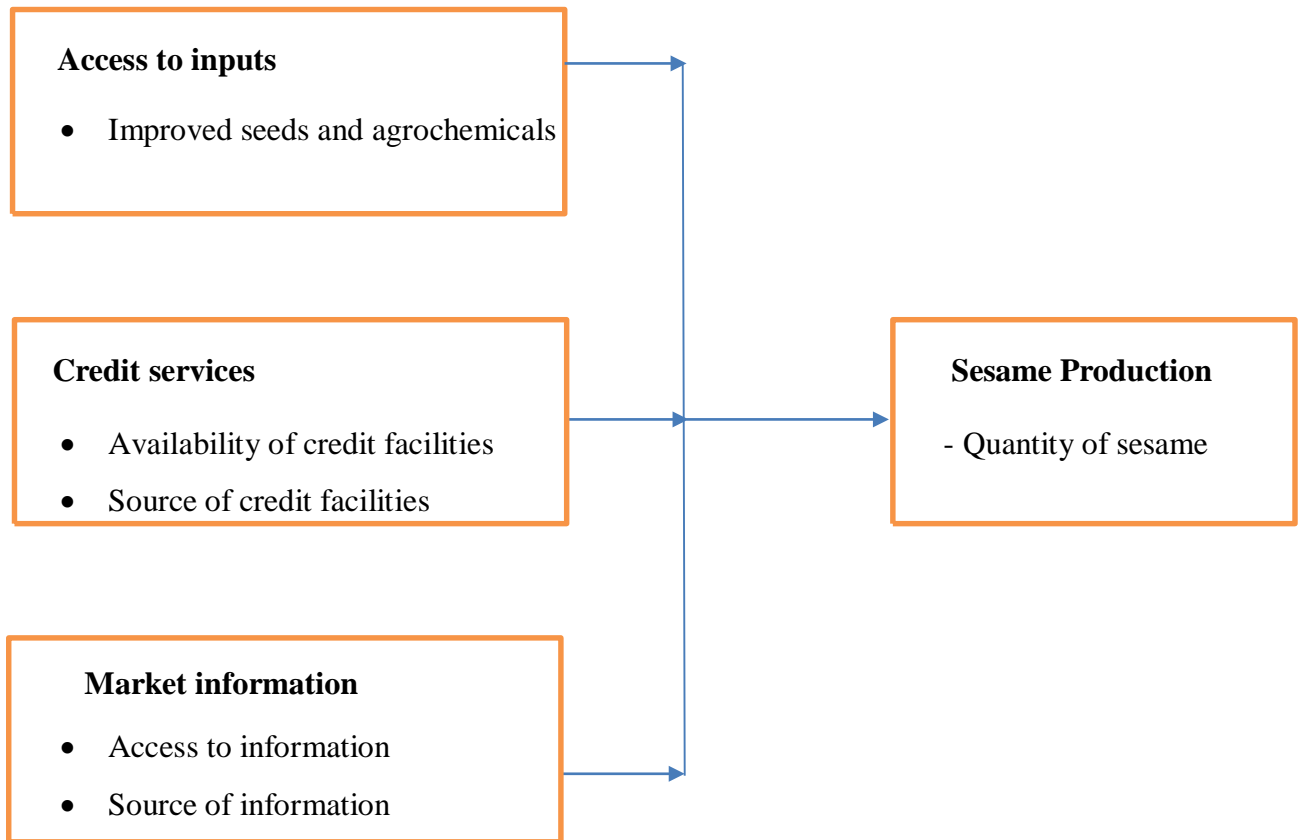
based modeling of extension used in several previous studies. That is, formal statistical testing can be used to check whether extension should be included only in the production function, in the inefficiency effect function, or in both. An example used in this case can be the general form of the stochastic production frontier.

### **2.10 Conceptual framework**

The independent variable is extension services. Extension support services were measured in terms of access to agricultural input services, for example, percentage of improved seeds and agrochemicals. Credit services were measured in terms of the percentage of credit facilities and the source of the credit facilities. Market information was measured in terms of the percentage of access to information and the source of that information and source of information. The dependent variable of the study is sesame production, which was measured in terms of the yield in kgs of sesame. The moderating variables was and age (25–45 yrs.) of the farmers and size of the farmer, since these may modify the relationship in terms of access to extension support services.

**Figure 2**

*Relationship between the independent and dependent variables*



## CHAPTER THREE

### RESEARCH METHODOLOGY

#### 3.1 Introduction

This chapter describes the research methods that were used to carry out the study. It consists of the research design, study location, population of the study, sampling procedures and sample size, instrumentation, validity and reliability procedures, data collection procedures, and data analysis sections.

#### 3.2 Research design

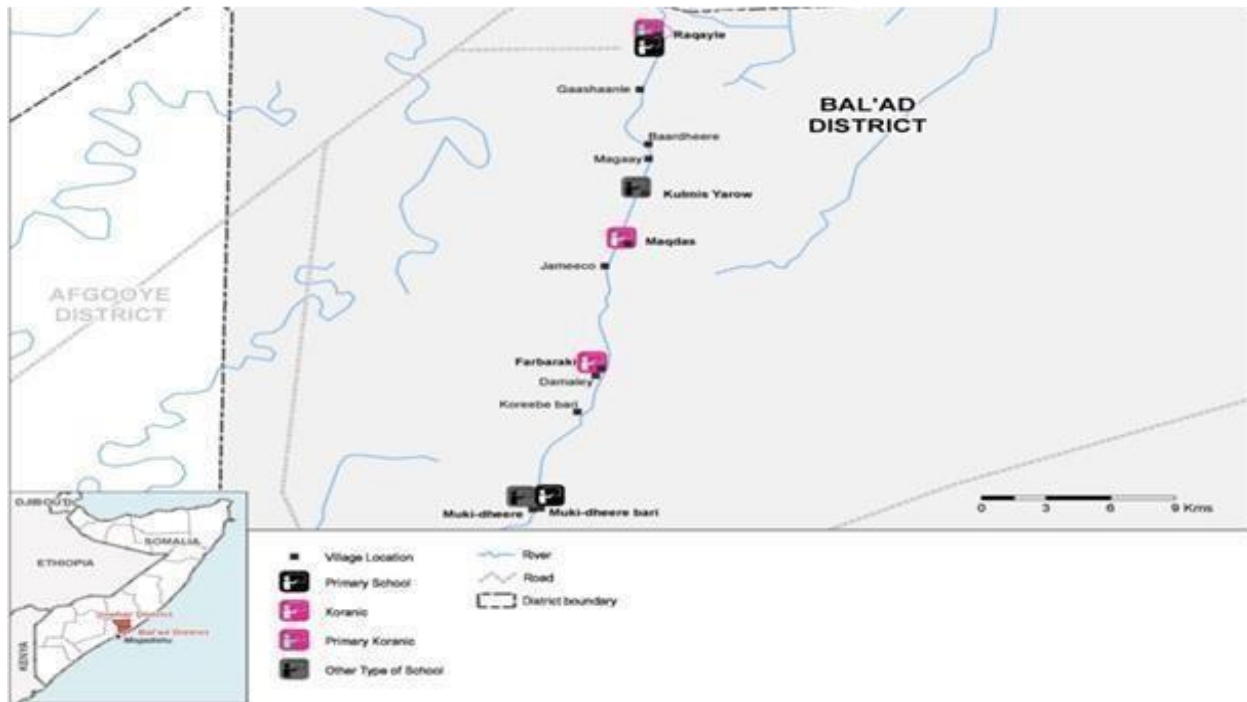
The study employed a cross-sectional survey design because it helps make inferences about populations across the study area. According to Reveille (2012), a cross-sectional survey design is described as a snapshot of the population based on the data it yields. It may be repeated periodically, and respondents can be intentionally sampled again at some point. The survey design is preferred for this because a survey is relatively less costly, easily accessible, and useful in describing the characteristics of a large population and making the results statistically significant even when analyzing the variables. The survey also makes data collection a flexible process, especially in deciding how the questions are administered to the respondents.

#### 3.3 Location of the study

The study was conducted in Bal'ad district. Bal'ad district is one of the districts of the middle Shabelle region of Somalia, and it is located about 36 kilometers northeast of the capital city of Mogadishu. The district is an area of 4,400 square kilometers (1,700 square miles) with an estimated population of 642,000 and 82 villages (Omar *et al.*, 2019). Bal'ad district has 30 villages, and these are occupied especially with sesame growers. The study was carried out in the ten villages of Kooreeb bari, Raqayle, Maqdas, Kulmis yarow, Mukidhere, Farbaraki, Mukidhere bari, Damaleey, Jameeco, and Gaashaanle, which belong to Bal'ad district (OCHA, 2015).

**Figure 3**

*Location of the study (OCHA, 2015).*



Bal'ad district is the second district after Jowhar district that produces a lot of tons of sesame product, which is being produced by many smallholder farmers, and those farmers need to increase their production because they are experiencing low productivity caused by the low accessibility of selected extension supports. This area was chosen for the study because farmers had recently shown interest in sesame farming. Another reason for the purposeful selection of the study areas was their proximity to the consumer center of the capital, Mogadishu, and port facilities for the export of sesame.

### **3.4 Target population**

This study targeted smallholder sesame farmers in the Bal'ad district. According to the 2022 agricultural census, with an estimated population of 642,000 and 82 villages, the district has almost 30 villages, including those that produce sesame crops other crops and livestock (Omar, 2018). The study targeted 3098 farmers from the 10 villages from which the sample for the study was chosen using simple random sampling. This formed a reachable population, which is divided into villages and presented in Table 1.

**Table 1***Location and number of sesame farmers in Bal'ad District*

<b>Village</b>	<b>Number of sesame farmers</b>
Kooreeb bari	177
Raqayle	616
Maqdas	904
Kulmis yarrow	366
Mukidhere	218
Farbaraki	227
Mukidhere bari	186
Damaleey	125
Jameeco	152
Gaashaanle	127
<b>Total</b>	<b>3,098</b>

Source: MoAI (2021).

**3.5 Sampling procedure and sample size**

A sample is a smaller number of the population that is allocated to make conclusions regarding the whole population. Sampling is the systematic process of selecting a few individuals for a study to represent the larger group from which they were selected. Purposive sampling was used to select the location of the study. Out of the 91 districts in Somalia, Bal'ad was chosen for the study. Bal'ad district was considered for the study because it is one of the districts that produces large quantities of sesame and has almost 30 villages of sesame farmers. Simple random sampling was used to narrow the field down to ten villages, from which the sample for the study was chosen. In addition, simple random sampling was used to obtain the desired sample at the village level. The sample for the study was guided by the Yamane's (1967)'s formula as indicated;

$$n = \frac{N}{1 + (e)^2}$$

Where n=the sample size

N= Population size (3098) and

e=Standard error = (0.08)<sup>2</sup>

$$n = 3098 / 1 + 3098 \times (0.08)^2 = 148$$

**Table 2***Distribution of sampled sesame farmers in the study area*

<b>Village</b>	<b>No. of sesame farmers</b>	<b>Proportion</b>	<b>Sample size</b>
Raqayle	177	6	9
Maqdas	616	20	30
Kulmis	904	29	43
Yarow	366	12	18
Mukidhere	218	7	10
Farbaraki	227	7	10
Mukidhere bari	186	6	9
Damaleey	125	4	6
Jamee'o	152	5	7
Gashanle	127	4	6
<b>Total</b>	<b>3,098</b>	<b>100</b>	<b>148</b>

### **3.6 Instrumentation**

The researcher administered a questionnaire with both closed and open-ended questions to collect data from the sampled farmers. The questionnaire was designed to enable the study to get relevant information about the influence of selected extension support services on sesame production. The option of 'tick (✓)' was employed in some parts of the questionnaire to get responses from respondents. Open spaces were used to record the answers from the respondents to obtain more information as per their views. The questionnaire was developed based on the study objectives and had three sections. Section A of the questionnaire was designed to collect information on input accessibility for sesame production, while Section B collected information on the accessibility and effects of credit services on sesame production; and Section C collected information on access to market information and its influence on sesame production. The second instrument was an interview; the researcher conducted an interview with banks, NGOs, cooperatives, input Suppliers Companies and district extension officers as extension service providers. The target respondents for the key informant interviews were extension service

providers, subject matter experts, local authorities and other key informants. The administering of the key informant's interview was guided by the researcher.

### **3.6.1 Validity**

The validity of a questionnaire means its ability to measure what it is meant to measure. It does establish the aspects of face validity, which involves experts looking at the questions in the questionnaire and approving that they are a valid measure of the idea that is being investigated just on its face (Bolarinwa, 2015). In addition, content validity ensures that the instrument captures all aspects of the study. Experts from the Department of Agricultural Education and Extension validated the questionnaire. Recommendations given were used to improve the instrument.

Furthermore, Validity covers collecting data in the actual area of investigation; validity is a measure of whether what is collected is of interest to the study (Taherdoost, 2016). The instrument must be face-and-content-validated. Face validity is a measurement that deals with the appearance of the instrument and its relevance to the context in which it is being administered (Pereira *et al.*, 2010). Content validity is used to check whether the instrument adequately covers all the content that relates to the variables under observations (Heale & Twycross, 2015). The researcher ensured that the instrument was valid by checking all the items and ensuring that they were measuring all the variables under observation. The researcher ensured that the appearance of the questionnaire relates to the respondents' convenience and doesn't contain unnecessary graphics or items that are not part of the study. The questionnaire was submitted to the supervisors at the Department of Agricultural Education and Extension, Egerton University, for validation.

### **3.6.2 Reliability**

A pilot study was carried out on a different population than that considered for this study to establish the reliability of the instrument before it was administered to the actual target population. The questionnaire was piloted in the Afgoi district, which has similar agricultural conditions to those in the Bal'ad district. A sample of 30 respondents was used for the piloting of the instrument. According to Connelly *et al.* (2008), 30 respondents are sufficient to test the reliability of the instrument. The Cronbach Alpha's test for reliability was used in establishing the reliability of the instrument. The instrument was deemed unreliable if a reliability coefficient of less than 0.7 was obtained, and it was revised accordingly.

### **3.6.3 Ethical considerations**

In this study, the respondents were informed that participation was voluntary so that they could make an informed decision about whether to participate or not. The researcher went with an introductory letter. Protecting respondents through data confidentiality also minimizes links between answers and identifiers, avoiding putting respondents in trouble. In addition, the researcher avoided political or tribal remarks, which are not gender-sensitive.

### **3.7 Data collection method**

Both quantitative and qualitative methods have been used to generate the necessary data to answer the research question and ensure that the data collection procedure is exhaustive and comprehensive. These methods complement one another and fill in the gaps left by the others in producing reliable data. When collecting quantitative data, especially during the exploratory phase, qualitative data were used to fill in the gaps that were discovered. An initial exploratory study was conducted to determine the top concerns on which to concentrate the main survey. For example, the researcher conducted informal group discussions, key informant interviews, and casual conversations with farmers, government officers, development agents, and experts.

The researcher obtained a clearance letter that allows him to conduct data collection from the graduate school at Egerton University. The researcher presented himself to the authorities in the Bal'ad district, Middle Shabelle region, seeking permission to start data collection. Upon being granted permission by the authorities to collect data, the researcher went to the respondents to administer the instrument. The researcher liaised with the Somali Agricultural Technical Group (SATG), which is in the private sector, and the district coordinator of the Ministry of Agricultural and Irrigation, who mediate between farmers' needs, the researchers' findings, and the interests of other stakeholders (e.g., extension providers), and who shared with them the list of sesame farmers from which they sampled the respondents to whom they administered the questionnaire. The questionnaires were administered by the researcher to achieve a high return rate and accuracy.

### **3.8 Data analysis**

The data collection was organized before being analyzed. It was organized into various categories that were different from each other, and through coding, the data were then

analyzed using SPSS version 22. Based on the objectives of the study and the nature of the data available, descriptive statistics such as percentages, frequencies, and mean square and T-test were used to analyze the influence of accessing inputs, credit, and market information on sesame production. Table 3 presents a summary of the data analysis procedures that were followed.

**Table 3**

*Data analysis summary*

<b>Research question</b>	<b>Variable</b>	<b>Data analysis</b>
How does access to farm input influence on sesame production by smallholder sesame farmers in Bal’ad district, Somalia?	Access to input	Frequencies percentages Standard deviation and T-test
How does access to farm credit influence on sesame production by smallholder sesame farmers in Bal’ad district, Somalia?	Access to credit	Frequencies percentages Standard deviation and T-test
How does access to farm market information influence on sesame production by smallholder sesame farmers in Bal’ad district, Somalia?	Access to market information	Frequencies percentages Standard deviation and T-test

## CHAPTER FOUR

### RESULTS AND DISCUSSIONS

#### 4.1 Introduction

Chapter four includes findings and discussions based on the objectives of the study. Completed surveys were received; the data was edited and coded, and the results were presented in tables and graphs. The researcher liaised with the Somali Agricultural Technical Group (SATG), which is in the private sector, and the district coordinator of the Ministry of Agricultural and Irrigation, who mediate between farmers' needs, the researchers' findings, and the interests of other stakeholders (e.g., extension providers), and who shared with them the list of sesame farmers from which they sampled the respondents to whom they administered the questionnaire. The questionnaires were administered by the researcher in order to achieve a high return rate and accuracy.

#### 4.2 Response rate on farm input influence on sesame production

Table 4 which shows the response rate of the questionnaires distributed to the sesame farmers. 148 questionnaires were prepared, and 145 of them were successfully filled out and returned properly, giving a 98% response rate. This was a high feedback rate that was seen as important for the inspirational driving test. The strategy for instrument association, which was well-planned for this situation, was used to get this high response rate. Similarly, the methods used to collect data, like interviews and questionnaires, make it possible to achieve a high response rate.

**Table 4**

*Respondents' response rate*

<b>Response rate</b>	<b>Frequency</b>	<b>Percent</b>
Responses	145	98
No response	3	2
<b>Total</b>	<b>148</b>	<b>100</b>

#### 4.2.1 Influence of extension support service on sesame production

It was necessary for the researcher to investigate on the influence of extension support service on Sesame production. Results are shown and discussed below.

**Table 5** *Influence of extension support service on sesame production*

<b>Response rate</b>	<b>Frequency</b>	<b>Percent</b>
Access to input	50	34
Access to credit	45	32
Access to market information	50	34
<b>Total</b>	<b>145</b>	<b>100</b>

In evaluating the influence of extension support service on sesame production, results were 34% for both access to input and access to market information while 32% was for access to credit. Results revealed that all three factors are influenced by extension support services for better sesame production in the Bal'ad district.

#### 4.2.2 Respondents' farm sizes

It was necessary for the researcher to know the farm size of the farmers. Results are shown and discussed below.

**Table 6**

*Respondents' farm sizes*

<b>Farm size</b>	<b>Frequency</b>	<b>Percent</b>
1-2 hectares	20	14
2-3 hectares	42	29
3-4 hectares	60	41
4-5 hectares	23	16
<b>Total</b>	<b>145</b>	<b>100</b>

From the findings on the size of farms that farmers of Sesame own, results were 41% for 3-4 hectares, 29% for 2-3 hectares, 16% for 4-5 hectares and 14% for 1 -2

hectares. The results revealed that Sesame production is common in the Bal’ad District occupying major farms than other plantations or productions.

#### 4.2.3 Average sesame yield (in kilograms) in the last farming season

It was necessary for the researcher to know farmers average sesame yield (in kilograms) in the last farming season. Results are shown and discussed below.

**Table 7**

*Average sesame yield (in kilograms) in the last farming season*

Average sesame yield in Kilograms	Frequency	Percent	SD	Mean
1-2 hectares	16	11	22.54	36.25
2-3 hectares	18	12		
3-4 hectares	39	27		
4-5 hectares	72	50		
<b>Total</b>	<b>145</b>	<b>100</b>		

From the findings on what is farmers' average sesame yield (in kilograms) in the last farming season, results were 50% for 400-500kg, 27% for 300-400kg, 12% for 200-300kg and 11% for 100=200kg. Results revealed that the production in Bal’ad District is successful resulting in farmers getting successful in their Sesame production. With the right inputs, farm size, and access to funds, Sesame production gets successful (Maryama, 2015).

Using a T-test to check the influence of input on sesame yield. To get the uniform distribution, we can calculate the expected frequency for each weight range:

$$\text{For the range 100-200 kg: } (200 - 100) / (500 - 100) * 145 = 29$$

$$\text{For the range 200-300 kg: } (300 - 200) / (500 - 100) * 145 = 29$$

$$\text{For the range 300-400 kg: } (400 - 300) / (500 - 100) * 145 = 29$$

$$\text{For the range 400-500 kg: } (500 - 400) / (500 - 100) * 145 = 58$$

$$\text{P-value} = -12.89$$

P-value for a t-value of -12.89 is very close to 0.

Therefore, the p-value is approximately 0 (or very close to it), indicating a highly significant difference between the different yields.

#### 4.2.4 Respondents' satisfaction with the sesame yield

It was necessary for the researcher to know whether the farmers of Sesame are satisfied with the yield. Results are shown and discussed in Table 8.

**Table 8**

*Respondents' satisfaction with the sesame yield*

<b>Farmer's satisfaction with sesame yield</b>	<b>Frequency</b>	<b>Percent</b>	<b>SD</b>	<b>Mean</b>
Yes	121	83	48.54	72.5
No	24	17		
<b>Total</b>	<b>145</b>	<b>100</b>		

From the yield findings on whether the farmers are satisfied with the yield, results were 83% for those who agreed while 17% was for those who did not agree on getting satisfied with the yield. With access to inputs and funds, the end produce satisfies the farmers (Maryama, 2015).

#### 4.2.5 Pesticides used in sesame production

It was necessary for the researcher to know the kind of pesticides farmers of Sesame used in sesame production. Results are shown and discussed below.

**Table 9**

*Pesticides used in sesame production*

<b>Pesticide</b>	<b>Frequency</b>	<b>Percent</b>	<b>SD</b>	<b>Mean</b>
Insecticides	133	92	53.47	24
Fungicides	2	1		
Bactericides	4	0		
Rodenticides	0	0		
Others	6	4		

<b>Total</b>	<b>145</b>	<b>100</b>
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From the findings on the kind of pesticides farmers of Sesame used in sesame production, results were 92% for insecticides, 4% for other, 3% for bactericides and 1.3% for fungicides. From the results, it is common that the Sesame plant is always applied with insecticides since it is vulnerable to insect attacks. When it comes to managing these small insects, sesame seed pest control is fairly easy to attain with insecticidal soap spray (Mohamed, 2015).

#### 4.2.6 Respondents' access to farm inputs

The researcher was interested to find out if farmers access farm input services. This was done to know the types of inputs issued to farmers. The results are shown below in Table 10, which shows 60% of those who gained access to farm input services while the remaining 40% was for those who did not gain access. It was therefore revealed that the provision of loans, other forms of financial support and the information regarding credit to the societies and institutions for Sesame farmers has been made available. For sesame productivity and a viable market, support should be provided and made available by the stakeholders (Adra, 2019).

**Table 10**

*Respondents' access to farm inputs*

<b>Access to input</b>	<b>Frequency</b>	<b>Percent</b>	<b>SD</b>	<b>Mean</b>
Yes	87	60	14.5	72.5
No	58	40		
<b>Total</b>	<b>145</b>	<b>100</b>		

The SD=14.5

Pooled proportion

$$\frac{87 \cdot 0.60 + 58 \cdot 0.40}{87 + 58}$$

$$87 + 58$$

=0.52

Standard error

$$\sqrt{\frac{0.52 \cdot (1-0.52)}{\frac{1}{87} + \frac{1}{58}}}$$

SE=0.74

The difference in proportions is statistically significant meaning there is a significant difference in the proportions of access to farm inputs between the two groups. One group easily access farm inputs while the other is not advantaged.

#### 4.2.7 Farm inputs accessed by respondents

The study wanted to discover the types of farm inputs that sesame farmers access. This was done to establish the inputs that are used by sesame farmers for better production. The results are summarized in Table 11, which shows which farm inputs Sesame farmers access, 33% were for accessing tractors, 28% for chemicals, 22% for improved seeds, 12% for irrigation, and 6% for labour. According to the results of the questionnaires, it was revealed that sesame farmers can access tractors that are donated to the village or hired at fair prices during the cultivation and preparation of the land. This is possible due to the accountability and availability of extension support service providers.

**Table 11**

*Farm inputs accessed by the respondents*

<b>Farm input</b>	<b>Frequency</b>	<b>Percent</b>	<b>SD</b>	<b>Mean</b>
Improved seeds	48	33	14.67	29
Chemicals	40	28		
Tractors	32	22		
Irrigation equipment	17	12		
Labour	8	5		
<b>Total</b>	<b>145</b>	<b>100</b>		

#### 4.2.8 Sesame inputs

The study also wanted to discover the farm inputs required to produce sesame. This was done to find out the exact inputs that should be included before sesame production.

The results are summarized below in Table 12. In finding out which farm inputs the sesame farmers require when producing sesame, 48% were for inorganic fertilizers like DAP, 33% were for organic fertilizers, 7% were for herbicides, 6% were for labour, and 5% were for pesticides. It was evident that most of the farmers preferred fertilizers to help increase production and boost the growth of the sesame. Most of the land in the district is not viable without the use of fertilizers, which is why extension services try to reach all the farmers by providing the required fertilizers. Fertilizers replace essential nutrients for sesame growth in the soil after they have been depleted (Noor, 2020).

**Table 12**

*Farm inputs required in sesame production*

<b>Farm input</b>	<b>Frequency</b>	<b>Percent</b>	<b>SD</b>	<b>Mean</b>
Organic fertilizers	49	34	26	29
Inorganic fertilizers	70	48		
Pesticides	7	5		
Herbicides	10	7		
Laborers	9	6		
<b>Total</b>	<b>145</b>	<b>100</b>		

#### 4.2.9 Improved sesame seed varieties in the last season

As noted in the table, the study sought to determine if sesame farmers used or used improved seed varieties in the last season. This was done in order to establish the types of seeds that sesame farmers used. The results are summarized below in Table 13.

**Table 13**

*Respondents' use of improved sesame seed varieties during the last season*

<b>Use of improved seed varieties</b>	<b>Frequency</b>	<b>Percent</b>
Yes	87	60
No	58	40
<b>Total</b>	<b>145</b>	<b>100</b>

In determining if the sesame farmers used improved sesame seed varieties in the last season, the results were 60% for those who used improved sesame seed varieties and 40% for those who did not. Results revealed that most of the farmers prefer improved sesame seed varieties to produce the best quality sesame. Through their departments, the extension services can introduce new sesame seed varieties that match and perform well in the weather of Bal’ad District. Increasing the quality of the seeds can increase the yield potential of the sesame significantly (Siad, 2021).

#### 4.2.10 Types of sesame seeds used

The study wanted to find out the kind of sesame seeds used. This was done to establish the best type of sesame seeds to use. The results are summarized below in Table 14.

**Table 14**

*Types of sesame seeds used*

Type of seed	Frequency	Percent
Certified	9	6
Uncertified	125	86
Both	11	8
<b>Total</b>	<b>145</b>	<b>100</b>

Investigating what kind of sesame seed varieties farmers’ use, the findings were 86% for those who used uncertified sesame seed varieties, 8% for both, and 6% for those who used certified. The local seeds do well in Bal’ad District and therefore do not require certification; the process is also engaging and expensive (Hussein *et al.*, 2023).

#### 4.2.11 Variety of sesame seeds being used

The researcher sought to find out what kind of variety of sesame seeds farmers use. The results are shown below and in Table 15.

**Table 15***Kind of variety of sesame seeds being used*

<b>Sesame variety</b>	<b>Frequency</b>	<b>Percent</b>
Local	103	71
Yamani	12	8
Nigerian	10	7
Humera	7	5
Abasena	13	9
<b>Total</b>	<b>145</b>	<b>100</b>

Investigating what kind of variety of sesame seeds farmers use, the results were 71% for local, 9% for Abanesa, 8% for Yamani, 7% for Nigerian, and 5% for Humera. The results were evident: most of the farmers prefer local seeds that have undergone extension support service certification and do well in the local weather and soil conditions (Amina, 2020). The other major reason is that the local seeds are profitable after maturity.

#### **4.2.12 Sources of sesame seeds**

The study also sought to find out the sources of the sesame seeds used. This was done in order to establish the relative quality of the planting materials that the sesame farmers used. The results are summarized below in Table 16.

**Table 16***Sesame seeds sources*

<b>Sesame seeds sources</b>	<b>Frequency</b>	<b>Percent</b>
Own seed	59	41
Public institutions/ centers	33	23
Private extension providers	38	26
Market	15	10
<b>Total</b>	<b>145</b>	<b>100</b>

In determining the sources of the seeds used, the results were 41% for own seeds, 26% for private extension providers, 23% for public institutions or centers, and 10% for the market. Findings revealed that the locally approved sesame seeds are the main sources of the seeds used. It is better to have a local source of seeds to avoid delay in seed preparation before the sesame season starts (Hassan *et al.*, 2018).

### 4.3 Response rate on access to credit on sesame production

The study sought to find out if the sesame farmers accessed credit, the sources of credit and the frequency of access from specific financial institutions

#### 4.3.1 Application of fertilizers in the garden in the last season

The study asked if sesame farmers had applied fertilizers in the garden in the last season. This was done in order to establish whether fertilizers help in production. The results are summarized below Table 17.

**Table 17**

*Application of fertilizers in the last season*

<b>Application of fertilizer in last season</b>	<b>Frequency</b>	<b>Percent</b>
Yes	67	46
No	78	54
<b>Total</b>	<b>145</b>	<b>100</b>

In determining whether sesame farmers applied fertilizers in their gardens in the last season, the results were 54% for those who did not apply and 46% for those who did. It was evident that some of the sesame farmers understand the benefits of fertilizers but lack the cash to purchase them or have no access to them. Therefore, extension support services should ensure more fertilizers reach all farmers in the villages of Bal'ad District (Usman, 2016).

#### 4.3.2 Borrowing credit to finance the sesame production

The study examined whether farmers borrow credit in order to finance sesame production. This was done in order to establish if farmers could manage sesame production without seeking credit or not. The results are summarized in Table 18. On the question of whether the respondents have ever borrowed credit to finance the sesame production, the results were 70% for those who gave no feedback and 30% for those who have ever borrowed. It was revealed that most of the Sesame farmers have not borrowed, with the reason being that they can generate enough income to sustain their business continuity without loans. Sesame farmers can save much in the absence of loans (Nancy, 2020).

**Table 18***Borrowing credit to finance the sesame production*

<b>Borrowed credit</b>	<b>Frequency</b>	<b>Percent</b>	<b>SD</b>	<b>Mean</b>
Yes	43	30	41.7	72.5
No	102	70		
<b>Total</b>	<b>145</b>	<b>100</b>		

**4.3.3 Seeking credit services on sesame production from the banks**

The study further examined whether farmers sought credit services from the banks. This was evaluated in order to know if farmers rely on credit services. The results are summarized below in the Table 19.

**Table 19***Seeking credit services for sesame production from banks*

<b>Sought credit</b>	<b>Frequency</b>	<b>Percent</b>
Yes	2	1
No	143	99
<b>Total</b>	<b>145</b>	<b>100</b>

In finding out if the Sesame farmers interact with you or seek credit services on Sesame production from the banks, the results were 99% for those who do not seek credit services and the remaining 1% for those who do seek credit services. Most of the responses were no because the study focused on smallholder farmers and credit services are only given to large-scale farmers (Mao, 2019).

The T-test to check how access to credit influences Sesame production. The results gave a P-value of 0.90. The p-value was above the reliable equal or greater than 0.70. There was a highly significant difference between those who interacted with banks to get credit and those who did not. Information of most farmers accessing credit was therefore reliable.

**4.3.4 Frequency of seeking credit services from the banks**

The purpose of the study was to determine how frequently farmers seek credit services from banks. The results are summarized below in Table 20. Which shows 1% seeks credit from the banks yearly while 99% don't seek any credit service from the banks.

**Table 20***Frequency of seeking bank services*

<b>Frequency of seeking bank services</b>	<b>Frequency</b>	<b>Percent</b>
Daily	0	0
Weekly	0	0
Monthly	0	0
Annually	23	1
Other	122	99
<b>Total</b>	<b>145</b>	<b>100</b>

In finding out how often farmers interact with or seek credit services on sesame production from the banks, the majority of results did not respond to this question since most of them did not get or apply for credit services since they were smallholder farmers. It was therefore revealed that most of the sesame farmers in Bal'ad District are smallholder farmers (Gavin, 2018).

#### **4.3.5 Use of loan accessed**

The study wanted to find out what Sesame farmers do with the loan(s). This was done to establish the various functions of loans being issued to farmers. The results are summarized below in the Table 21.

**Table 21***Use of accessed loans by sesame farmers*

<b>Loan uses</b>	<b>Frequency</b>	<b>Percent</b>
Buying input	23	1
Casual labor	0	0
Land	0	0
Other	122	99
<b>Total</b>	<b>145</b>	<b>100</b>

In establishing what Sesame Street farmers do with the loan(s) accessed, respondents did not respond positively to the question, with most of them having a different opinion. From the choices, the majority (99%) were of another opinion since the farmers were not qualified to get credit.

#### 4.3.6 Sources of loans for Sesame production

The researcher sought to find out where farmers acquired their loans for sesame production from. Results are shown in the Table 22.

**Table 22**

*Sources of loans for sesame production*

Sources of loans	Frequency	Percent	SD	Mean
Friends	14	10	43.7	29
Commercial banks	116	80		
Relatives	4	3		
Public credit providers	2	1		
Others	9	6		
<b>Total</b>	<b>145</b>	<b>100</b>		

In establishing where you received a loan for sesame production, results were 80% from commercial banks, 10% from borrowing friends, 6% from other sources, 3% from relatives and 1% from public providers. Banks act as credit facilities to help farmers in purchase farm inputs such as seeds, fertilizers and chemicals and pay later after production or during production where farmers pay with an interest (Mao, 2019).

#### 4.4 Response rate on access to market information on sesame production

The study also sought to find out if the sesame farmers accessed information on where to market their sesame. This involved finding out about their market outputs as well as the challenges encountered regarding market access information.

##### 4.4.1 Sesame market outlets

The study also interested where sesame farmers sell their produce. This was done to determine if there is a ready market for Sesame products. The results are summarized below in the Table 23. In trying to know where Sesame farmers sell their produce, results were 57% for those who sell to processors, 21% to hotels, 14% to schools/research Institutions and 9% to other farmers. Results revealed that ready markets of processors make it possible for the farmers to sell their products and grow more sesame.

**Table 23***Sesame market outlets*

<b>Sesame market outlets</b>	<b>Frequency</b>	<b>Percent</b>	<b>SD</b>	<b>Mean</b>
Other farmers	13	9	31	36
Sesame oil processors	82	56		
Schools/ research institutions	20	14		
Hotels	30	21		
<b>Total</b>	<b>145</b>	<b>100</b>		

**4.4.2 Challenges faced in accessing market information**

In trying to find out if farmers face challenges in accessing market information, questionnaire results were 76% for those who gave no feedback and 24% for those who agreed that farmers face challenges in accessing market information. According to the results below in Table 24, it was evident that the policymakers and Agricultural Extension experts understand the effectiveness of selected extension support services in assisting the sesame farmers with market information by providing a ready market (Ali, 2020).

**Table 24***Challenges faced in accessing market information*

<b>Experience market information access challenges</b>	<b>Frequency</b>	<b>Percent</b>	<b>SD</b>	<b>Mean</b>
Yes	35	24	53	73
No	110	76		
<b>Total</b>	<b>145</b>	<b>100</b>		

The T Test to check if farmers face challenges in accessing market information gave a P-value of 0.95. The p-value was above the reliable equal or greater than 0.70. There was a highly significant difference between those who faced challenges and those who faced no challenges.

**4.4.3 Sesame market price information**

The study also required finding out if the sesame farmers received market information on input and output prices in the last season for sesame production. This was necessary

so as to establish market organization for the farm produce in the country. The results are presented in Table 25.

**Table 25**

*Access to sesame price information*

<b>Access to sesame market price information</b>	<b>Frequency</b>	<b>Percent</b>
Yes	124	86
No	21	14
<b>Total</b>	<b>145</b>	<b>100</b>

In finding out if the sesame farmers received market information on input and output prices in the last season for sesame production as can be seen in above Table 19, the results were 86% for those who received market information on input and output prices in the last season for sesame production and 14% for those who did not receive. It was therefore revealed that, for prices, the farmers rely on local traders to know the current prices being traded. This shows that due to price changes, the farmers have to rely on local traders to adjust their prices for-profit purposes (Hagmann & Stepputat, 2016).

#### **4.4.4 Sesame market information sources**

The researcher sought to find out the sources of information on sesame production concerning the input and output prices in the last season for sesame production. The results are shown below in Table 26.

**Table 26**

*Sesame market information sources*

<b>Sources</b>	<b>Frequency</b>	<b>Percent</b>
Public extension providers	33	23
Non-profit extension providers	9	6
Farmer associations	10	7
Local traders	68	46
Fellow farmers	17	12
Ministry of Agriculture	3	2
Websites	1	1

Newspapers	4	3
<b>Total</b>	<b>145</b>	<b>100</b>

The researcher investigated the sources of information on sesame production concerning the input and output prices in the last season for sesame production. The results were 47% for local traders, 23% for public extension providers, 12% for fellow farmers, 7% for farmer associations, 6% for nonprofit extension providers, 3% for newspapers, 2% for the Ministry of Agriculture and Irrigation, and 1% from the website. Results revealed that the major sources of price changes depend on local traders. Local traders are the directly involved parties in local trade, and therefore current market prices depend on them (Maystadt & Ecker, 2014).

#### 4.4.5 Sesame products market distance

The researcher analyzed if sesame farmers have to travel long distances to market their sesame products, and the results were 97% for those who do not travel long distances, while 3% were for those who traveled long distances in order to search for markets. The results revealed that due to local traders, the products easily found buyers (Kahraman & Jama, 2024).

**Table 27**

*Sesame products market distance*

<b>Long distance to sesame markets</b>	<b>Frequency</b>	<b>Percent</b>
Yes	5	3
No	140	97
Total	145	100

#### 4.4.6 Challenges accessing input and output prices information during the last season

The researcher also sought to find out if the Sesame farmers experienced any problems accessing information on input and output prices in the last season. This was done to establish whether farmers experience challenges while accessing information on input and output prices. The results are summarized below in Table 28.

**Table 28***Challenges accessing input and output prices information during the last season*

<b>Experienced challenges</b>	<b>Frequency</b>	<b>Percent</b>
Yes	7	5
No	138	95
<b>Total</b>	<b>145</b>	<b>100</b>

In analyzing if the Sesame farmers experienced any problems with accessing information on input and output prices in the last season, the results were 95% for those who did not experience problems and 5% for those who did. The results revealed that local traders and the extension support services easily made information access easier for the farmers (Abebe, 2016).

#### **4.4.7 Sesame markets**

The researcher also sought to find where farmers sell their sesame production. The results are summarized in Table 29.

**Table 29***Sesame markets for farmers*

<b>Sesame markets</b>	<b>Frequency</b>	<b>Percent</b>
Brokers	95	66
Local traders	50	34
Others	0	0
<b>Total</b>	<b>145</b>	<b>100</b>

In analyzing where farmers sell their sesame production, the results were 65.5% for those that sell to brokers and 34% for local traders. The results revealed that brokers have a ready market making it possible for farmers to sell their produce immediately after harvest. The ready market is very important to keep production going (Morris, 2019).

## **CHAPTER FIVE**

### **SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS**

#### **5.1 Introduction**

This chapter summarizes the findings from chapter four and makes conclusions and recommendations based on the findings.

#### **5.2 Summary of findings**

The aim of the study was to investigate how certain factors, such as accessing inputs, credit, and market information, affect sesame production by smallholder farmers in the Bal'ad district of the middle Shabelle region in Somalia. The ultimate goal is to improve the production of sesame in the area. The study utilized both quantitative and qualitative methods to gather data from farm households regarding the impact of these factors on sesame production. Despite facing numerous challenges and experiencing significant production losses, the sesame crop sector in the country remains crucial to its economic recovery and long-term development. There is a lack of understanding of how small-scale farmers perceive their farming needs and how they respond to the services provided by the top-down extension system, which is a one-way flow of knowledge dissemination from experts to practitioners, such as government agents teaching farmers new agricultural techniques. Based on the study's findings, the researcher concludes that extension support services play a vital role in ensuring sesame farmers have access to inputs that positively impact sesame production. Through these services, farmers receive training on sesame production and small amounts of inputs like fertilizers and herbicides that have undergone testing before distribution. As all farmers require inputs to maintain their practice, these inputs become more affordable through extension services, and farmers rely on them to improve their production.

It is summarized that most smallholder farmers do not apply for loans since credit facilities give loans to large-scale farmers. This study therefore focuses on smallholder farmers, unlike large-scale farmers, who at some point will require funds to boost their production. The large-scale farmers, after accusing them of fraud according to the questionnaires given, revealed that most of them do well with increases in production and on-time salary payments.

New farmers were found to know less about sesame production. The extension support services were therefore in charge of enlightening the farmers on sesame production. Its preparation, planting, and harvesting days are the common information given by the support services. Without access to information, losses are experienced before and after harvest. The ready-to-market information is also provided by the support services. This helps the farmers have the next path to take in mind.

The study wanted to discover the types of farm inputs that sesame farmer's access. This was done to establish the inputs that are used by sesame farmers for better production. The results are summarized in Table 10. From Table 11 above, which shows which farm inputs Sesame farmers access, 33% were for accessing tractors, 28% for chemicals, 22% for improved seeds, 12% for irrigation, and 6% for labor. According to the results of the questionnaires, it was revealed that sesame farmers can access tractors that are donated to the village or hired at fair prices during the cultivation and preparation of the land. This is possible due to the extension support service providers' accountability and availability. Additionally, most of the interviewees felt that the NGOs don't go to these villages because of insecurity, but the farmers are called into town and then they are given some inputs. Some think they don't give them input, but we give the market only when they come to our places and call us, which isn't often. It was found that they had different opinions on that, meaning most of the producers needed to put in more effort to access the extension support services even though they were available. Furthermore, the results of the interview schedule revealed that some agricultural extension services, such as farm inputs, are sold to smallholder sesame farmers, but most beneficiaries are large-scale farmers who get the services for free, at no cost, or low cost. Other results from the interviews received were that NGOs selected some farmers to come to Bal'ad district or Mogadishu's capital city. This meant that the most beneficiary sesame producers were those that practice on a large scale.

In finding out if the Sesame farmers interact with you or seek credit services on Sesame production from the banks, the results were 99% for those who do not seek credit services and the remaining 1% for those who do seek credit services. Most of the responses were no because the study focused on smallholder farmers and credit services are only given to large-scale farmers. Additionally, Based on the interview schedule conducted on how smallholder farmers in these villages access agricultural extension support

services (farm inputs, credit, and market information), most of the interviewees believed that only large-scale farmers are qualified to get loans after meeting the requirements. Smallholder farmers cannot meet the requirements; therefore, most of the sesame producers are large-scale in the villages. In finding out if the sesame farmers received market information on input and output prices in the last season for sesame production, the results were 86% for those who received market information on input and output prices in the last season for sesame production and 14% for those who did not receive. It was therefore revealed that, for prices, the producers rely on local traders to know the current prices being traded. This shows that due to price changes, the producers have to rely on local traders to adjust their prices for-profit purposes. Additionally, a lot of challenges were mentioned, which included poor infrastructure, insecurity, high staff runoff, a lack of an innovation system, a lack of research institutions, unpredictable weather, the instability of the market, poor training on agrochemical usage, and poor communication between traders and farmers. With an in-depth investigation by the interviewer, it was found that these challenges are what led to extension support services to help sesame producers in this area of Bal'ad district.

To improve access to extension support services by smallholder sesame farmers, it became necessary to get the views of the interviewees concerning suggestions or recommendations that can work to improve the access of small farmers to extension support services factors such as farm inputs, credit, and market information in this area of Bal'ad district. Feedback ranged from limiting the borrower's ability to provide a house pawn; reducing rationed conditions; and stopping the ordering of smallholders, which is recommended to form cooperatives. Improving security so that extension support service providers can reach all areas of the villages; the government should hold providers and farmers accountable by providing public funds and irrigation channels; and the government should hold providers and farmers accountable by providing public funds and irrigation channels. All the recommendations mentioned were directed at the government, which ensures support services reach the people.

This meant that sesame was an important practice for the people of the Bal'ad district. Sesame production creates employment for most people/income and a source of revenue for the Bal'ad district and therefore it should be taken for granted ensuring recommendation implementation success. For this study, the inferential analysis used hypothesis Testing

showing the difference between groups through T-test. The difference in proportions is statistically significant meaning there is a significant difference in the proportions of access to farm inputs between the two groups. There is a statistically significant difference in sesame production between these groups.

### **5.3 Conclusions**

Based on the findings of this study, it is concluded that: Extension support services in the district should ensure all farmers records are taken and regular distribution of inputs to the farmers.

This will ensure continuity and a good relationship between the support services and farmers in terms of access to inputs. At least before the sesame plantation season starts, all farmers should be able to get inputs to allow fertile growth and later a successful harvest.

- i. It is concluded that this study covered small holder farmers who do not require or get credit; therefore, to access credit, the farmers must be large-scale farmers.
- ii. It is concluded that despite the small-holder sesame farmers having their own market, extension support services get involved by providing a ready market for sesame production. This makes it easier for farmers to obtain ready markets at lower prices.
- iii. Using T Test to check the influence of input on sesame yield gave a P-value for a t-value of -12.89 which is very close to 0, therefore, the p-value is approximately 0 (or very close to it), indicating a highly significant difference between the different yields.
- iv. The T Test to find access to farm inputs gave a 0.74 p value revealing that the difference in proportions is statistically significant meaning there is a significant difference in the proportions of access to farm inputs between the two groups. One group easily access farm inputs while the other is not advantaged.
- v. The T Test to check how accesses to credit influence on Sesame production. The results gave a P-value of 0.90. The p-value was above the reliable equal or greater than 0.70.
- vi. There was a highly significant difference between those who interacted with banks to get credit and those that did not. Information of most farmers accessing credit was therefore reliable.

- vii. The T Test to check if farmers face challenges in accessing market information gave a P-value of 0.95. The p-value was above the reliable equal or greater than 0.70. There was a highly significant difference between those who faced challenges and those who faced no challenges.

#### **5.4 Recommendations**

The study recommends the following:

- i. The study recommended that sesame production should be practiced on a large scale since it's a common production practiced in the district and many people can earn a good living from it.
- ii. According to the research, it is recommended that extension support services should guarantee that access to information about sesame production is readily available and offered to new farmers.
- iii. It is also recommended that credit be offered to all smallholder farmers rather than just large-scale farmers.
- iv. Market information should be available to all farmers so that the produce does not overstay its welcome after harvest.
- v. Each village in the district should have a sub-extension service office to ensure all farmers are served equally.

#### **5.5 Suggestions for further research**

Further studies into this study area are encouraged to further broaden the study on the influence of selected extension services on sesame production among smallholder farmers. A familiar study needs to be done in neighboring Baidoa to try and find out if similar results will be attained.

It is also suggested that further studies should be carried out to establish effective methods of information dissemination in Somalia. Such a study should compare the various methods, which are categorized into mass media, social media, group visits, and individual visits, and establish the best methods for the greatest impact.

## REFERENCES

- Abate, G. T., Abay, K. A., Chamberlin, J., Kassim, Y., Spielman, D. J., & Tabe-Ojong, M. P. J. (2023). Digital Tools and Agricultural Market Transformation in Africa: Why Are They Not at Scale Yet, and What Will it Take to Get There? *Food Policy*, *116*(23), 1-12.  
<https://doi.org/10.1016/j.foodpol.2023.102439>
- Abdulkadir, G. (2017). Assessment of Drought Recurrence in Somaliland: Causes, Impacts and Mitigations. *Journal Climatology Weather Forecasting*, *5*(2), 1-12. DOI: 10.4172/2332-2594.1000204
- Abdulle, Y. A., Hussein, M. F., Mohamed, A. M., Mohamud, A. H., Osman, A. F. I., Mohamuud, B. A., & Idiris, F. H. (2022). Effects of Soil Erosion on Crop Productivity in Afgoye, Lower Shabelle-Somalia. *International Journal of Plant, Animal and Environmental Sciences*, *12*(3), 115-122.  
<https://fortuneonline.org/articles/effects-of-soil-erosion-on-crop-productivity-in-afgoye-lower-shabelle-somalia.html>
- Abebe, N. T. (2016). Review of Sesame Value Chain in Ethiopia. *International Journal of African and Asian Studies*, *19*(1), 36-47.  
<https://core.ac.uk/download/pdf/234690065.pdf>
- Abdullahi, A. A., & Arisoy, H. (2022). Agricultural structure in Somalia. *Eurasian Journal of Agricultural Economics*, *2*(1), 1-14.  
<https://dergipark.org.tr/en/pub/ejae/issue/83852/1460761>
- Adra, N. (2019). The Impact of Male Outmigration on Women's Roles in Agriculture in the Yemen Arab Republic. <https://www.najwaadra.net/impact.pdf>
- Agada, M. O., & Jiriko, R. (2020). Youth Participation in Sesame Production in Gwer West Local Government Area of Benue State, Nigeria. *International Journal of Sustainable Agricultural Research*, *7*(3), 109-117.  
<https://ideas.repec.org/a/pkp/ijosar/v7y2020i3p109-117id297.html>
- Ahmed, A. M. (2018). *Practising On-farm Diversification and its Contribution to Food Accessibility among smallholder farmers of Balcad district, Middle Shabelle region, Somalia* (Master's Thesis, Van Hall Larenstein University).  
<https://www.semanticscholar.org/paper/Practising-on-farm-diversification-and-its-to-food-Ahmed/d9089092ae8d217a38361f05fe76d085d27e5cb1>

- Aidaa, A. M., Mana, N., Nawib, N. M., Latifb, I. A., & Shehua, N. I. (2021). The Effects of Foreign Aid Towards Agricultural Production Intention Among Farmers in Afgooye District, Somalia. *Food & Agribusiness Management*, 2(2), 67-70.  
<http://doi.org/10.26480/fabm.02.2021.81.84>
- Akudugu, M. A., Guo, E., & Dadzie, S. K. (2012). Adoption of Modern Agricultural Production Technologies by Farm Households in Ghana: What Factors Influence their Decisions? *Journal of Biology, Agriculture and Healthcare*, 2(3). 1-13  
[https://www.researchgate.net/publication/235751741\\_Adoption\\_of\\_modern\\_agricultural\\_production\\_technologies\\_by\\_farm\\_households\\_in\\_Ghana\\_What\\_factors\\_influence\\_their\\_decisions](https://www.researchgate.net/publication/235751741_Adoption_of_modern_agricultural_production_technologies_by_farm_households_in_Ghana_What_factors_influence_their_decisions)
- Ali, A. O. (2022). Challenges Facing Agribusiness Sector in Lower Shawele Region, Somalia. *East African Journal of Business and Economics*, 5(1), 187-195.  
<https://journals.eanso.org/index.php/eajbe/article/view/659>
- Antwi-Agyei, P., & Stringer, L. C. (2021). Improving the Effectiveness of Agricultural Extension Services in Supporting Farmers to Adapt to Climate Change: Insights from Northeastern Ghana. *Climate Risk Management*, 32(1).1-13.  
<https://doi.org/10.1016/j.crm.2021>.
- Bolarinwa, O. A. (2015). Principles and Methods of Validity and Reliability Testing of Questionnaires Used in Social and Health Science Researches. *Nigerian Postgraduate Medical Journal*, 22(4), 195-201. DOI: 10.4103/1117-1936.173959
- Camillone, N., Duiker, S., Bruns, M. A., Onyibe, J., & Omotayo, A. (2020). Context, challenges, and prospects for agricultural extension in Nigeria. *Journal of International Agricultural and Extension Education*, 27(4), 144-156.  
<https://doi.org/10.5191//jiaee.2020.274144>
- Connelly, P. J., Prentice, N. P., Cousland, G., & Bonham, J. (2008). A Randomised Double-blind Placebo-controlled Trial of Folic Acid Supplementation of Cholinesterase Inhibitors in Alzheimer's Disease. *International Journal of Geriatric Psychiatry: Journal of the Psychiatry of Late life and Allied Sciences*, 23(2), 155-160.  
<https://doi.org/10.1002/gps.1856>.
- Conteh, A. R. (2020). Ensuring Quality Fertilizer for Farmers in Sierra Leone. *Journal of Agriculture and Veterinary Science*, 13 (5). 48-57. doi: 10.9790/2380-1305014857.
- Couch, A., Gloaguen, R. M., Langham, D. R., Hochmuth, G. J., Bennett, J. M., & Rowland, D. L. (2017). Non-dehiscent Sesame (*Sesamum indicum L.*): Its Unique

- Production Potential and Expansion into the Southeastern USA. *Journal of Crop Improvement*, 31(2), 101-172.  
<https://www.tandfonline.com/doi/abs/10.1080/15427528.2017.1280575>
- De Janvry, A., & Sadoulet, E. (2020). Using Agriculture for Development: Supply- and Demand-side Approaches. *World Development*, 133(1), 1-14.  
<https://doi.org/10.1016/j.worlddev.2020.105003>
- Deka, N., Goswami, K., Thakur, A. S., & Bhadoria, P. B. S. (2020). Are Farmer Producer Companies Ready to Behave as Business Entities? Insights from the Vegetable-based Farmer Companies in West Bengal, India. *International Journal of Agricultural Sustainability*, 18(6), 521-536.  
<https://doi.org/10.1080/14735903.2020.1794213>
- dos Santos, G., Schroeder, A. J., Goodman, J. L., Strelets, V. B., Crosby, M. A., Thurmond, J., ... & FlyBase Consortium. (2015). FlyBase: Introduction of the *Drosophila Melanogaster* Release 6 Reference Genome Assembly and Large-scale Migration of Genome Annotations. *Nucleic Acids Research*, 43(1), 690-697.  
<https://academic.oup.com/nar/article/43/D1/D690/2437432> by Somali Federal Parliament user on 07 August 2024
- Elder, C. (2022). Logistics Contracts and the Political Economy of State Failure: Evidence from Somalia. *African Affairs*, 121(484), 395-417.  
<https://creativecommons.org/licenses/by/4.0/>
- Etonihu, K. I., Rahman, S. A., & Usman, S. (2013). Determinants of Access to Agricultural Credit Among Crop Farmers in a Farming Community of Nasarawa State, Nigeria. *Journal of Development and Agricultural Economics*, 5(5), 192-196.  
<https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=639dbb8f26e56eb6d28a291b6e06aea76b1862f7>
- European Union. (2010). *Review and Identification of the Agriculture Programme for Somalia* (9 ACP SO 3/52; Executive Summary and Main Report).  
[https://www.academia.edu/74093308/Review\\_and\\_Identification\\_of\\_the\\_Agriculture\\_Programme\\_for\\_Somalia?uc-sb-sw=62917315](https://www.academia.edu/74093308/Review_and_Identification_of_the_Agriculture_Programme_for_Somalia?uc-sb-sw=62917315)
- Freudenberg, M. (2014). *Trade and Private Sector Development* (Annual Report No. APR2 014; C2 Project Annual Report, p. 7). UNDP.  
<https://www.undp.org/sites/g/files/zskgke326/files/migration/so/6e3b2db4b1b1d68774e07fac204745dd82920d4c3fd57012940b31cca572e1c9.pdf>

- Gavin, R. T. (2018). *Improving the Agronomics and Economics of Cereal Production in Somalia's Lower Shebelle Riverine Region* (Master's Thesis, University of Minnesota).  
<https://www.proquest.com/openview/0ce3695ff9405dae85bad76175696b04/1?pq-origsite=gscholar&cbl=18750&diss=y>
- Gebremedhn, M. B., Tessema, W., Gebre, G. G., Mawcha, K. T., & Assefa, M. K. (2019). Value Chain Analysis of Sesame (*Sesamum indicum L.*) in Humera District, Tigray, Ethiopia. *Cogent Food & Agriculture*, 5(1), 1-11.  
<https://doi.org/10.1080/23311932.2019.1705741>
- Geretharan, T., Reid, J. I., Gray, D. I., & Ramilan, T. (2019). Agricultural Support Service Provision-the Voices of Smallholder Farmers from Post-war Northern Sri Lanka. *Rural Extension and Innovation Systems Journal*, 15(1), 30-39.  
<https://search.informit.org/doi/epdf/10.3316/informit.940467662666054>
- Getnet, K., & Anullo, T. (2012). Agricultural Cooperatives and Rural Livelihoods: Evidence from Ethiopia. *Annals of Public and Cooperative Economics*, 83(2), 181-198.  
<https://doi.org/10.1111/j.1467-8292.2012.00460.x>
- Gramzow, A., Batt, P. J., Afari-Sefa, V., Petrick, M., & Roothaert, R. (2018). Linking Smallholder Vegetable Producers to Markets-A Comparison of a Vegetable Producer Group and a Contract-Farming Arrangement in the Lushoto District of Tanzania. *Journal of Rural Studies*, 63(1), 168-179.  
<https://doi.org/10.1016/j.jrurstud.2018.07.011>
- Hagmann, T., & Stepputat, F. (2016). *Corridors of Trade and Power: Economy and State Formation in Somali East Africa*. Institut for Internationale Studier/Dansk Center for Internationale Studier og Menneskerettigheder.  
<https://forskning.ruc.dk/en/publications/corridors-of-trade-and-power-economy-and-state-formation-in-somal>
- Hananu, B., Abdul-Hanan, A., & Zakaria, H. (2015). Factors Influencing Agricultural Credit Demand in Northern Ghana. *African Journal of Agricultural Research*, 10(7), 645-652. <https://doi.org/10.5897/AJAR2014.%209330>
- Haruna, I. M. (2011). Dry Matter Partitioning and Grain Yield Potential in Sesame (*Sesamum indicum L.*) as Influenced by Poultry Manure, Nitrogen and Phosphorus at Samaru, Nigeria. *Journal of Agricultural Technology* 7(6), 1571-1577.  
<https://www.thaiscience.info/Journals/Article/IJAT/10841180.pdf>

- Haruna, I. M., & Abimiku, M. S. (2012). Yield of Sesame (*Sesamum indicum* L.) as Influenced by Organic Fertilizers in the Southern Guinea Savanna of Nigeria. *Sustainable Agriculture Research*, 1(1), 66-69. <https://ageconsearch.umn.edu/record/231409/?v=pdf>
- Hassan, A. A., Mohamed, M. M., Isak, N. N., & Mohamed, S. B. (2018). Export Performance and Economic Growth in Fragile Economies: the Case of Somalia. *Academic Research International*, 9(3), 108-117.
- Hassan, A. Y., & Mohamed, M. A. (2024). Dynamic Impacts of Economic and Environmental Performances on Agricultural Productivity in Somalia: Empirical Evidence from ARDL Technique. *Cogent Food & Agriculture*, 10(1), 1-13. <https://doi.org/10.1080/23311932.2024.2369204>
- Hussein, H. A., Khalif, M. A., & Warsame, A. A. (2023). The Impact of Trade Openness on Economic Growth in Somalia. *International Journal of Sustainable Development and Planning*, 18(1), 327-333. [https://repository.simad.edu.so/id/eprint/101/1/ijstdp\\_18.01\\_34.pdf](https://repository.simad.edu.so/id/eprint/101/1/ijstdp_18.01_34.pdf)
- Heale, R., & Twycross, A. (2015). Validity and Reliability in Quantitative Studies. *Evidence-Based Nursing*, 18(3), 66-67. <https://doi.org/10.1136/eb-2015-102129>
- Huang, & Lius. (1994). A Model for Technical Inefficiency Effects in a Stochastic Frontier Production Function for Panel Data. *Empirical Economics*, 20(2), 325–332. <https://doi.org/10.1007/BF01205442>
- Ibrahim, M. A. (2012). *Contribution of Commercial Banks to the Economic Development of Mogadishu, Somalia* (Doctoral Dissertation, Kampala International University). <https://ir.kiu.ac.ug/items/dafbb88b-cf2e-40d8-8f39-959dc21b040c>
- Ibrahim, M.M., & Ngina, J. (2019). The Economic Impact of Cooperatives in Somalia: Key Economic Issues and Potential for Development. Sipam Institute. [https://scholar.google.com/scholar?hl=en&as\\_sdt=0%2C5&q=Ibrahim%2C+M.+M.%2C+%26+Ngina%2C+J.+%282019%29.+The+economic+impact&btnG=](https://scholar.google.com/scholar?hl=en&as_sdt=0%2C5&q=Ibrahim%2C+M.+M.%2C+%26+Ngina%2C+J.+%282019%29.+The+economic+impact&btnG=)
- Ilesanmi, T. O., Awolola, V. G., Ii, O. R. U., Mustapha, S., & Lawal, T. M. (2020). Sesamum Indicum and Trichilia heudelotii N-hexane and Ethanol Extracts: Effective Remedy Against Callosobruchus Maculatus F.(Coleoptera: Chrysomelidae) Infesting Cowpea Grains. *Selcuk Journal of Agriculture and Food Sciences*, 34(3), 214-222. <http://sjafs.selcuk.edu.tr/sjafs/index>

- Ismaan, H. N., Isse, M. M., Siad, S. A., Islam, M. S., & Sidkar, S. I. (2020). Evaluation of new Sesame Varieties for Growth and Yield Performance in Summer Season in Afgoi, Somalia. *IOSR Journal of Agriculture and Veterinary Science*, 13(1), 58-61. DOI: 10.9790/2380-1305015861
- Jama, A. M., & Kahraman, A. (2024). Farming Legumes for Food Security and Agricultural Sustainability in Somalia. *Selcuk Journal of Agriculture and Food Sciences*, 38(1), 147-157. <https://dergipark.org.tr/en/pub/selcukjafsci/issue/84294/1430340>
- Jimale, A. (2020a). *Exploring Possibilities of Using Smartphones to Deliver Agricultural Advisory Services in Afgooye District -Somalia* (Master's Thesis) Swedish University of Agricultural Sciences. [https://stud.epsilon.slu.se/15400/1/jimale\\_a\\_200303.pdf](https://stud.epsilon.slu.se/15400/1/jimale_a_200303.pdf)
- Jimale, A. (2020b). *Exploring Possibilities of Using Smartphones to Deliver Agricultural Advisory Services in Afgooye District -Somalia* [University Thesis]. Sveriges Lantbruksuniversitet Swedish University of Agricultural Sciences. [https://stud.epsilon.slu.se/15400/1/jimale\\_a\\_200303.pdf](https://stud.epsilon.slu.se/15400/1/jimale_a_200303.pdf)
- Kefyalew, G. Determinants of Smallholder Farmers' Participation in Sesame Production: Evidence from Diga, Ethiopia. In: Wolde Mekuria. (ed). 2013. Rainwater Management for Resilient Livelihoods in Ethiopia: Proceedings of the Nile Basin Development Challenge Science Meeting, Addis Ababa, 9–10 July 2013. NBDC Technical Report 5. Nairobi, Kenya: International Livestock Research Institute. <https://core.ac.uk/download/pdf/132646602.pdf>
- Kubayo, K. S. (2009). *Analysis of Agricultural Input Supply System: The Case of Dale Woreda, Southern Nations, Nationalities and Peoples' Region* (Doctoral Dissertation, Haramaya University). <https://cgspace.cgiar.org/items/2ea00283-2b8d-425d-83df-010e11561da1>
- Labarthe, P., & Laurent, C. (2013). Privatization of Agricultural Extension Services in the EU: Towards a Lack of Adequate Knowledge for Small-scale Farms? *Food policy*, 38(1), 240-252. <http://dx.doi.org/10.1016/j.foodpol.2012.10.005>
- Langham, D., Zhang, H., & Miao, H. (2021). *World Sesame Production: The Sesame Genome, 1*. Springer. <https://doi.org/10.1007/978-3-319-98098-0>

- Liao, C. (2020). *The Role of Agricultural Extension Services and Farmers' Practices in Meeting Smallholder Farmers' Needs in China* (Doctoral Dissertation, The University of Queensland). <https://core.ac.uk/download/pdf/328924523.pdf>
- Longley, C., Jones, R., Ahmed, M. H., & Audi, P. (2001). Seed Sector Study of Southern Somalia. *Final Report Submitted to the EC Somalia Unit*. [https://www.researchgate.net/profile/Catherine-Longley-2/publication/268042361\\_SEED\\_SECTOR\\_STUDY\\_OF\\_SOUTHERN\\_SOMALIA/inks/54b7aa2e0cf2bd04be33b7b1/SEED-SECTOR-STUDY-OF-SOUTHERN-SOMALIA.pdf](https://www.researchgate.net/profile/Catherine-Longley-2/publication/268042361_SEED_SECTOR_STUDY_OF_SOUTHERN_SOMALIA/inks/54b7aa2e0cf2bd04be33b7b1/SEED-SECTOR-STUDY-OF-SOUTHERN-SOMALIA.pdf)
- Madukwe, M. C., & Anugwa, I. (2020). Provisions for Agricultural Extension Services in the Implementation Manuals of the World Bank Assisted Fadama Development Projects in Nigeria: Gaps and Lessons. *Journal of Agricultural Extension*, 24(3), 138-151. <https://www.ajol.info/index.php/jae/article/view/198663>
- Magesa, M. M. (2014). Access to Agricultural Market Information by Rural Farmers in Tanzania. *International Journal of Information and Communication Technology Research* [Master's Thesis, Sokoine University of Agriculture, Tanzania]. <http://41.59.85.213/handle/20.500.12479/470>
- Makama, S. A., Ilu, I. Y., Usman, S., & Haruna, S. K. (2018). Assessing the Effect of Agricultural Extension Services on Sesame Farmers' Productivity and Efficiency in Jigawa State, Nigeria. *Nigerian Journal of Agricultural Extension*, 19(1), 1-15. <https://doi.org/10.1007/978-3-319-98098-0>
- Makawia, P. J. (2018). *Agricultural Information Needs and their Accessibility to Sesame Producers in Morogoro District, Tanzania* (Doctoral Dissertation, Sokoine University of Agriculture). <http://hdl.handle.net/123456789/91086>
- Maystadt, J. F., & Ecker, O. (2014). Extreme Weather and Civil war: Does Drought Fuel Conflict in Somalia Through Livestock Price Shocks?. *American Journal of Agricultural Economics*, 96(4), 1157-1182. <https://doi.org/10.1093/ajae/aau010>
- Mavuthu, A. K. (2017). *Effect of the National Accelerated Agricultural Inputs Access Subsidy Program on Fertilizer Usage and Food Production in Kakamega County, Western Kenya* (Doctoral Dissertation, Walden University). <https://www.proquest.com/openview/1d553080f1f67d1646fe848e06165972/1?pq-origsite=gscholar&cbl=18750>

- Menkhaus, K. (2014). State failure, State-Building, and Prospects for a “Functional Failed State” in Somalia. *The Annals of the American Academy of Political and Social Science*, 656(1), 154-172. DOI: 10.1177/0002716214547002
- Michael, A., Tashikalma, A. K., & Maurice, D. C. (2018). Agricultural Inputs Subsidy in Nigeria: an Overview of the Growth Enhancement Support Scheme (GESS). *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*, 66(3), 781-789. <https://doi.org/10.11118/actaun201866030781>
- MoAI. (2021). *Draft for National Agricultural Extension Policy of Ministry of Agriculture and Irrigation of Somalia*. Unpublished.
- Mohamed, B. M. (2015). *The Role of Information Dissemination Approaches on Climate Change and Food Security in Jowhar, Somalia* (Doctoral Dissertation, University of Nairobi). <http://erepository.uonbi.ac.ke/handle/11295/91130>
- Mohamed, H. M. (2018). *Challenges of Promoting Food Security Policies in Kenya, (1990-2017)*. (Doctoral dissertation, University of Nairobi). <http://erepository.uonbi.ac.ke/handle/11295/105846>
- Mohamed, M. M., Isak, N. N., & Roble, D. H. (2019). Private Sector Developments in Somalia: Analysis on Some Major Sectors. *International Journal of Economics, Commerce and Management*, 7(12), 938-951. [https://www.researchgate.net/profile/Najibullah-Isak/publication/338229873\\_Private\\_sector\\_developments\\_in\\_Somalia\\_analysis\\_on\\_some\\_major\\_sector/links/5e09ace392851c8364a492b5/Private-sector-developments-in-Somalia-analysis-on-some-major-sector.pdf](https://www.researchgate.net/profile/Najibullah-Isak/publication/338229873_Private_sector_developments_in_Somalia_analysis_on_some_major_sector/links/5e09ace392851c8364a492b5/Private-sector-developments-in-Somalia-analysis-on-some-major-sector.pdf)
- Mulupi, D. K., Sibiko, K. W., & Mose, P. B. (2021). Fertilizer Subsidy Program a Strategy of Addressing low Maize Productivity in Kakamega County. *International Journal of Agricultural Extension and Rural Development Studies*, 8(5), 44-62. <https://tudr.org/id/eprint/133/>
- Munyua, B., Orr, A., & Okwadi, J. (2013). Open Sesame: A Value Chain Analysis of Sesame Marketing in Northern Uganda. Socio-economics Discussion Paper Series 6. <https://oar.icrisat.org/7095/>
- Msuya, C. P., Annor-Frempong, F. K., Magheni, M. N., Agunga, R., Igodan, C., Ladele, A. A., ... & Ndiaye, A. (2017). The Role of Agricultural Extension in Africa’s Development, the Importance of Extension Workers and the Need for Change. *International Journal of Agricultural Extension*, 5(1), 51-58

- Muse, N. M., Tayfur, G., & Safari, M. J. S. (2023). Meteorological Drought Assessment and Trend Analysis in Puntland Region of Somalia. *Sustainability*, *15*(13), 10652. <https://doi.org/10.3390/su151310652>
- Musyoka, H. J. (2017). *Influence of Socio-economic Status on the Access to Agricultural farm Inputs by Smallholder Farmers in Yatta Sub-county of Machakos County, Kenya* (Doctoral Dissertation, University of Nairobi). <http://erepository.uonbi.ac.ke/handle/11295/102221>
- Naik, A., Patil, D. H., Teggelli, R. G., & Ahamed, B. Z. (2016). Productivity Enhancement of Sesame (*Sesamum indicum L.*) Through Improved Production Technologies/Frontline Demonstrations. *Res Environ Life Sci*, *9*(5), 573-574. [https://www.researchgate.net/profile/Dh-Patil/publication/326668282\\_Productivity\\_enhancement\\_of\\_sesame\\_Sesamum\\_indicum\\_L\\_through\\_improved\\_production\\_technologies\\_frontline\\_demonstrations/links/5b5c0287a6fdccf0b2fcaebc/Productivity-enhancement-of-sesame-Sesamum-indicum-L-through-improved-production-technologies-frontline-demonstrations.pdf](https://www.researchgate.net/profile/Dh-Patil/publication/326668282_Productivity_enhancement_of_sesame_Sesamum_indicum_L_through_improved_production_technologies_frontline_demonstrations/links/5b5c0287a6fdccf0b2fcaebc/Productivity-enhancement-of-sesame-Sesamum-indicum-L-through-improved-production-technologies-frontline-demonstrations.pdf)
- Najeeb, U., Mirza, M. Y., Jilani, G., Mubashir, A. K., & Zhou, W. J. (2012). *Technological Innovations in Major World Oil Crops*. Springer. [https://doi.org/10.1007/978-1-4614-0356-2\\_5](https://doi.org/10.1007/978-1-4614-0356-2_5)
- Noor, R. S., Hussain, F., Abbas, I., Umair, M., & Sun, Y. (2020). Effect of Compost and Chemical Fertilizer Application on Soil Physical Properties and Productivity of Sesame (*Sesamum Indicum L.*). *Biomass Conversion and Biorefinery*, *13*(1), 1-11. <https://doi.org/10.1007/s13399-020-01066-5>
- Nwafor, C. U., Ogundeji, A. A., & Nwafor, I. C. (2021). Review of Agricultural Extension and Advisory Services in Sub-Saharan African countries. Progress with Private Sector Involvement. *Journal of Agribusiness and Rural Development*, *3*(61), 271-282. DOI: 10.20944/preprints202008.0294.v1
- Nzomo, M., & Muturi, W. (2014). The Effect of Types of Agricultural Credit Programmes on Productivity of Small-scale Farming Businesses in Kenya: A Survey of Kimilili Bungoma Sub-County. *Journal of Economics and Sustainable Development*, *5*(23), 150-161. <https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=4172be9f96cd2669eb76405a0bca81085b955f7d>
- OCHA. (2015). *Somalia Middle Shabelle Location of Schools in Assessed Districts of Jowhar and Balad.pdf*. Unpublished

- Okello, G., Devereux, G., & Semple, S. (2018). Women and Girls in Resource Poor Countries Experience Much Greater Exposure to Household Air Pollutants than Men: Results from Uganda and Ethiopia. *Environment International*, 119(1), 429-437.  
<https://doi.org/10.1016/j.envint.2018.07.002>
- Omar, A. A. (2018). *Assessment of Irrigation Water Supply Losses in Major Irrigation Canals in Bal'ad District of Middle Shabelle Region in Somalia* (Doctoral Dissertation, University of Nairobi).  
<http://erepository.uonbi.ac.ke/handle/11295/106848>
- Omar, A. A., Omuto, C., & Ondieki, S. (2019). Determination of Irrigation Supply Efficiency in Challenging Environment Case Study of Bal'ad District, Middle Shabelle Region in Somalia. *Computational Water, Energy, and Environmental Engineering*, 8(1), 1-10. [https://www.scirp.org/html/1-2570181\\_89753.htm](https://www.scirp.org/html/1-2570181_89753.htm)
- Opee, P. O. (2018). *Selected Factors Influencing Cotton Production Among Smallholder Farmers in Bura Irrigation and Settlement Scheme, Kenya* (Doctoral Dissertation, Egerton University).  
<http://41.89.96.81:8080/xmlui/handle/123456789/1765>
- Osman, H., & Theuri, F. (2016). *Factors Influencing Production of Sesame Seeds in Somalia (Case Study: Jowhar and Bal'ad District Farmers, Middle Shebelle Region)* (Master's Thesis, Jomo Kenyatta University of Agriculture and Technology). <https://www.ajol.info/index.php/jae/article/view/198663>
- Pereira, E. J., Kroner, D. G., Holden, R. R., & Flamenbaum, R. (2010). Testing Shneidman's Model of Suicidality in Incarcerated Offenders and in Undergraduates. *Personality and Individual Differences*, 49(8), 912-917.  
<https://doi.org/10.1016/j.paid.2010.07.029>
- Peterman, A., Behrman, J. A., & Quisumbing, A. R. (2014). *A Review of Empirical Evidence on Gender Differences in Nonland Agricultural Inputs, Technology, and Services in Developing Countries*. Springer. [https://doi.org/10.1007/978-94-017-8616-4\\_7](https://doi.org/10.1007/978-94-017-8616-4_7)
- Ragasa, C., & Mazunda, J. (2018). The Impact of Agricultural Extension Services in the Context of a Heavily Subsidized Input System: The case of Malawi. *World Development*, 105(1), 25-47. <https://doi.org/10.1016/j.worlddev.2017.12.004>
- Ragasa, C., Mazunda, J., & Kadzamia, M. (2016). *The Impact of Agricultural Extension Services in the Context of a Heavily Subsidized Input System* (No. 01498). IFPRI

- Discussion Paper. <https://cgspace.cgiar.org/server/api/core/bitstreams/832593b3-ec63-44ba-b891-aa991e18fb8d/content>
- Reveille, J. D., Witter, J. P., & Weisman, M. H. (2012). Prevalence of Axial Spondylarthritis in the United States: Estimates from a Cross-sectional Survey. *Arthritis Care & Research*, 64(6), 905–910. <https://doi.org/10.1002/acr.21621>.
- Salami, A., Arawomo, D. F., Kayizzi-mugerwa, S., & John, C. (2013). Empirical Analysis of Agricultural Credit in Africa: Any Role for Institutional Factors. *African Development Bank Group*, 192 (1), 1-28. <https://ideas.repec.org/p/adb/adbwps/995.html>
- SATG. (2016). *Sesame in Somalia | SATG | Somali Agriculture Technical Group*. <https://satg.org/sesame-in-somalia/>. (Accessed on March 13, 2024)
- Santoro, A., Pini, E., Scurti, M., Palmas, G., Berendsen, A., Brzozowska, A., & Commelin, E. (2014). Combating inflammation through a Mediterranean whole diet approach: the NU-AGE project's conceptual framework and design. *Mechanisms of Ageing and Development*, 136(1), 3-13. <https://doi.org/10.1016/j.mad.2013.12.001>
- Schmitt, E. (2012). *The Importance of Social Networks to Inform and Support Farmers About Adaptation Strategies Regarding Climate Change in Côte d'Ivoire* (Master's Thesis, Federal Institute of Technology). <https://doi.org/10.3929/ethz-a-009899608>
- Seko, K. K. (2009). *Analysis of Agricultural Input Supply System: The Case of Dale Woreda, Southern Nations, Nationalities and Peoples' Region* [Master's Thesis, Haramaya University]. <https://cgspace.cgiar.org/server/api/core/bitstreams/d37f436d-df3b-4de2-904f-07b9fcc469ed/content>
- Said, M., & Ibrahim, M. M. (2023). A Comprehensive Overview of Challenges and Prospects in Large-Scale Rice Production Among Farmers in Jawhar, Middle Shabelle, Somalia. *Biomedical Journal of Scientific & Technical Research*, 52(5), 44155-44163.  
DOI: 10.26717/BJSTR.2023.52.008321
- Siad, S. A., Ismaan, H. N., Isse, M. M., Mohamud, A. O., Islam, M. S., & Mohamed, A. E. (2021). Evaluation of New Sesame Varieties for Growth and Yield Performance during the Deyr Season in Afgoye, Somalia. *Asian Journal of Research in Crop Science*, 6(2), 1-7. <http://journal.scienceopenlibraries.com/id/eprint/126/>
- Somali Agriculture Technical Group (SATG) (2017). *Purifying Somali Sesame Seeds*. <https://satg.org/>. (Accessed July, 28, 2023).
- Strangio, D., & Strangio, D. (2012). Analysis of the Economic System of Somalia. *The Reasons for Underdevelopment: The Case of Decolonisation in Somaliland*, 39-74.

- [https://doi.org/10.1007/978-3-7908-2778-1\\_2](https://doi.org/10.1007/978-3-7908-2778-1_2)
- Suvedi, M., Ghimire, R., & Kaplowitz, M. (2017). Farmers' Participation in Extension Programs and Technology Adoption in Rural Nepal: A Logistic Regression Analysis. *The Journal of Agricultural Education and Extension*, 23(4), 351–371.  
<https://doi.org/10.1080/1389224X.2017.1323653>
- Swift, J. (2019). *Pastoral Development in Somalia: Herding Cooperatives as a Strategy Against Desertification and Famine*. CRC Press.  
<https://www.taylorfrancis.com/chapters/edit/10.1201/9780429050893-11/pastoral-development-somalia-herding-cooperatives-strategy-desertification-famine-jeremy-swift>
- Taherdoost, H. (2016). Validity and Reliability of the Research Instrument; How to Test the Validation of a Questionnaire/survey in Research. *International Journal of Academic Research in Management*, 5(3), 28-36. <https://hal.science/hal-02546799/>
- Tekele, T. G. (2019). Promoting Female Leaders in Somali Region, Ethiopia: An Entrepreneurship Approach. *International Journal of Sociology and Anthropology*, 11(2), 18-26.  
<http://www.academicjournals.org/IJSA>
- Temesgen, F., Emanu, B., Mitiku, F., & Gobana, E. (2017). Application of Multivariate Probit on Determinants of Sesame Farmers Market Outlet Choices in Gimbi District, Ethiopia. *African Journal of Agricultural Research*, 12(38), 2830-2835.  
<https://doi.org/10.5897/AJAR2017.12605>
- Theingi, M., Aung, Y. M., Aye, M. S., & Eimon Thida Kyaw. (2017). YAU-JICA Technical Cooperation Project Assessment of Sesame Supply Chain Management in Magway Region Myanmar JICA TCP Research Report Document of RC01-2 in YAU-JICA Technical Cooperation Project. <https://doi.org/10.13140/RG.2.2.34893.69608>
- Triomphe, B., Waters-Bayer, A., Klerkx, L., Schut, M., Cullen, B., Kamau, G., & Borgne, E. L. (2014). *Proceedings of the International Workshop on Agricultural Innovation Systems in Africa, 29–31 May 2013, Nairobi, Kenya*.  
<http://aisa2013.wikispaces.com/ais+workshop>
- Ubfal, D., & Maffioli, A. (2010). *The Impact of Funding on Research Collaboration: Evidence from Argentina* (No. IDB-WP-224). IDB Working Paper Series.  
<https://hdl.handle.net/10419/89079>

- Usman, S. (2016). *Analysis of Wheat Value Chain: the Case of Sinana District, Bale Zone, Oromia Region, Ethiopia* (Doctoral dissertation, Haramaya University).
- Varghese, A., Edwards, B., Mitra, G., & Rendell, A. P. (2017). Programming the Adapteva Epiphany 64-core Network-on-chip Coprocessor. *The International Journal of High Performance Computing Applications*, 31(4), 285-302. DOI: 10.1177/1094342015599238
- Wamucii, S. (2020). Somalia Sesame Seeds Market Insights. *Selina Wamucii*. <https://www.selinawamucii.com/insights/prices/somalia/sesame-seeds/>. (Accessed on February, 6, 2024)
- Warsame, A. A., Sheik-Ali, I. A., Ali, A. O., & Sarkodie, S. A. (2021). Climate Change and Crop Production Nexus in Somalia: Empirical Evidence from ARDL technique. *Environmental Science and Pollution Research*, 28(16), 19838-19850. <https://doi.org/10.1007/s11356-020-11739-3>
- Weiland, S., Hickmann, T., Lederer, M., Marquardt, J., & Schwindenhammer, S. (2021). The 2030 Agenda for Sustainable Development: Transformative Change Through the Sustainable Development Goals? *Politics and Governance*, 9(1), 90-95. <https://www.cogitatiopress.com/politicsandgovernance/article/viewFile/4191/1984>
- Weingärtner, L., Humphrey, A., Sheikh, M., & Levine, S. (2022). Obstacles to and Opportunities for Anticipatory Action in Somalia. *Supporting Pastoralism and Agriculture in Recurrent and Protracted Crises (SPARC)*. <https://www.sparc-knowledge.org/sites/default/files/documents/resources/Obstacles%20to%20and%20opportunities%20for%20anticipatory%20action%20in%20Somalia%20Final.pdf>
- Yeshitila, M., Bunyasiri, I., Sirisupluxana, P., & Suebpongsakorn, A. (2020). The Impact of Contract Farming on Technical Efficiency in Ethiopia's Smallholder Sesame Production. *Journal of the Austrian Society of Agricultural Economics*, 16(4), 57-66. <https://www.sagepublisher.com/volume/JASAE/16/4/the-impact-of-contract-farming-on-technical-efficiency-in-ethiopias-smallholder-sesame-production-5f00865d3f54b.pdf>
- Yigezu Wendimu, G. (2021). The Challenges and Prospects of Ethiopian Agriculture. *Cogent Food & Agriculture*, 7(1), 1-26. <https://doi.org/10.1080/23311932.2021.1923619>

Yusuf, I. A. (2018). *Agricultural Production and Economic Growth in Somalia from 1986 to 2016* (Doctoral dissertation, Kampala International University).  
<https://ir.kiu.ac.ug/items/b56424fd-c2c5-4862-9e43-cae88f35a044>

## APPENDICES

### Appendix A: Research Questionnaire

#### Influence on selected extension support services for Sesame Production among Smallholder Farmers

##### Introduction

I am **Mohamed Hassan Mohamed**, a student pursuing a Master of Science degree in Agricultural Extension at Egerton University, the main Campus Njoro. I am conducting a research study on selected factors influencing sesame production among smallholder farmers in Bal'ad district. The study findings might be used to inform the Ministry of Agriculture and Irrigation, and other stakeholders on factors that influence sesame production and in turn take appropriate interventions to improve levels of production among smallholder farmers. You have been chosen to provide correct information that might help to improve sesame production in this district. Your responses were treated with the highest level of confidentiality.

##### Section A: Access to Inputs of the Respondent

1. What is your farm size?  
1-2 hectares ( )      2-3 hectares ( )      4 hectares ( )      5 hectares ( )
2. What was your average sesame yield (in kilograms) in the last farming season?  
100-200 kg ( )      200-300kg ( )      300-400kg ( )      400-500kg ( )
3. Are you satisfied with your sesame yield? Yes ( )      No ( )
4. Do you access farm input services?  
Yes ( )      No ( )
5. If yes, which farm inputs do you access? Improved seeds ( )    Chemical ( )  
)    Tractor ( ) irrigation equipment ( )  
) Labour ( ) Others,  
specify.....  
.....
6. Which farm inputs do you require when producing sesame production?

Organic fertilizers ( ) Inorganic fertilizers ( ) Pesticides ( ) Herbicides ( )

Laborers ( )

Other, please specify .....

7. Did you use improved sesame seed varieties in the last season?

Yes ( ) No ( )

a) If yes, what kind of seeds

did you use? Certified ( )

Uncertified ( )

Both ( )

8. What kind of variety of sesame seeds do you use? (Tick one)

Local ( ) Yamani ( ) Nigeria ( ) Humera ( ) Abasena ( )

9. Which one is the most profitable variety among the above varieties? (Tick one)

Local ( ) Yamani ( ) Nigeria ( ) Humera ( ) Abasena ( )

10. What are the sources of the seeds used? (Tick

one) Own seeds ( ) Public institutions/centers (

)

Private extension providers ( ) market (

)

Others, please specify .....

11. Have you applied fertilizers in your sesame garden in the last season? Yes ( ) No ( )

a) If yes, what kind of fertilizers did use in the last season? (Tick one)

None ( ) Organic fertilizer ( ) Inorganic fertilizer ( ) both ( )

12. What kind of pesticides do you use in sesame

production? Insecticides ( ) Fungicides ( ) Bactericides

( ) Herbicides ( )

Rodenticides ( ) other, please

specify.....

.....

13. What difference have you realized in using farm inputs? (Tick all that apply) Increased crop yield ( ) Increased income Lowering production costs ( )

Ability to produce more with less land ( )

Others, please specify .....

**Section B: Information on Access to Credit on Sesame Production**

14. Have you ever borrowed credit to finance the sesame production? (Tick one)

Yes ( ) No ( )

a) If no, please provide reason (s).....

b) If yes, please state where you received your loan for sesame production from

Borrowing from friends ( ) Commercial banks ( ) Relatives ( ) Public providers ( )

Others,

specify.....

(ii). Please indicate the influence of the loan on sesame production received from the above loan providers.

15. Do you interact or seek credit services on sesame production from the banks?

Yes ( ) No ( )

a) If no, give a reason.....

b) If yes, how often do you interact? (Tick one)

Daily ( ) Weekly ( ) Monthly ( ) Yearly ( )

16. What do you do for the loan (s) you access on sesame production? Please (Tick one)

For buying inputs ( ) for casual Labourers ( ) For land ( )

17. Where do you sell your sesame product? Please (Tick one)

Sesame oil ( ) Processors ( ) Schools/ Research institutions ( ) Hotels ( ) Other farmers ( )

Others (specify) .....

**Section C: Information on Access to Market information on sesame Production**

18. Are there challenges you face in accessing Market information?

Yes ( ) No ( )

19. Tick the following statements that apply to you on the accessibility of markets for the Sesame production. Never ( ) Sometimes ( ) Always ( )

20. Did you receive market information on input and output prices in the last season for Sesame production? Yes ( ) No ( )

21. If yes, please indicate the source of information (Tick one) Public extension providers ( ) Non-profit private extension providers ( ) Profit extension providers ( ) Farmer associations ( ) Local traders ( ) Fellow farmers ( ) Ministry of Agriculture and Irrigation ( ) Website ( ) Newspaper ( )

Others,

specify.....

22. Do you have to travel long distance to market your sesame products? Yes ( ) No ( )

If yes, please indicate the distance

.....

23. Please, indicate where you sell your sesame production. (Tick one)

Brokers ( ) Local traders ( )

24. Did you experience any problem with accessing information on input and output price in the last season? (Tick one) Yes ( ) No ( )

If yes, please

indicate.....

## Appendix B: Key Informant Interview Guide

1. How do smallholder farmers in these villages access to extension support services (farm inputs, credit and market information)?

.....

2. To accelerate the availability of extension support services how do private banks provide agricultural, credits in this area of Bal’ad district?

.....

3. According to your view what are the factors that influence the provision to extension support services to sesame farmers such as farm inputs, credit and market information?

.....

4. What are the main challenges faced by extension services providers in delivering extension support services like farm inputs, credit and market information?

.....

5. How are agricultural extension services, such as farm inputs, credit and market information offered to the smallholder sesame farmers?

.....

6. What are your suggestions or recommendations that can work to improve the access of extension support services factors of farm inputs, credit and market information by small farmers in this area?

.....

## Appendix C: Map of Bal'ad District



## Appendix D: Research Permit

**EGERTON**

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**OFFICE OF THE DIRECTOR GRADUATE SCHOOL**

EM12/13595/19

12<sup>th</sup> September, 2022

Ref:.....

Date:.....

The Director General  
National Commission for Science Technology and Innovation,  
P. O. Box 30623-00100  
**NAIROBI**

Dear Sir,

**RE: REQUEST FOR RESEARCH PERMIT – MR. MOHAMED HASSAN  
MOHAMED REG. NO. EM12/13595/19**

This is to introduce and confirm to you that the above named student is in the Department of Agricultural Education & Extension, Faculty of Education & Community Studies, Egerton University.

He is a bona-fide registered M.Sc student in this University. His research topic is **“Influence of Selected Extension Support Services on Sesame Production Among Smallholder Farmers in Bal’ Ad District, Somalia.”**

He is at the stage of collecting field data. Please issue him with a research permit to enable him undertake the studies.

Your kind assistance to him will be highly appreciated.

Yours faithfully,

A handwritten signature in blue ink over a circular blue stamp. The stamp contains the text 'BOARD OF POSTGRADUATE STUDIES' and '12 SEP 2022'.

**Prof. George M. Ogendi, PhD.**  
**DIRECTOR, BOARD OF POSTGRADUATE STUDIES**

GMO/vk

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Transforming Lives Through Quality Education

## **Influence of Selected Extension Support services on Sesame Production Among Smallholder Farmers in Bal'ad District, Somalia**

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**ABSTRACT:** *Sesame is valuable cash crop in Somalia, as a significant income source for smallholder farmers. Its cultivation and trade make substantial contributions to the national economy, generating revenue and creating employment opportunities. Farmers face challenges related to poor-quality seeds, limited fertilizers, and a lack of proper pest control practices. The paper was to investigate the influence of selected factors (access to farm inputs, access to credit, and access to market information) on sesame production among smallholder farmers in Bal'ad district/Middle Shabelle/Somalia. The target population was 3098 sesame farmers. Purposive sampling and simple random sampling were used to select a sample of the respondents. The sample size was 148 farmers. The study used both quantitative and qualitative methods. Descriptive and inferential statistics were used to analyze the data. The paper recommends that extension support services should guarantee that access to inputs of sesame production is available and offered to new farmers.*

**KEYWORDS:** Influence, extension support services, sesame production, smallholder farmers

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