Sudan University of Science and Technology
College of Graduate Studies
Department of Agricultural Economics

Analysis of Value Chain and Competitiveness of Sesame Crop in Gadarif State- Sudan

تحليل سلسلة القيمه والتنافسية لمحصول السمسم بولاية القضارف ـالسودان

A thesis submitted for the fulfillment of the requirements of the degree of Ph.D. in Agricultural Economics

By:

Salwa Ali Mohammed El Hassan Abd Alla

BSc. Agricultural Economics, University of Khartoum (1994)

MSc. Agricultural Economics, University of Khartoum (2008)

Supervisor:

Prof. DR. Hag Hamid Abd Alaziz

Co- Supervisor

Dr. Intisar Yousif Ahamed Elbashir

July 2022

Dedication

To Soul of my dear mother & father

To my sincere sister & brothers

To my lovely son Mohammed

To all my friends everywhere,

I offer this work.

Salwa

Acknowledgments

This work could not have been completed without God's guidance, wisdom, provision of good health and brining the right people to assist me at the different stages of the study.

I would like to sincerely thank my main supervisor Prof. Hag Hamid Abd Alaziz for his advising and supporting me. I would also express my sincere thanks to Co. supervisor Dr. Intisar Yousif Ahamed Elbashir for her unlimited cooperation.

I want to give special thanks to the Ministry of Agriculture in Gadarif State for supporting me during field stage by providing two employees to work with me in the survey, especial thanks to Sunia and Huwedia Hassan for helping me in data collection.

I am very grateful indeed to my employer the Ministry of Agriculture and Natural Resources especially General Department of Planning and Agric. Economics, a lot of thanks and gratitude go to soul of Dr. Nabeel Ahamed Saeed for helping me in research proposal preparation.

Finally, I am very grateful to my family for supporting and encouraging me, I am so thankful to my sister's son Mohammed Mustafa for helping me in different stages of the study.

Abstract

The main objective of this study is to analyze the sesame crop value chain and its competitiveness in Gadarif State in order to identify the challenges and opportunities throughout the value chain stages. Also, to determine the contributions of all actors in the value added and profits of sesame, as well as, to estimate the socioeconomic factors influencing producers' profitability. Both primary and secondary data were used in the study. Multistage random sampling technique and purposive sample procedure were used to collect the primary data for the season 2019/2020 using questionnaires. The total sample size was 230 participants (150 farmers, 30 wholesalers, 15 traditional processors, 15 exporters, 15 oil retailers and 5 cake traders). Secondary data was collected from different relevant sources of the study. In addition to linear regression and SWOT analysis, descriptive, functional, and quantitative analyses were used to analyze the data. Descriptive analysis showed that the key actors of the value chain in the study area included input suppliers, producers (farmers), wholesalers, processors, exporters, retail traders. The majority of them within the economic active age (20-60 years) and they had primary or secondary education. Functional analysis revealed that sesame has been traded in big quantities through different activities of the value chain. Quantitative analysis indicated that farmers added largest share of value and got highest gross marketing margins. While the exporters and traders received highest share of profits. Most of the value added in the value chain was due to high transportation cost and cost of losses. The coefficient of private profitability (CPP) indicated the profitability of sesame in all value chain stages. However, the return from investment of one SDG to the farmer was found to be very low. This implies low farmer's profitability. Export parity price at farm gate level revealed that exporting 10% with the official exchange rate was not rewarding for the exporters. Regarding linear regression analysis the results revealed that Producer's profitability was affected positively by productivity, selling price and selling directly after harvest and negatively by harvesting cost and the experience of the farmers. SWOT analysis showed a lot of advantages and opportunities in the sesame value chain stages such as presence of good climate, labor employment, existence of local and global markets and high demand for sesame oil and cake. On the other hand, there were some challenges and

weaknesses such as absence of improved seeds, high infection by pests and diseases, presence of brokers, high transportation cost. The study suggests some recommendations as: use of improved high yielding and disease resistant varieties, raise farmers' skills, improve the efficiency of marketing system, use of effective pricing policies, strengthen export promotion and encourage investments in the sesame oil manufacturing.

المستخلص

الهدف الرئيس من هذه الدراسة هو تحليل سلسلة قيمة محصول السمسم وقدرته التنافسية في ولاية القضارف من أجل تحديد التحديات والفرص خلال مراحل سلسلة القيمة. أيضًا لتحديد مساهمات جميع الجهات الفاعلة في القيمة المضافة والأرباح من السمسم ، وكذلك لتقدير العوامل الاجتماعية والاقتصادية التي تؤثر على ربحية المنتجين. تم استخدام كل من البيانات الأولية والثانوية في الدراسة. تم استخدام أسلوب العينات العشوائي متعدد المراحل وإجراء العينة القصديه لجمع البيانات الأولية للموسم 2020/2019 عن طريق الاستبيانات. بلغ حجم العينة الإجمالي 230 مشاركًا (150 مزارعًا ، و 30 تاجر جملة ، و 15 مصنعاً تقليديًا ، و 15 مصدرًا ، و 15 تاجر تجزئة للزيت ، و 5 تاجر امباز). تم جمع البيانات الثانوية من مصادر مختلفة ذات صلة بالدراسة. بالإضافة إلى الانحدار الخطي وتحليل SWOT ، تم استخدام التحليلات الوصفية والوظيفية والكمية لتحليل البيانات. أظهر التحليل الوصفي أن الجهات الفاعلة الرئيسية في سلسلة القيمة في منطقة الدراسة شملت موردي المدخلات والمنتجين (المزارعين) وتجار الجملة والمصنعين والمصدرين وتجار التجزئة. غالبيتهم في سن النشاط الاقتصادي (20–60 سنة) وحصلوا على تعليم ابتدائي أو ثانوي. أظهر التحليل الوظيفي أنه تم تداول السمسم بكميات كبيرة من خلال أنشطة مختلفة لسلسلة القيمة. أشار التحليل الكمي إلى أن المزارعين أضافوا النصيب الأكبر من القيمة وحصلوا على أعلى هوامش إجمالية للتسويق. بينما حصل المصدرون والتجار على أعلى حصة من الأرباح. يرجع معظم القيمة المضافة في سلسلة القيمة إلى ارتفاع تكلفة النقل وتكلفة الفاقد. يشير معامل الربحية الخاصة (CPP) إلى ربحية السمسم في جميع مراحل سلسلة القيمة ومع ذلك ، وجد أن العائد من استثمار واحد جنيه سوداني للمزارع منخفض للغاية، وهذا يعني انخفاض ربحية المزارع. كشف سعر المساواه للصادرات على المستوى المزرعي أن تصدير 10٪ بسعر الصرف الرسمي لم يكن مجدياً للمصدرين. فيما يتعلق بتحليل الانحدار الخطي أوضحت النتائج أن ربحية المنتج قد تأثرت إيجابياً بالإنتاجية وسعر البيع والبيع مباشرة بعد الحصاد وسلبًا بتكلفة الحصاد وخبرة المزارعين. أظهر تحليل SWOT الكثير من المزايا والفرص في مراحل سلسلة قيمة السمسم مثل وجود المناخ الجيد ، وتوظيف العمالة ، ووجود الأسواق المحلية والعالمية ، وارتفاع الطلب على زيت السمسم والامباز. من ناحية أخرى كانت هناك بعض التحديات ونقاط الضعف مثل عدم وجود بذور محسنة ، وارتفاع الإصابة بالآفات والأمراض ، ووجود السماسرة ، وارتفاع تكلفة النقل. تقترح الدراسة بعض التوصيات مثل: استخدام أصناف محسنة ذات إنتاجية عالية ومقاومة للأمراض ، رفع مهارات المزارعين ، تحسين كفاءة نظام التسويق ، استخدام سياسات تسعير فعالة ، تعزيز ترويج الصادرات وتشجيع الاستثمار في تصنيع زيت السمسم.

List of Contents

List of Tables

List of Figures

List of Maps

Abbreviations and Acronyms

ARC	Agricultural Research Corporation
CPP	Coefficient of Private Profitability
CBS	Central Bank of Sudan
DW	Durbin Watson
FOB	Free on Board
GDP	Gross Domestic Product
GCC	Global Commodity Chain
ha	Hectare
ITC	International Trade Centre
IPPC	International Plant Protection Convention
Kg	Kilogram
MOAF	Ministry of Agriculture and Forestry
MOI	Ministry of Industry
MOH	Ministry of Health
MT	Metric Ton
NGOs	Non-Governmental Organizations
NMM	Net Marketing Margin
OECD	Organization for Economic Co-operation and Development
PAM	Policy Analysis Matrix
PGM	Producer Gross Margin
PPD	Plant Protection Directorate
SWOT	Strength, Weakness, Opportunities and Threats
SPSS	Statistical Package for Social Sciences
SSMO	Sudanese Standards and Metrology Organization
SPS	Sanitary and phyto-sanitary
SDG	Sudanese Geinah
TGMM	Total Gross Marketing Margin
TGPM	Total Gross Profit Margin
VCA	Value Chain Analysis
VIF	Variance Inflation Factor

List of appendixes

CHAPTER ONE

Introduction

CHAPTER ONE

Introduction

1.1 Background

Agriculture is one of the most important productive sectors in Sudanese economy especially after secession of South Sudan and the reduction of oil contribution to the Gross Domestic Product (GDP). Its contribution is about 31% in 2017 (Luigi C., *et al*, 2018). The agricultural sector has an important role in achieving food security by increasing food production and providing employment opportunities in the rural areas. Crops produced are diversified including cereals (such as sorghum, millet, wheat, rice and maize), oilseeds (mainly sesame, groundnuts and sunflowers), industrial crops (cotton and sugarcane), fodder crops (alfalfa, fodder sorghum), pulses (broad beans and pigeon peas) and horticultural crops (okra, onions, tomatoes, citrus, mango, etc.). Crop production is practiced under three main systems: irrigated agriculture, semi-mechanized rain-fed agriculture and traditional rain-fed agriculture. Semi-mechanized rain-fed agriculture is practiced in Gadarif, Kassala, Blue Nile, Sennar, White Nile and South Kordofan states, the crops produced in this sector are sorghum, sesame, sunflower and millet.

Oil crops are the main crops in Sudan and come in second place after cereals in terms of area. Groundnuts, sesame, cotton seed and sun flower are the most important oil crops. Sesame comes in the second place after groundnuts in terms of production and in first in terms of area. These oil crops represent a major and important source of vegetable oils. They also play an important role in Sudan exports. The main sesame exporters worldwide include India, Ethiopia, Nigeria, Sudan, China, Paraguay, Myanmar, and Mexico. As can be seen in table (1.1), Sudan ranked number

fourth in the world total production in 2016 (Myanmar produced 812000 Mt tons; India 797000 Mt tons; China 649000 Mt tons; Sudan 525000 Mt tons and Ethiopia 267000 Mt tons). Sudan ranked first in term of area harvested (2,134(000ha), whereas in term of yield it ranked fifth (0.25 tones/ha). High yield of sesame is achieved in china (1.56 tones/ha), in spite of that, it ranked fourth in term of export quantities and this due to high consumption. As for Sudan, it ranked third in export quantities as a result of low yield (www.fao.org/faostat.).

Table (1.1): Comparison between Sudan and main producers and exporters of Sesame (2016)

Country	Area harvested 000 ha	Rank	Production 000 tones	Rank	Yield kg/ha	Rank	Export quantities 000tones	Rank
China	417.5	4	649.5	3	1560	1	34.5	4
India	1900	2	797.7	2	420	4	279.7	1
Myanmar	1495.2	3	812.9	1	540	3	33.3	5
Sudan	2134.8	1	525	4	250	5	219.6	3
Ethiopia	337.9	5	267.8	5	790	2	240	2

Source: Fao.org/faostat.

Sudan's markets for sesame are quite diversified; China, India and Malaysia are the main and biggest markets in Asia countries. Saudi Arabia, Lebanon and Syria are the major importers of sesame in the Arab countries. In African countries Egypt, Tunisia and Algeria are the traditional markets. In industrial countries, the main partners are Greece, Japan, Italy and Canada. In Europe, the main market is Turkey. From figure (1.1) it appeared that the values of sesame export during the period 2010 to 2020 increased in some markets especially in Asia markets, it reached the maximum in year 2020 (379.7 million dollars) except in year 2019, the high values comes from Arab countries (2020-2003،بنك السودان). The main

markets of sesame in United States and others industrial countries have little share of values due to low quality of the Sudan's sesame seeds and inability to comply with sanitary and phyto-sanitary (SPS) standards.

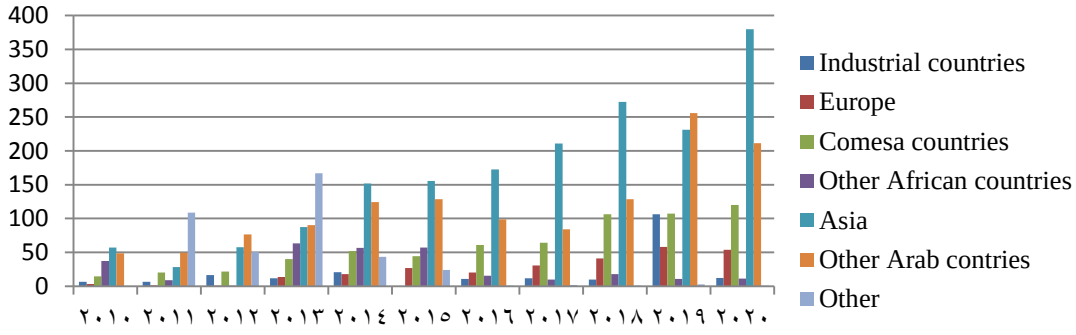


Figure (1.1): Main markets for Sudanese sesame seeds in the world (Values in million dollars)

Source: Foreign Trade Statistical Digest (2010- 2020) - Central Bank of Sudan

Sesame production in Sudan is categorized into two types of farming: semi-mechanized rain-fed farming and traditional rain-fed farming. The traditional rain-fed farming produces 44% of the total production. It occupies considerable acreage of about 52% from total areas and is mostly practiced by smallholder farmers. On the other hand, semi-mechanized rain-fed farming produces 56% of the country's sesame seeds and occupies an area of about 48% from total areas in Sudan, (see appendix 1). Semi-mechanized rain-fed farming is generally practiced by large farmers and companies with large investments. Gadarif state is the main state in the semi-mechanized rain fed in producing sesame; it contributes by 33% of sesame produced in semi-mechanized and 19% from total sesame produced in Sudan, (see appendix 2). Sudan's yield of sesame seeds is relatively low and fluctuates under both mechanized and traditional rain-fed production systems this is largely due to the distribution of rainfall, shattering variety of sesame, poor technology (manual harvesting). The average yield in semi mechanized was 109.6 Kg/fed whereas in traditional

rain fed was 82 kg/fed and in Gadarif state was 116 kg/fed, (see appendix3).

About 61% of Sudan production of sesame exported as sesame seeds, an average of 307.5 thousand ton and worth of about 325 million dollars (see appendix 4). Only white sesame is exported as grain while the lower-quality red sesame is processed domestically.

During the period (2000- 2020) the areas planted by sesame in semi mechanized sector and the areas planted in Gadarif state fluctuated up and down due to climatic factors and sometimes expansion of the areas planted by sorghum at the expense of sesame areas. The areas decreased and fluctuated from 71% in 2000 to 45% in 2020. Consequently, the share of semi mechanized in total production decreased from 80% in 2000 to 49% in 2020. These lead to big variability of export quantities during this period. There was rapid increase in exports during 2014 to 2018 (299.7 to 704.5 thousand tons). In contrast the year 2019 showed drop to 582 thousand tons, in spite of high production, this may attributed to high prices of Sudan which leads partners to change to cheaper markets (figure 1.2).

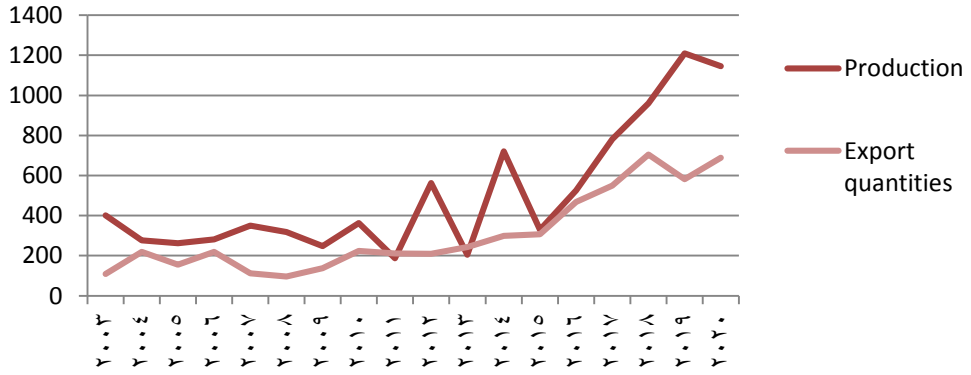


Figure (1.2): Production of sesame and export quantities (000ton)

Source: MOA and Bank of Sudan

The prices of sesame vary based on its color, quality, oil contents, origin, moisture content and purity. According to the International Trade Centre (ITC), the average world price of sesame reached 1229 US$/ton in 2018 (Azad Rahman et al., 2019). Comparing Sudan sesame price with Indian and Nigerian sesame prices during the period 2010 to 2019 (as in figure 1.3), it appeared that the highest price was in 2014 for Indian sesame price (2515 US$/ton). Interestingly, in the years followed the Sudanese' sesame price started to rise up and exceeded Indian sesame. This led import partner countries to change from Sudan to cheaper markets. High export prices of Sudan may be due to high local prices. It appeared from figure (1.4) that the prices of Gadarif and average Sudan prices increased from year 2010 to 2014. Then the prices dropped in the next two years, namely 2015 and 2016. The following years showed dramatic change, where it increased in the year 2019 by 431% in Gadarif and 390% in average of Sudan.

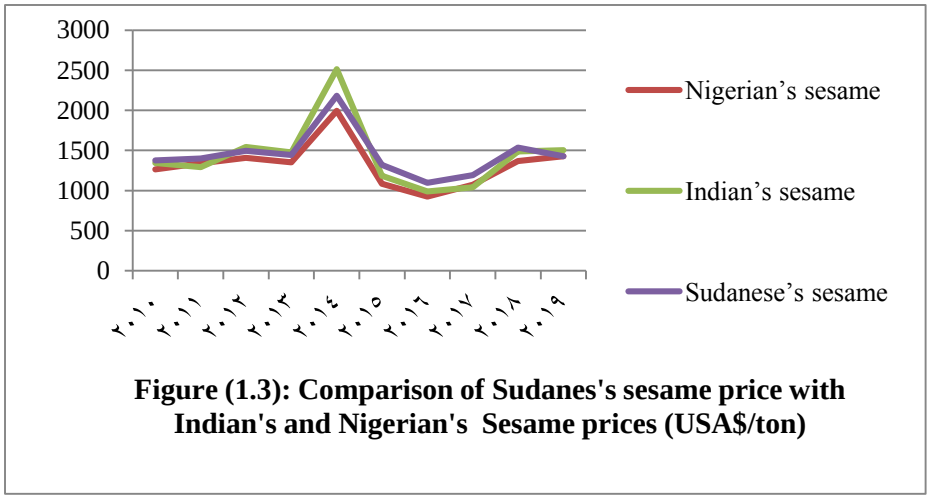


Figure (1.3): Comparison of Sudanes's sesame price with Indian's and Nigerian's Sesame prices (USA$/ton)

Source: Sudanese Trade Point

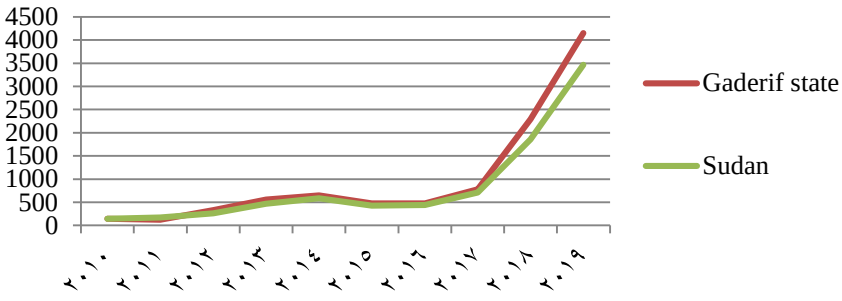


Figure (1.4): Local Sesame prices in Gadarif state and average of Sudan (SDG/Gantar)

Source: Ministry of Agriculture and Natural Resource

1.2 Statement of the Problem

Sesame crop is an important cash crop in Sudan, it contributed by 771.6 million dollars to GDP in 2019 (بنك السودان، 2019). Semi-mechanized rain fed sector is the main contributor of sesame especially in Gadarif state. Despite of its importance in the economy potentiality and competitiveness were restrained and challenged by some factors that hinder its contribution. Elfadil, (2015) mentioned some constraints associated with rainfall variability, low yield, land tenure, harvesting and post-harvesting losses, quality of seeds and weak links in its value chain in addition to ineffectiveness of agricultural extension, lack of agricultural rotation, low or no use of technology, frequent mono-cropping and use of non-certified seeds. Furthermore, fluctuation in area planted and production during 2000 to 2020 as mentioned above led to big variability in export quantities which affected the competitiveness of sesame crop. According to Elfadil, (2015) area variation, yield and unstable fluctuating exchange rate are the main factors affecting sesame export earnings. Moreover, removed of fuel subsidies, devaluation of local currency, high inflation rate all led to high transaction costs (Alvi I. et al, 2020). High inflationary pressures have contributed to diminishing the purchasing power of urban consumers and farmers, but also significantly constraining their access to food and

agricultural inputs. According to the Central Bank of Sudan, prices of food as well as transport costs increased most sharply, reflecting higher input costs that include fuel and agricultural inputs (FAO report, 2021). Also, the decrease of the values of Sudanese Pound exerted upward pressure on prices. Thus, the new policy measures added more burden and stresses on sesame competitiveness and profitability in different stages of marketing channels. Therefore, the major questions the study focused on are: how is sesame value chain organized and functioning? What are the contributions of actors in sesame transformation and profits? Also, what are the factors affecting producer's profitability? Moreover, what are the major opportunities and challenges in sesame value chain stages?

1.3 Significance of the Study

The study provides information about the actors engage in the sesame value chain, their role and functioning, particularly in the domestic market and export market focusing on Gadarif state which is one of the major sesame producing areas in the country. The study results showed the weaknesses and threats in different stages which helps the government to support weak segments of the value chain. Also the study considered as source or material for decision makers, planners to promote sesame sector. In addition to that the study provides additional inputs for further related studies.

1.4 Objectives of the Study

The main objective is to analyze sesame value chain in Gadarif state in order to identify the contributions of all chain actors in sesame transformation and competitiveness.

1.4.1 Specific objectives

The study specifically attempts to:

1. study socioeconomic characteristics of value chain actors in Gadarif state;
2. identify the structure and functions of sesame value chain;
3. determine the profits and margins received by different actors along the sesame value chain;
4. determine total gross marketing margin and the producer's share in consumer price;
5. compute export parity price at farm gate level with two exchange rate (45 SDG/$) and (90 SDG/$);
6. determine the socio-economic factors affecting producer's profitability; and
7. Identify the challenges and opportunities of sesame value chain.

1.5 Hypotheses of the Study

The study is guided by the following hypotheses:

1. target groups in the study area are not homogenous;
2. structure of sesame value chain is not well-functioning;
3. there is no significant difference in profits between actors;
4. producer's shares in consumer price have negative relation with total gross marketing margins;
5. exporting sesame with the official exchange rate (45 SDG/$) is not rewarding;
6. socio-economic factors have no influence on producer's profitability; and
7. In spite of challenges in sesame value chain, there are great opportunities existed.

1.6 Research Methodology

It is systematically way to solve the research problem it includes research design and research methods. Research methods are all techniques that are used for conduction of research. Methods include methods for data collection and methods for data analysis.

1.6.1 Source of Data

The study depended on both primary and secondary data

1.6.1.1 Primary data

The study focused on Gadarif state as the main sesame producing area in the semi- mechanized sector. A structured questionnaire was used to collect the primary data from farm households, traders, exporters and traditional oil processors. Data on technical and economic aspects such as the socio economic characteristics of the respondents, costs, outputs, prices, quantities, taxes, challenges and constraints were collected. A multistage random sampling procedure was used to select the sample of the farmers. Relatively large sample size of 150 respondents was collected. Seven areas were chosen to represent different locations according to area cultivated. Purposive sample procedure was used to select wholesalers, exporters, processers, oil retailers and cake traders. Thirty respondents of wholesalers participated in the survey, jointly with fifteen exporters, fifteen traditional processers, fifteen oil retailers and five cake traders. The survey was conducted specifically in January 2020 which is considered as the most appropriate period to meet producers, traders, processors, exporters as well as other organizations that play important roles in the regulation of sesame trade.

1.6.1.2 Secondary data

Secondary data, including time series data of areas, production, yield, costs, export quantities and prices, were collected and used to provide background information of sesame. Reviews of published and

unpublished materials from federal Ministry of Agriculture, state Ministry of Agriculture, Central Bank of Sudan, input suppliers, providers of agricultural finance (banks), researches studies and on line publications were also used.

1.6.2 Data analysis

Both quantitative and qualitative methods of data analysis were used. These include: descriptive statistics to describe socio-economic characteristics of the participants and value chain analysis which contains functional analysis and quantitative analysis. Functional analysis was used to identify the activities of the actors and their roles in the value chain. As for quantitative analysis, it was used to determine production and marketing costs, profitability and marketing margins. The study, also, calculated the export parity price at farm gate level to measure the competitiveness of sesame with two exporting exchange rates. In addition, the study used linear regression analysis to determine the socioeconomic factors affecting profitability at the farm level. SWOT analysis was used to identify challenges and opportunities throughout the value chain stages. SPSS and Excel programs were used for entered and processed data.

1.7 Organization of the Study

The study consists of five chapters each of which has some sections. Chapter one is an introductory one about the importance of sesame in Sudan, stating the problem, objectives, hypotheses and methodology. Chapter two reviews the literature related to the concepts of analytical techniques and previous studies. Chapter three describes the research design, methods of data collection and methods of data analysis. Chapter four presents analysis, results and discussion. Chapter five contains summary, conclusions and recommendations.

1.8 Study Limitations

The major limitation of the study was Covid-19 because the study was conducted during this period and also lack of budget and time limitations in addition to unavailability of some data.

CHAPTER TWO

Literature Review

CHAPTER TWO

Literature Review

2.1 Preface

This chapter gives brief literature about sesame production, processing and agricultural policies. In addition to reviews the value chain definitions, concept, history, importance and limitations. The chapter also includes definitions of competitiveness and its measurements, beside some reviews about SWOT analysis and its meaning. The chapter contains brief summary of the previous studies related to the topic.

2.2 Sesame production

Sesame, or *(Sesamum indicum)*, is native to savanna area in sub-Saharan Africa and considered to be originated in Eastern part of Sudan. Sesame is an erect annual plant, growing up to one meter. It is suitable for light (sandy), medium (loamy) and heavy (clay) soils and prefers well-drained soil. It is sensitive to salt, but tolerant to drought-like conditions making it an adapted plant for rain-fed cultivation in Central and Eastern Sudan (rainfall between 300 and 1,000 mm). Sesame-seed occurs in many colors depending in cultivation areas, the most traded variety of sesame-seed is off-white colored, and other common colors are buff, tan, gold, brown, red, gray, and black (STDF, 2017). Sesame is labeled as the queen of oilseeds because of its high oil content, delicious nutty aroma, and flavor. Sesame seed is used for a wide array of edible products in raw or roasted form and also for industrial uses such as soaps, lubricants, lamp oil, in cosmetics, pharmaceutical uses, and animal feed. It contains a considerable amount of oil, proteins, carbohydrates, and essential minerals, a high amount of methionine and tryptophan, fibers as well as secondary

metabolites such as lignans, saponins, flavonoids, and phenolic compounds. Moreover, the seeds are a good source of calcium, phosphorus, and iron and rich in vitamin B, E, and a small amount of trace elements. (Myint D. *et al,* 2020).

The agronomic practices for sesame according to Abu Asar (2020), (ابو عصار، 2020)in his special guidance for oil seed crops production includes:

1. Sesame is sensitive crop to weeds and drowning, well drained lands should be chosen.
2. The planting date is determined by the onset of rain, and it is preferable not to delay planting in order to avoid exposure of the crop to pests which leads to a significant decrease in productivity, the best time to plant is not to exceed second week of July.
3. Seed rate is 1.1 – 1.6 gram per feddan.
4. Chemicals are used at a rate of 3 grams per one kilogram of seed.
5. The experiments have shown that the response of sesame to nitrogen fertilization is very weak, not exceeding 5% because the fertilizer is linked to availability of sufficient moisture in the soil.
6. Sesame doesn’t follow the agricultural cycle but it is exchange with sorghum in the muddy lands and with millet or sorghum in the sandy lands.
7. Sesame has shown a severe sensitivity to herbicides.
8. One of the most important signs of sesame ripening is the yellowing of the stems and leaves, any delay in the harvesting process leads to the dispersal of the crop and it reached up to 70% while harvesting before the appropriate time leads to variance in seed quality.
9. There are several methods of harvesting, manual harvesting and full mechanized harvesting using combine harvester. Also, there is semi mechanized harvesting in which the harvest is carried out in two

stages first cutting by baler then collecting the bundles and studying them by the labor after dried.

2.3 Process of sesame oil

Sesame oil is extracted from the seeds by mechanical pressing it may be cold-pressed to give an aromatic salad oil or hot pressed to give a lower grade product. Local processors (Asarat) types of processors are available for sesame in different regions the rural population usually prefers the local sesame processors (Asarat) for their high quality "Walad" oil produced which enters as a medicament for many stomach and back-ache troubles. Modern manufacturers with higher processing capacities extract oil using specialized machines, some supplement their products by purchasing raw oil extracted through traditional methods. Large oil producers and refineries are in Khartoum, and a few are located in other cities, with the overall daily processing capacity exceeding 5,000 tons. The bi-product sesame cake is sold to animal feed manufacturers, who blend it with other ingredients. Small quantities of seeds cakes are also exported. More than 90 percent of sesame seeds production enters the local market for consumption and export. Poor infrastructure, limited access to the latest processing equipment, and a lack of quality packaging material reduces the quality and output of sesame seed processing in Sudan (Alvi I. et. al., 2020).

2.4 Agricultural Policies

The production of oilseeds is affected by macroeconomic policies, sectorial and agricultural policies related to production, marketing and foreign trade. Sudan has adopted a set of economic policies, including price liberalization and the removal of subsidies.

2.4.1 Price policies

The price policies of production and inputs are linked to exchange rate policies and taxes. The adoption of realistic exchange rates led to a

significant decline in the value of the Sudanese pound, and consequently to a significant increase in the cost of imported inputs. The high taxes imposed on the agricultural sector also hindered price policies aimed at increasing the income of the farmer.

2.4.2 Financing policies

Financing policies are considered one of the most important economic policies that contribute significantly to agricultural production and to the efficiency of government projects. They have had limited results. Oil grain crops do not enjoy any advantages or facilities in financing.

2.4.3 Marketing policies

The marketing sector for agricultural crops generally suffers from a weak structure, the large presence of intermediaries, and the poor keeping pace by the private sector with the indications of liberation policies and entering into the marketing process and organizing it on the basis of commercial and economic efficiency.

2.5 Review of the Value Chain

The term value chain refers both to a set of interdependent economic activities and to a group of vertically linked economic agents, the focus of the analysis can be on the activities or on the agents (Bellù, L. G., 2013).

2.5.1 Definition of value chain concept

Value chain concepts have been defined differently by different scholars, Hobbs et al (2000) defines the value chain as one particular form of the supply chain. In this approach, the supply chain refers to the entire vertical chain of activities: from production on the farm, through processing, distribution and retailing to the consumer – in other words – from gate to plate, regardless of how it is organized or how it functions (Nang'ole EM, *et al*., 2011). Kaplinsky and Morris (2001) define a value

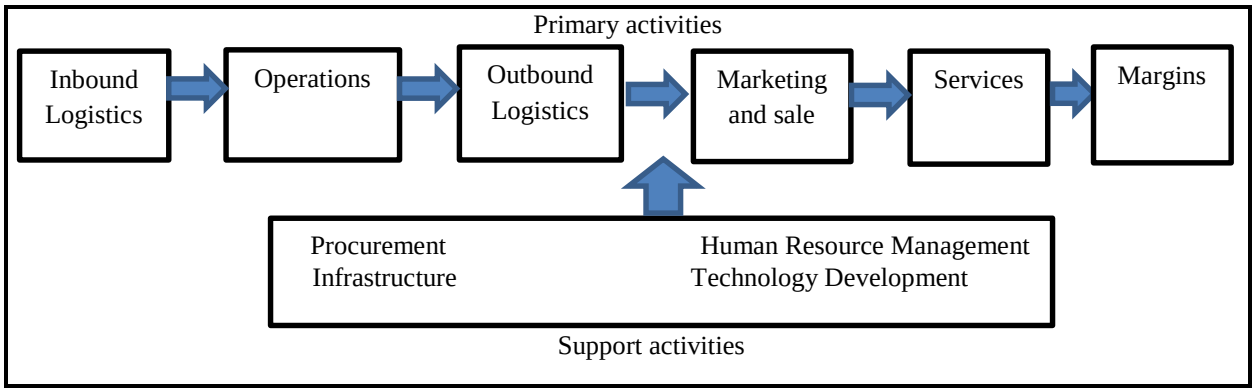
chain as the full range of activities which are required to bring a product or service from conception, through the different phases of production, transformation and delivery to final consumers, and eventual disposal after use. In Kaplinsky and Morris' approach, value chain analysis seeks to characterize how chain activities are performed and to understand how value is created and shared among chain participants (Nang'ole EM, *et al*., 2011). Fries, (2007) described value chain as the assessment of the actors and factors that influence the performance of an industry, relationship among the participants to identify the driving constraints to increase efficiency, productivity and competitiveness of an industry and on how these constraints can be overcome (Magabe, 2016).

Bellù, L. G., (2013) defined value chains as a complex sets of interrelated elements (public and private agents, domestic and foreign markets, inputs, outputs, production factors, institutions, environment and natural resources, etc.).

2.5.2 History of value chain

The scientific discussion about the vertical integration of production and distribution processes started in the 1960s; the '**filière'** approach was developed by a French researcher who studied vertical integration in agriculture, filieres which can be translated as channels. This approach was developed by his concept as an analytical tool to study the ways in which agricultural production systems were organized in the context of developing countries, he put special attention to how local production systems are linked to processing industry, trade, export and final consumption. The concept was used to describe the flow of physical inputs and services in the production of a final product and in terms of its concern with quantitative technical relationships. However, 'filière' analysis tended to be viewed as having a static character, reflecting relations at a certain point in time (Nang'ole EM, *et al*., 2011). In 1970, the concept of the sub-

sector introduced by **Shaffer** was also an important conceptual development related to value chains. A sub-sector involves a set of activities and actors and the rules governing those activities, Sub-sector analysis encompasses a grouping of economic activities linked horizontally and vertically by market relationships. It involves studying the networks of relationships linking suppliers, processors, transporters and traders in ways that connect producers and enterprises with final consumers of goods and services (Nang'ole EM, *et al*. 2011). In the mid-1980s, the term 'Value Chain' was used by Michael Porter in his book "Competitive Advantage: Creating and Sustaining superior Performance" (1985). Porter used the framework of value chains to assess how firm should position itself in the market and in the relationship with suppliers, buyers and competitors. Porter argued that the sources of competitive advantage cannot be detected by looking at the firm as a whole; the firms should be separated into a series of activities and competitive advantage found in one or more activities. Porter distinguishes between primary activities, which directly contribute to add value to the product or services and support activities, which have indirect effect on the final value product. Primary activities can be grouped into five main areas: inbound logistics, operations, outbound logistics, marketing and sales, and service. Each of these primary activities is linked to support activities which help to improve their effectiveness or efficiency. There are four main areas of support activities: procurement, technology development, human resource management, and infrastructure (M4P, 2008) figure (2.1).



Source: https://www.ifm.eng.cam.ac.uk/research/dstools/value-chain-/

Figure (2.1): Basic model of Porter Value Chain

Primary activities

1/ Inbound Logistics - involve relationships with suppliers and include all the activities required to receive, store, and disseminate inputs.

2/ Operations - are all the activities required to transform inputs into outputs (products and services).

3/ Outbound Logistics - include all the activities required to collect, store, and distribute the output.

4/ Marketing and Sales - activities inform buyers about products and services, induce buyers to purchase them, and facilitate their purchase.

5/ Services - includes all the activities required to keep the product or service working effectively for the buyer after it is sold and delivered.

Secondary activities

1/ Procurement - is the acquisition of inputs, or resources, for the firm.

2/ Human Resource management - consists of all activities involved in recruiting, hiring, training, developing, compensating and (if necessary) dismissing or laying off personnel.

3/ Technological Development - pertains to the equipment, hardware, software, procedures and technical knowledge brought to bear in the firm's transformation of inputs into outputs.

4/ Infrastructure - serves the company's needs and ties its various parts together, it consists of functions or departments such as accounting, legal, finance, planning, public affairs, government relations, quality assurance and general management.

Porter introduced the 'value system' as an alternative way of competitive advantage approach. A value system includes the activities implemented by all the firms involved in the production of a good or service, starting from basic raw materials to those engaged in the delivery to the final consumers. The concept of value system is therefore broader compared to the one of 'enterprise value chain (M4P, 2008). In the mid-1990s, the concept of the "Global Commodity Chain (GCC)," was introduced by Gereffi and others. Gereffi *et al* (2005) utilized the framework of value chain to examine the ways in which firms and countries are globally integrated and to assess the determinants of global income distribution. GCC focuses on the power relations in the coordination of globally dispersed, but linked production systems. Gereffi shows that commodity chains are generally characterized by a leading party or parties that determine the overall character of the chain. Gereffi established four core elements: (a) input-output structure, (b) territorial (international) structure, (c) institutional framework, and (d) governance structure (Nang'ole EM, *et al*. 2011).

2.5.3 Domains of value chain analysis

Value chain analysis allows analysts to identify issues of constraints, opportunities, strengths and weaknesses to be addressed by policies. Analysis should be carried out for the following domains which are:

1. Socio-economic context of the value chain.
2. Demand for value chain outputs
3. Analysis of the institutional set-up

4. Analysis of input and output markets.
5. Functional analysis of the value chain.
6. Economic analysis of the value chain.

Bellù, L. G., (2013) highlights some points that analyst can allow by conducting a value chain analysis as:

• Identify bottlenecks that deserve priority attention from the government.

• Identify target groups.

• Trace the effects of a policy along the chain of commodities.

• Understand how value added creation and profit earning will change for each agent and the value chain as a whole.

• Identify "winners" and "losers" of a policy measure

2.5.4 Importance of value chain analysis

Kaplinsky and Morris, 2001, attributed importance of value chain analysis to three main sets of reasons:

- With the growing division of labor and the global dispersion of the production of components, systemic competitiveness has become increasingly important.
- Efficiency in production is only a necessary condition for successfully penetrating global markets.
- Entry into global markets which allows for sustained income growth that is, making the best of globalization - requires an understanding of dynamic factors within the whole value chain.

2.5.5 Limits of the value chain approach

According to Bellù, L. G., (2013), certain limitations of the value chain approach were identified:

- Value chain analysis mostly relies on the build-up of agents accounts to describe technical relations and it allows for distributional and impact assessments, as well as for competitiveness and protection appraisals. Hence, it can be considered as an accounting framework

and not a behavioral model since no particular assumptions are made on agents' behavior.

- Value chain analysis lies in its lack of a time dimension. Despite being usually carried out with reference to a specific accounting period (i.e., a given year), it does not explicitly considers the impact of time on the variables considered. Hence, we call it a "static" framework.
- Value chain analysis is not a stylized representation of the whole economy, but an in-depth description of a specific segment of it giving only a partial vision of the economy and requiring a large amount of data.

2.5.6 Sesame Value Chain in some Countries

2.5.6.1 Sudan

Value chains in the agricultural sector in Sudan are involving multiple actors from the formal and informal sectors. In the sesame value chain, several actors are exist, including farmers, traders at different administrative levels (village, district, state, and national), transporters, small-scale and large-scale processors, and exporters. Farmers sell their sesame within two or three weeks after harvest to a village collectors or traders who take and sell the purchased sesame seeds to intermediate traders in the regional markets, who in turn collect larger quantities and sell them to the wholesalers, processors, or exporters. Large commercial farmers usually have direct purchase agreements with the wholesalers, processors, and exporters and they have storage facilities to store their product and wait for better prices. Additionally, there are some institutions that play an important role in the sesame seeds marketing these institutions include the Ministry of Agriculture and Forestry (MOAF), the Ministry of Industry (MOI), Agricultural Research Corporation (ARC), Sudanese

Standards and Metrology Organization (SSMO), Industry Stakeholder Associations, international organizations and NGOs. Most exporters and processers are in the capital city Khartoum and Port Sudan. The exporters screen, clean, and bag sesame seeds into 50 kg sacks. The bagged sesame seed is then packed into 20 MT and 40 MT containers which are transported to the shipping lines for transport to the export destinations. The sesame seed processing sector is dominated by 2–3 large corporations operating in the capital Khartoum (Alvi I. *et al*, 2020).

2.5.6.2 Ethiopia

Sesame seed is an important export crop in Ethiopia and the country has a substantial role in the global sesame trade. It is the third world exporter of the commodity after India and Sudan. The major sesame producing regions in Ethiopia are Tigray, Amhara, Oromia and Benishangul Gumuz. The production technique is still dominated by traditional means. Marketing system is determined by type of production system (small scale, large scale), location of production, and the nature of the product. Sesame produced in large and small scale of production. Smallholder farmers are generally in a weak bargaining position, they only have very small volumes to sale; they lack market information and are fully dependent on middlemen (traders). Mostly they sell their output immediately after harvesting when the supply is abundant and consequently the prices are relatively low. Ethiopian sesame seed value chain is generally high due to the large number of producers, brokers and buyers. Producers (farmers) sell to a local collector, this collector in general sells to another larger broker and this process is repeated a few times mostly without adding value. Relative longer chain involves producers selling to exporters through brokers. Alternatively, farmers may sell to cooperatives, which in turn sell to unions and then to exporters. The other alternative is farmers selling directly to exporters through their branches in Humera.

Cooperatives are found to be the major channel for farmers to secure better income from sesame produced in different areas. This is because cooperatives are believed to pay better price and provides other market related information; hence those farmers who have sold their product to local cooperatives were found to generate better income than others. Access to market information was also found to be an important factor in securing better income from sesame sells for smallholders. This is because sesame is one of the international crops in which its price is linked to international markets; hence market information is necessary and significantly determines the level of income farmers derives. The sesame marketing has been constrained by diverse factors: shortage of modern inputs, shortage of capital, lack of timely and accurate market information, and poor quality of packing materials were few of the inherent problems. Besides, the lengthy export procedures, and corruption practices by some institutions are the main and challenging problems for the majority of traders (Abebe T. N. (2016).

2.5.6.3 Myanmar

Agricultural sector in Myanmar plays a vital role in providing food for an increasing population and earning foreign exchange. Sesame crop is important for domestic consumption and for exporting because it has an important role in the livelihood activities of smallholder farmers and earning foreign income. Most of the farmers grew the black sesame variety because of the higher price and the higher market demand from stakeholders. Sesame products flowed from the farmers to wholesalers and Chinese commission agents in Mandalay, who traded them directly to cross-border exporters to China. Exporters in Yangon traded raw products to Japan and Taiwan and roasted sesame powder to Korea via the Yangon port as normal trade. Raw sesame products were bought by oil millers and

sent to the mills for milling after processing, the sesame oil was transacted back to the wholesalers, retailers and consumers in different areas. Food processors processed the sesame seeds into sesame brittle as a snack and as a roasted sesame powder. Sesame value chain was very weak in Myanmar because of the unequal marketing margin among actors, which was caused by the farmers' lack of negotiation power with other actors along the chain. Although sesame is an economically important crop, stakeholders involved along the oilseed crop value chain face major problems, such as price uncertainty, low productivity and quality of sesame, lack of strict marketing laws and regulations, competition among important edible oils, lack of advanced facilities and technologies and the linkages and relationships among actors along the value chain are fragmented. Therefore, public and private investments should be raised in this sector not only to overcome the major constraints but also to produce international standard-quality seed (Myin T. & Aung Y. M. 2019).

2.6 Definitions of the Competitiveness

Competitiveness is an indicator of the ability to supply goods or services in the location and form at prices that as good as or better than those of other potential suppliers (Klaus F. &Monika H., 1997). Two types of competition are included in this definition. First, is the competition on domestic and international product markets and second, the competition in factor markets.

The Organization for Economic Co-operation and Development (OECD) defines competitiveness as the "ability of companies, industries, regions, nations, and supranational regions to generate, while being and remaining exposed to international competition, relatively high factor income and factor employment levels on a sustainable basis". The European Commission defines it as "a sustained rise in the standards of

living of a nation or region and as low a level of involuntary unemployment as possible" (Latruffe, L. (2010). Competitiveness would then be the ability to sell products that meet demand requirements and, at the same time, ensure profits over time that enable the firm to thrive. Measurement of competitiveness can be made according to two disciplines: i) the neoclassical economics which focuses on trade success and measures competitiveness with the real exchange rate, comparative advantage indices, and export or import indices; ii) the strategic management school which emphasis on the firm's structure and strategy in this the competitiveness is defined as cost leadership and it measures with domestic resources cost (DRC), social cost benefit ratio (SCBR) and production cost in addition to profitability, productivity and efficiency (Latruffe, L., 2010).

2.6.1 Measures of Competitiveness

2.6.1.1 Production costs measurement

Costs of production based on farmers' records of purchased inputs and on farmers' reports of machinery time allocation among activities. Care must be taken over the costs of own inputs (labor, capital, and land), which are usually not directly observable but may influence the costs of production measures.

Latruffe, L. (2010) reported Sharples (1990) argues that "competitiveness cannot be evaluated on the sole basis of costs of production, but that researchers should also take account of marketing costs, i.e. the additional costs arising from getting the commodity to the foreign buyer".

2.6.1.2 Profitability measurement

Profitability is obviously related not only to costs of production but also to revenue. Profitability can be defined in several ways, such as the difference between revenue and costs (gross margin), or the ratio between costs and revenues. As Harrison and Kennedy (1997) argue that, "firms

with positive profits indicate that they are able to create barriers preventing the entry of new firms, that is to say they are able to maintain their market shares and thus possess some type of competitive advantage" (Latruffe, L. 2010). Market shares are sometimes mentioned as a way of assessing a firm's competitiveness, but the concept is often quantitatively measured by profitability variables.

2.6.1.3 Parity price measurement

Parity means equal or equivalent it makes the price of particular commodity equal or equivalent to reference price for the same commodity in another location. Parity price used to assess the incentives to trade as well as incentives to produce where local producers are in competition with producers and suppliers from the outside the country or across the border (Mabiso A., 2008). There are two types of parity prices first, Export parity prices (EPP) which is the value of product sold at a specific location in a foreign country but valued from a specific location in the exporting country. Second, Import parity price (IPP) which is the value of a unit of product bought from foreign country, valued at geographic location of interest in the importing country.

Calculating a parity price involves taking the price of a commodity at a border post or port of entry and adjusting it for the transport, marketing and transaction costs that are incurred when bringing the commodity to the geographic location under consideration. Policy effects such as taxes, subsidies and tariffs on the commodity are also included in these adjustments, and if we are interested in expressing the parity price in local currency terms, a currency conversion must be made using the appropriate foreign exchange rate. The end result is a unit price referred to as the parity price, which reflects the cash or financial value of the commodity in the location under consideration.

2.7 Review of SWOT Analysis

SWOT analysis is a business analysis technique that the organization can perform for each of its products, services and markets when deciding the best way to achieve future growth. The process involves identifying the strength and weaknesses of the organization, and opportunities and threats present in the market that it operates in. The first letter of each of these four factors creates the acronym SWOT (FME, 2013).

Other definition to the SWOT Analysis is a tool used for strategic planning and strategic management in organizations it can be used effectively to build organizational strategy and competitive strategy. In accordance with the system approach, organizations are whole that are in interaction with their environments and consist of various sub-systems. In this sense, an organization exists in two environments, one being inside organization and the other being outside. It is a necessity to analyze these environments for strategic management practices. This process of examining the organization and its environment is termed SWOT Analysis (Gurel & Merba, 2017).

Table No (2.1): Elements of SWOT analysis

	Helpful	**Harmful**
Internal origin	**Strengths**	**Weaknesses**
External origin	**Opportunities**	**Threats**

Source: FME, 2013

The above table is a SWOT Analysis, with its four elements in a 2x2 matrix. Strengths and opportunities are helpful to achieve the organizational objectives they are favorable for organizations whereas weaknesses and threats are harmful to achieving the organizational objectives they are un- favorable for organizations.

1/ Organization strengths

It defines as the characteristics and situations in which an organization is more effective and efficient compared to their competitors. It is a distinctive competence that gives the organization a comparative advantage in the market place. Strengths may exist with regard to financial resources, image, market leadership, buyer/supplier relations, and other factors. Being strong and having strengths are quite important for an organization. Otherwise, the opportunities created by the outside environment cannot be used.

2/ Organization weaknesses

Weaknesses at organizational level refers to the situations in which the current existence and ability capacities of an organization are weaker compared to other organizations and competitor organizations. A weakness is a limitation or deficiency in resource, skills, and capabilities that seriously impedes an organization's effective performance. Facilities, financial resources, management capabilities, marketing skills, and brand image can be sources of weaknesses.

3/ Environmental opportunities

External elements in the environment that gives benefit for organization, opportunities also are the conditions that allow an organization to take advantage of organizational strengths, overcome organizational weaknesses or neutralize environmental threats.

4/ Environmental threats

Threats are the situations that come out as a result of the changes in the immediate environment that would prevent the organization from maintaining its existence or lose its superiority in competition, and that are not favorable for the organization. All environmental factors that can impede organizational efficiency and effectiveness are threats (Gurel and Merba, 2017).

2.8 Previous Studies

The value chain analysis has been applied in different ways by researchers as shown by the increasing number of publications and studies, also there are a considerable amount of academic studies on SWOT technique in the analysis of internal and external environments of organization to support strategic decision situations. The study reviewed the results of some relevant researches as:

Katanga Y. N.*et al*. (2018) studied the profitability of sesame value chain along Jigawa-Kano Axis in Nigeria. Multistage sampling technique was employed for the selection of respondents (farmers, traders, processors and exporters). 120 sesame farmers were randomly selected at the entry point of the upstream level of the value chain. While in the downstream level, 112 actors which comprise 60 traders, 36 processors and 16 exporters were selected. Data were analyzed using gross margin and marketing margin. The results of the study showed that sesame farmers produced an average of 576.21Kg/ha. The profitability measures have indicated that farmers had a gross margin of ₦35,087.94/ha, traders had marketing margin of ₦36,499.85/ton while processors and exporters have ₦35,085.17/ton and ₦19,851.63/ton as processing and export margins, respectively. These values indicated profitable enterprises along the sesame value chain. Challenges of the sesame value chain include problem of improved seeds, high cost of inputs, transportation, price uncertainty/low price, contract transactions, and policy issues. The study therefore, recommended that, increased profitability, production and productivity along the sesame value chain could be achieved through the provision of improved varieties with desired characteristics, well managed contract transaction, provision of necessary infrastructures and a guarantee minimum price for all sesame enterprises along the chain.

Magabe (2016) used value chain analysis in his study which conducted to assess the profitability of sesame actors along the value chain in Masasi District (Tanzania). The findings showed that, farmers had a gross margin of 323.64 TZS per kg, while traders had a gross margin of 581.57 TZS per kg which was relatively higher than that of farmers. The finding also showed that the farmers' gross margin was influenced by household education level, household age and market information and extension services.

Linn T., (2013) studied sesame value chain in Magway Township (Myanmar), he found that there were many actors in the value chain such as input providers, farmers, wholesalers, millers, processors and exporters. Wholesalers received the highest percentage of profit (70.66%). The percentage of marketing margin of farmers (71.48%) was the highest among actors. The wholesalers received the largest profit because they bought the sesame directly from the farmers and store the product for approximately 6 months before selling to the exporters. For sesame oil, wholesalers also received the highest percentage of profit (66.84%) and the farmers again occupied the highest percentage of margin (64.94%). For sesame brittle, the processor gained the highest percentage of profit (84.99%) and the farmers received the lowest percentage of profit (3.94%). He was also used SWOT analysis to analyze the structure of all actors of value chain the results showed that, the major constraints for sesame farmers were lack of technology, low access to credit, lack of knowledge concerning quality of inputs and products. The major constraint for wholesalers, millers, processors and exporter was low access to financial possibilities.

Ali Showgi, (2013) analyzed sesame value chain in Kordofan (Sudan), he found that traditional oil processors appeared to have higher profits(1,297.1 SDG/ton) compared to the industry sesame oil and

attributed this to the high cost of oil that was processed in the industry. The results also showed 'that tahania processors were the winners of the chain in terms of profits with the highest profit share of 2705.5 SDG in any ton of sesame processed. He used SWOT analysis in his study and the findings revealed that sesame production is constrained by lack of extension services, civil war and conflicts between farmers and livestock keepers over natural resources and scarcity of farming equipment. Oil processors are constrained by high cost and insufficiency of inputs and oil imports. Sesame producers' opportunities in the region include production of good local varieties and favorable growing conditions. Oil processors have the potential to increase oil production and compete with other oils by improving quality.

Munyua.B *et al*, (2013) investigated the value chain for sesame in Uganda that was characterized by numerous small producers, sellers, and buyers. Of the total sesame production, 50 % passes through rural assemblers, and 6 % is handled by rural wholesale buyers who buy and transport sesame to regional centers where it is bought by regional wholesale traders. Regional wholesalers sell sesame to export and domestic processors. About 42 % of the crop is exported, 10 % is consumed in urban centers, and the remaining 25 % is sold for consumption in rural areas. The findings revealed that numerous traders from the grassroots to the regional level make the market for sesame reasonably competitive in Uganda. On average, the farmer gets 70 % of the ex-local assembly level price and 60 % of the ex-regional level price. Smallholders do not have strong bargaining power and collective marketing would allow them to bargain for better prices or sell directly at regional level where the returns are higher. They used SWOT analysis to assess the internal and external factors that affect the performance of the trade in Uganda. The study found that the strengths summarized in the availability of credit at wholesale level traders,

good transport infrastructure in the regional centers and well-developed shipping lines to export markets and have opportunities of supporting from NGO's and industrial association. Number of weaknesses were arise in the analysis include in adequate capital investment at lower assembly levels, poor transport infrastructure at the assembly level, poor handling at farm level raising phyto- sanitary, high handling costs such as loading and unloading and high concentration of market power to a few exporters.

Kumuar & Nain (2013) analyzed the strengths, weaknesses, opportunities and threats to agriculture in India. They presented that the strength lies in having the largest cultivable land with record food grains production, the weakness lies in having low yields, less value addition and food processing and large amount of post-harvest losses. Whereas the main threats faced the Indian agriculture are land degradation, low seed replacement ratio, climate change and declining interest in agriculture. One of important opportunities is that more than 5 thousand hectares are under organic farming, now peoples preferred to utilize the commodities produced by practicing organic farming.

Hala A., (2010) evaluated the effects of the main economic factors on sesame production, marketing and exports of Gadarif and North Kordofan States, of Sudan. The study tested the positive hypothesis of socio-economic characteristics on producers and traders, high share of harvesting, crop physical losses and transportation costs, existence of market oligopoly, and co-integration of markets in Sudan with the export market. The study used descriptive statistics, marketing margins, budgeting, policy analysis matrix (PAM), and time series temporal and spatial co-integration methods for analysis. The results indicated that the share of farmers' price was about 75% on average of the FOB prices; the market-margin shares of the exporters exceeded those of the assemblers, the sesame crop was profitable despite the high cost of harvest, physical

losses and transportation in production and marketing activities. The study put many recommendations some of them were reducing sesame production and harvesting cost through breeding of non-shattering varieties; reducing marketing cost through introduction of sieving process in the production areas to reduce physical losses; improving infrastructure to reduce transportation cost of sesame.

It is very clear from the mentioned literature that, there were many studies conducted to assess sesame value chain. As the previous studies, this study used gross margin analysis as a tool to determine efficiency of the market and regression analysis to determine factors affecting profitability. Also, SWOT analysis to identify the challenges and opportunities through the stages of the value chain. But unlike the previous studies, this study used analysis of the export parity price at farm gate level in addition to production costs and profitability as the tools of measuring competitiveness of the sesame crop.

CHAPTER THREE

Methodology Approaches

CHAPTER THREE

Methodology Approaches

3.1 Preface

Research methodology is a systematically way to solve the research problem. There are three basic approaches to research; quantitative approach, qualitative approach and mixed approach.

The research methodology includes research design, description of the study area and research methods in which methods of data collection and data analysis are described.

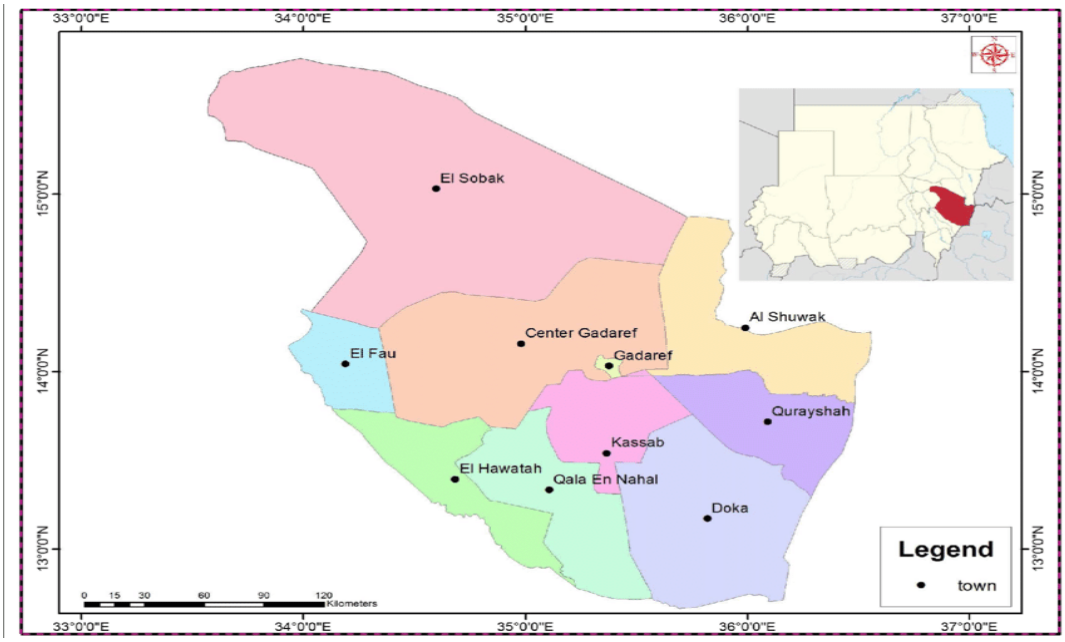
3.2 Research Design

Research design is the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure (Kothari C. R., 1990). The research design for this study was the applied and descriptive design which includes survey and fact-finding enquiries of different kinds. It identifies social, economic and political trends that may affect the sesame crop in the different value chain. Also, it was a cross-sectional type of research, where the data collected at a single point and time. The reason for choosing this design was simply because it was flexible, economical and easy to work on data and information extraction.

3.3 Description of the Study Area

The study concentrated in Gadarif state, it is located in the eastern part of Sudan between latitudes 12 and 17 degrees north and latitudes 34 and 36 degrees east. It is bordered on the north and west by the states of Khartoum and Jazeera, on the eastern side by the state of Kassala and the Ethiopian border, and from the south by the state of Sennar. It is characterized by its wide agricultural areas and fertile soil and considered

as one of the largest projects for mechanized rain- fed agriculture in Sudan. Also it is considered as one of the largest areas of sorghum and sesame production in the world, though the state became the important strategic center for food security. The number of localities in the state is ten localities, which are the: Gadarif, Central Gadarif, Al-Rahad, Al Galabat Al Sherigia, Al Galabat Al Grebia, Al-Fashqa, Al Fau, Al Greisha, and finally Basinda and Mafazah were added. The most important cities in the state are Gadarif, Hawatah, Doka, Al-Fau, and Al-Shuwak.



Source: Eldegail Mawahib H., 2018

Map (3.1): Gadarif localities

3.4 Data Collection Methods

Primary and secondary data were used in the research. A structured questionnaire was designed to collect the primary data from the actors in the value chain. The data included age, education, experience of the respondents, production, marketing and transaction costs, prices and challenges faced the respondents. Secondary data included time series data (from 2000 to 2020) of area cultivated, production, yield, local and international prices, export quantities and values.

3.4.1 Sampling frame and procedure

The sampling frame consisted of sesame farmers (producers), traders, exporters and traditional oil processors. A multistage random sampling procedure was used to select the farmers sample from the Gadarif state with three stages. Firstly, the sample size divided between four locations (north, west, south and east) according to the area cultivated in each location in season 2019/20. Then two localities from each location of the state were randomly chosen, because there was insufficient time to visit all localities. Secondly, systematic sample procedure was used to select areas from each locality according to area cultivated. The areas selected were AL Shouwak, Al Greisha, Doka, AL Hawata, Glea Al Nahal, Al Gadarif and Al Hiorey. The areas cultivated obtained from State Ministry of Agriculture. Lastly, simple random sample technique was used to select farmers from the lists obtained from agricultural offices in the areas. The population size of farmers was given by State Ministry of Agriculture. Steven K. Thompson formula was used to calculate the sample size of the farmers.

Formula of the sample size: (Steven K. Thompson, (2012)3rd edition p59-60)

$$n = N \times Z^2 P (1-P)/e^2 / [(N-1) + Z^2 P (1-P)/e^2]$$

Where:

n = sample size N = population (about 25000 farmers)

z = critical value (1.96) p = sample proportion (11%)

e = margin error (5%)

The size of the farmers sample calculated was 150 respondents.

Purposive sample procedure was used to select traders; exporters and traditional oil processers from the trading centers nearest to the farmer villages as well as the regional centers. The reasons of using this procedure are due to that; the population data was not exists or not reliable, so it is not

possible to set up a sampling frame, also the time of survey was limited. 80 respondents were participated including exporters, traders and processors. Total sample size of the study was then 230 participants. The survey conducted on January 2020.

3.4.2 Distribution of the samples size

Tables (3.1-3.2) show the distribution of the samples of farmers, traders, exporters, processors and oil retailers. Total sample size of the farmers was 150 respondents. The big portion of the sample located in Al Gadarif area 23% and 22.7% from Al Shouwak. Whereas 17% of the sample from Doka and the same percent from Al Hawata. Other sample separated between Gela Al Nahal, Al Hiorey and Al Greisha. For wholesalers sample 76% from Al Gadarif city which represents urban markets. The remains from Al Fashaga and it represent rural markets. 87% of the exporters and 80% of traditional processors were from Gadarif area. Whereas all oil retailers and cake traders were from Gadarif city.

Table No (3.1): Distribution of the farmers in the sample

Localities	Areas	Frequency	Percent
Alfashga	AL Shouwak	34	22.7
Al Greisha	Al Greisha	6	4
Al Glabat Al Sherigia	Doka	26	17.3
Al Rahad	AL Hawata	26	17.3
Glea Al Nahal	Glea Al Nahal	12	8
Middle Al Gadarif	Al Gadarif	35	23.3
Al Glabat Al Grebia	Al Hiorey	11	7.3
Total		**150**	**100**

Table No (3.2): Distribution of the traders, exporters, processors and oil retailers

Area/Actors	Wholesalers	Exporters	Traditional Processors	Oil retailers	Cake traders
Al Gadarif	23	13	12	15	5
Al Fashaga	7				
Al Glabat Al Grebia		1	3		
Khartoum		1			
Total	**30**	**15**	**15**	**15**	**5**

3.4.3 Sources of secondary data

The data collected from different institutions such as Federal and State Ministries of Agriculture, Bank of Sudan, Gadarif Auction, Foreign Trade Point, Theses and researches.

3.5 Analysis Methods

To achieve each specific objective, both quantitative and qualitative methods of data analysis were carried out. The methods included:

3.5.1 Descriptive Analysis

It was used to describe socioeconomic characteristics of the respondents like age, education, experience, occupation, land tenure, machines ownership, area planted and yield. Frequencies, averages and percentages were used.

3.5.2 Value Chain Analysis

3.5.2.1 Functional Analysis

It was used to identify structure and functions of the sesame value chain in the study area. Functional analysis consists of four steps (Bellù, L. G., 2013):

1. Setting boundaries of the value chain,
2. Identifying the main actors and their activities,
3. Mapping the flows and volume of the products and
4. Set up rules, regulations and coordination of institutions governance the value chain.

3.5.2.2 Quantitative Analysis

It was used to determine costs, profits and margins to different actors of the value chain. Quantitative value chain analysis is focused on the amount of money a customer is willing to pay for a firm's output in an open economy, this price is determined competitively and flows upstream from the consumer to each producer and marketing company involved in

the growing, collection, transformation and delivery of that commodity to its terminal market (John C. Keyser, 2006).

3.5.2.2.1 Cost structure and revenues

Cost is often used as a measure of competitiveness. Latruffe, L. (2010) mentioned in his study the argues of Sharples (1990) about competitiveness that "the competitiveness cannot be evaluated on the sole basis of costs of production, but that researchers should also take account of marketing costs, i.e. the additional costs arising from getting the commodity to the foreign buyer". Though cost structure includes production cost, purchase prices, marketing cost and processing cost.

1/Total costs at production stage (TC) = production costs (variable costs +fixed costs) + marketing costs.

2/ Total costs at marketing or export stage (TC) = purchase price of sesame + marketing costs.

3/Total costs at processing stage (TC) = purchase price + processing costs + marketing costs.

Variable costs include costs of mechanical operations, labor operations, inputs used, labor feeding and other costs. Fixed costs include salaries of permanent labor, land rent, managerial costs and other costs. Marketing costs include costs of handling, transport, packaging, storage, losses, taxes, fees and port expenses. Processing costs include maintenance, processing costs, labor wages and losses.

According to Estifanos T. the total revenues are calculated by multiplying the quantity sold (Q) with the selling price to one unit (p). Selling prices of upstream stage of the value chain is actually the purchase price for downstream stage.

Total Revenue (TR) = Sold quantities (Q) × Selling price/unit (p) …… (1)

3.5.2.2.2 Profit calculation

According to Klaus F. & Monika H. (1997), profitability can be defined as the difference between revenues and costs, or the ratio between cost and revenue.

Profit (Net income) = Revenue – Total cost

Profit = TR – TC ……. (2)

Profit also used as a measure of competitiveness as Latruffe, L. (2010) indicated that "the firms with positive profits are able to create barriers preventing the entry of new firms that is to say they are able to maintain their market shares and thus possess some type of competitive advantage".

3.5.2.2.3 Financial ratios

Certain financial ratios were used to measure and compare the profitability between the actors represented in the equations (3, 4, 5, and 6) (سحر، 2014، ص31-32).

1/Net margin (currency) = Net profit/ quantity sale …….. (3)

2/Net profit margin %= unit profit/unit price ……. (4)

3/Coefficient of private profitability (CPP) = Revenue/Total costs …… (5)

(If CPP < 1, that means the actor not profitable)

4/Return for 1 SDG invested= revenue/variable costs …….. (6)

3.5.2.2.4 Marketing margin

Kindie A, (2007) indicated in his study the argued of Mendoza (1995), that "when there are several participants in the marketing chain, the margin is calculated by finding the price variations at different segments and then compared them with the final price to the consumer". That means marketing margin measures the share of final selling price that is captured by a particular agent in the marketing chain.

Marketing margin at stage i =

(Selling price – Purchase price)/Consumer price. …… (7)

3.5.2.2.5 Marketing margin indicators

Consumer price is always used as the base or the denominator for all marketing margins as it indicated by Kindie A, (2007).

1/Total Gross Marketing Margin (TGMM) is the final price of the produce paid by the end consumers minus farmers' price divided by consumers' price and expressed as a percentage.

$$TGMM\% = (Pc-Pp)/ Pc \times 100 \qquad \ldots\ldots\ldots\ldots \quad (8)$$

Where: TGMM is the total gross marketing margin

Pc is the consumer price

Pp is the producer price

2/ Producer's Gross Margin (PGM), it is useful to introduce the idea of 'farmer's portion', or 'Producer's Gross Margin' which is the share of the price paid by the consumer that goes to the producer. The producer's margin is calculated as:

$$PGM= (Pc- TGMM)/Pc \times 100 \qquad \ldots\ldots\ldots\ldots \quad (9)$$

Where: PGM is the producer's share in consumer price

3/ The Net Marketing Margin (NMM) is the percentage of the final price earned by the intermediaries as their net income after their marketing costs are deducted. An efficient marketing system is where the marketing costs are expected to be closer to transfer costs and the net margin is near to normal or reasonable profit.

$$NMM= (TGMM- MC)/Pc \times 100 \qquad \ldots\ldots\ldots\ldots \quad (10)$$

Where: NMM is the net marketing margin

MC is the marketing costs

4/ Markup is the currency amount added to the cost of products to get the selling price in other words markup means percentage of selling price that is added to the cost to get the selling price. A high markup may result in a price that is too high, a price at which few customers will buy.

$$\text{Total Markup}\% = (Pc – Pp) /Pp \times 100 \qquad \ldots\ldots\ldots\ldots \quad (11)$$

The formulae included in Table (3.3) were used to determine costs, revenue, profits and market margins to different actors of the sesame value chain.

Table No (3.3) Formulae for calculation of costs, profits, margins and ratios

Value chain actors	Costs			Revenues	Profits		Margins
	Total cost	Added cost	%added cost	Unit price	Unit profit	% of total profit	Unit margin
Farmers	A	-	A/F	G	G-A	(G-A)/(K-F)	G
Assemblers	G+B	B	B/F	H	H-B-G	(H-B-G)/(K-F)	H-G
Exporters/ Processors	H+C	C	C/F	I	I-C-H	(I-C-H)/(K-F)	I-H
Traders	I+D	D	D/F	J	J-D-I	(J-D-I)/(K-F)	J-I
Retailers	J+E	E	E/F	K	K-E-J	(K-E-J)/(K-F)	K-J
Total		F=A+B+ C+D+E	100		K-F	100	

Source: M4P (Making Markets Work Better for the Poor), 2008

3.5.3 Calculation of the Export Parity Price (EPP)

The government's policy obligates the exporters to allocate 10% of the export earnings to the Central Bank of Sudan with official exchange rate to import human medicines (CBS, 2019). The official exchange rate was 45 SDG/$ (January 2020) and it was 90 SDG/$ in the parallel market, which is double than bank prices. Therefore, this policy is disincentives the exporters to continue in this business especially with high transaction costs. So the export parity price at farm gate was used to measure the competitiveness of the sesame using two scenarios of exchange rates, scenario 1 with 45 SDG/$ and scenario 2 with 90 SDG/$.

The export parity price computes using FOB prices to calculate the export parity price at farm gate level (EPPF) and compare it with production cost to one unit. First, calculate the export party price at the wholesale level (EPPW) and deduct all marketing cost from the port to the wholesalers point in addition to deducting the port expense.

EPPW = FOB price× EER - Port expenses – Marketing cost …….. (12)

Where: EER= Effective Exchange Rate

Then, calculate the EPPF by deducting all marketing costs from wholesale point to the farm gate.

EPPF= EPPW – Marketing costs. ..…… (13)

If EPPF > production cost it is better to export the commodity, i.e. if EPPF/production cost >1 the crop competes in the international market.

3.5.4 Linear Regression Analysis

Linear regression was used to analyze the socioeconomic factors influencing producer's profitability. Socio-economic characteristics of the farmers are important in influencing farm decision making and production planning, persons differ from one another in many respects and the behavior of a person is determined by his/her characteristics (M. A. Monayem Miah *et al*, 2014 p:37). The factors of farmer age, education level, occupation, farming experience, yield, harvesting cost, transport cost, selling price, sale place and time of selling were examined to show their influence on producer's profitability.

According to Kindie A., (2007, p 37-38), the empirical model of regression was specified as follows:

$$Y\tau = \beta o + \beta_{\tau}\chi_{\tau} + \varepsilon\tau \quad \text{…..……} \quad (14)$$

$Y\tau$ =Dependent variable

βo =An intercept

β_{τ} =Coefficients of explanatory variables

χ_{τ} =Vector of explanatory variables

$\varepsilon\tau$ = error term.

Then, the study equation of the regression model was given as follow:

$$Y\tau = \beta o + \alpha_1 D_1 + \alpha_2 D_2 + \alpha_3 D_3 + \alpha_4 D_4 + \beta_1 Age + \beta_2 Exp. + \beta_3 Yield + \beta_4 Ha.\cos t +$$

$$\beta_5 Tr.\cos t + \beta_6 Sp + \varepsilon\tau \quad \text{……..} \quad (15)$$

Where:

$Y\tau$ = Profit per feddan (measured by SDG/kg)

D1= Education level (dummy, 1=secondary school and graduate, 0= otherwise).

D2= Agricultural occupation (dummy, 1= main occupation, 0= otherwise)

D3 = Sale place (dummy, 1= farm, 0 = otherwise)

D_4= Time of sale (dummy, 1= after harvesting (November), 0= otherwise)

Age = Farmer age (continuous variable measured by years).

Exp. = Experience in agriculture (continuous variable measured by years)

Yield= Yield of sesame (continuous variable measured by kg/fed).

Ha. Cost = Harvesting cost (continuous variable measured by SDG/fed).

Tr. Cost = Transport cost (continuous variable measured by SDG/kg).

Sp. =Selling price of sesame (continuous variable measured by SDG/kg).

$\beta_{1,2,3,4,5,6}$ = Coefficients of explanatory variables

$\alpha_{1,2,3,4}$ = Coefficients of dummy variables

$\varepsilon\tau$ = Error term.

3.5.4.1 Description of the variables used in the model

1/Age is a demographic variable and is measured by years the expected influence of age is positive since the active age range can easily gain skill and experience and adopted new innovations which can enhance their productivity (Nuha E., 2016).

2/Education level is human capital for agricultural production. Farmer with good knowledge can adopt better practices than illiterates that would increase marketable supply. Magabe, (2016) implies on his study that better education of the producers has advantages as it enlightens them on how best to strategize and adapt better production and marketing conditions of sesame business.

3/ Experience in the farming expected to influence the profit positively according to (Zubaidah O. & Fazleen A., 2020) more experience that the

smallholders have, the more output that they will get and hence increase their profits.

4/ Producers practiced farming as the main occupation became more specialized and devoted to their jobs, so it expected to influence the profit positively.

5/ Yield is an economic factor that can affect the household level marketable supply and measured in kg per feddan. Kindie A, (2007) indicated that yield is assumed to affect the marketable supply positively, because a farmer that obtains high yield can supply more to the market than a producer who had less yield and so he gained more profit.

6/Selling price is an economic factor but it reflects farmer abilities in delivering crop to city markets or sold it in the farm. Selling price of the previous year stimulated production of next year, so it affects the profit positively.

7/ Sale place has a positive relationship with price if the farmer sells his product in village or city markets he will gain higher prices. So, selling in the farm will affect profits negatively.

8/Time of sale was measured as a dummy variable that would take the value of 1 if the producer sales sesame soon after harvest (November) and 0 other wise. Time of sale is expected to affect the profit positively because after harvest there was high purchasing power with low supply of the crop. So the producer has a chance to determine better prices.

9/Harvesting cost is expected to influence profit negatively.

10/ Transport cost is one of the marketing costs which expected to affect the profit negatively.

3.5.5 SWOT Analysis

The acronym SWOT stands for ‘strengths’, ‘weaknesses’, ‘opportunities’ and ‘threats’. SWOT Analysis is a tool used for strategic planning and strategic management in organizations. It can be used

effectively to build organizational strategy and competitive strategy. It has two dimensions: Internal and external. Internal dimension includes organizational factors, strengths and weaknesses. External dimension includes environmental factors, opportunities and threats (Gurel & Merba, (2017).

SWOT analysis used to identify the challenges and opportunities in sesame value chain along different stages. The analysis based on the comments of the participants about special questions given in the questionnaires, in addition to the results revealed from analyses. The questions in the questionnaires revolved on the problems faced the actors in the production, marketing, exporting and processing of sesame. Also, the questionnaires contain questions about the advantages of each enterprise concerning sesame. For more details about questionnaires see appendixes 19-23). This analysis helps to put some intervention measures to be recommended at the end of the study.

CHAPTER FOUR

Analysis, Results and Discussion

CHAPTER FOUR

Analysis, Results and Discussion

4.1 Preface

Sesame crop has great important role in Sudan economy. It provides vegetable edible oil to human being and cake product to the animals as well as foreign currency from export seeds. The study aimed to come out with the factors restraining sesame potentiality in Gadarif state and that by carrying out a value chain analysis. The analysis detected the contributions of all actors in the transformation of sesame from production stage throughout the different phases to the final consumers. Also, it tried to depict the profitability of sesame between the actors and estimate the factors affected it at the farm level. Meanwhile the analysis formulated some intervention policies to upgrade sesame competitiveness and profitability. This chapter discusses the main findings of the study. It is divided into five sections. The first section illustrates the socioeconomics characteristics of the value chain actors. The second section rounds on the functional analysis of the actors their role and activities in the value chain. Third section revolves on quantitative analysis calculation of profits, margins and value added in addition, to measure the incentive or disincentive of exporting sesame with two exchange rates. The fourth section depicts the factors affecting producer's profitability by using linear regression analysis. The fifth section illustrates the SWOT analysis in which challenges and opportunities in the value chain were identified.

4.2 Descriptive Analysis

4.2.1 Socioeconomic characteristics

4.2.1.1 Age of the respondents

The age of the actors was examined by classifying them into four groups: 20-40, 41-60, 61-80 and >80 years (table 4.1). Nearly, half of the respondents belonged to the age group 41-60 years. This information implied that the majority of the actors were relatively younger in age and were in a position to put more physical efforts. The oil retailers and cake traders concentrated in the age range 20-40 years, this reflects the trend of young people to trade.

Table (4.1): Distribution of the actors according to age

Actors/ years range	**20-40**	**41- 60**	**61- 80**	**>80**	**Total**
Farmers	28	77	44	1	150
Wholesalers	12	14	4	-	30
Exporters	6	9	-	-	15
Processors	5	9	1	-	15
Oil retailers	7	3	5	-	15
Cake traders	3	1	1	-	5
Total	61	113	55	1	230
Percent (%)	26.5	49.1	24	0.4	100

Source: Survey results, January 2020

4.2.1.2 Education level

The education level of the respondents has been grouped into five categories. The categories are (1) illiterate, (2) primary school, (3) secondary school, (4) university and (5) post graduate (table 4.2). It is observed that among most of actors the education was primary and secondary education except the exporters 93% of them had university level. About 27%, 20%, 14% and 13% of the wholesalers, oil retailers, farmers and processors, respectively had university level. 10% of wholesalers and 3% of farmers had post graduate level of education. Age and education level are used as indicators of awareness and abilities of taking decisions on crop cultivation, marketing, finance, resources allocation, and new agricultural technologies adoption. High level of education ensures high awareness of their business environment and ability to take right decisions (Nuha E., 2016).

Table (4.2): Distribution of the actors according to education level

Actors/ Education level	Illiteracy	Primary school	Secondary school	University	Post graduate	Total
Farmers	29	51	44	21	5	150
Wholesalers	-	9	10	8	3	30
Exporters	-	-	1	14	-	15
Processors	-	6	7	2	-	15
Oil retailers	-	7	5	3	-	15
Cake traders	-	3	2	-	-	5
Total	29	76	69	48	8	230
Percent (%)	13	33	30	21	3	100

Source: Survey results, January 2020

4.2.1.3 Experience of the respondents

It is cleared from table (4.3) that the majority of the respondents have got a good experience in their jobs between 10- 30 years. About 41% of farmers gained experience in production between 21-30 years which gave them high skills in adopting technologies and minimizing losses. Similarly, 47% of the wholesalers and exporters, 60% of the processors, oil retailers and cake traders have got a good experience in trading, exporting and processing sesame ranging from 10- 20 years.

Table (4.3): Distribution of the actors according to experience

Actors/ Years range	<10	10-20	21-30	>30	Total
Farmers	7	38	62	43	150
Wholesalers	4	14	10	2	30
Exporters	2	7	6	-	15
Processors	6	9	-	-	15
Oil retailers	3	9	2	1	15
Cake traders	1	3	1		5
Total	23	80	81	46	230
Percent (%)	10	34.8	35.2	20	100

Source: Survey results, January 202

4.2.1.4 Occupations

The work for which a man is engaged throughout the year is known as his main occupation (M. A. Monayem Miah *et al*, 2014, p 38). Table (4.4) shows that 87% of the farmers practiced farming as their main occupation, whereas 13% of them considered it as a secondary job. 77% of

wholesalers, 80% of exporters, 87% of processors and all of oil retailers and cake traders their occupations were the main jobs. These results indicate that the respondents are specialized and devoted to their jobs.

Table (4.4): Distribution of the actors according to occupation

Actors/ Occupation	Main	Secondary	Total
Farmers	130	20	150
Wholesalers	23	7	30
Exporters	12	3	15
Processors	13	2	15
Oil retailers	15	-	15
Cake traders	5	-	5
Total	198	32	230
Percent (%)	86	14	100

Source: Survey results, January 2020

4.2.1.5 Land tenure

Land is the most important asset for the farm household because farm family depends on the land. Table (4.5) shows that, the majority of the farmers in the sample cultivated sesame in their own lands, whereas 18% rent lands and small number of them used to share lands with others.

Table (4.5): Percentage distribution of land tenure

Land tenure	Own	Rent	Sharing	Total
No of Farmers	121	27	2	150
Percent (%)	81	18	1	100

Source: Survey results, January 2020

4.2.1.6 Machines ownership

Providing machines at right time of planting is very important element in season success, table (4.6) clears that more than half of producers used their own machines in the cultivation of sesame, while 38% of them rent machines from others. About 5% of the sample having some machines and complete their mechanical work by rent.

Table (4.6): Percentage distribution of machines ownership

Machines owner ship	Types of owner ship			Total
	own	rent	Own/rent	
No of farmers	85	57	8	150
Percent (%)	57	38	5	100

Source: Survey results, January 2020

4.2.2 Planted area, production and yield

Table (4.7) shows the total planted area, sesame area, production and yield by different areas, it is found that 28% of the area in the sample was planted by sesame. The average planted area by sesame was 182.6 feddans per farmer. AL Hawata, AL Shouwak and Doka are the main producing areas in the state, the average areas per farmer were 313, 260 and 230 feddans, respectively. The average yield per feddan was very low this season (2019/20). It was 67 kg compared to the last year 135 kg/fed (وزارة الزراعة، 2018).

Table (4.7): Average planted area, production and yield of sesame (season 2019/20)

Areas	Total area planted (feddan)	Sesame areas (feddan)	% of Sesame area	Production (sack)	Yield (kg/fed)
AL Shouwak	868.94	260.4	30	248.6	85.9
Al Greisha	187.83	59.5	32	50.2	75.9
Doka	860.58	230.2	27	160.5	62.8
AL Hawata	954.15	313.4	33	202.8	58,3
Glea Al Nahal	535.83	149.2	28	97.2	58.6
Al Gadarif	968.63	168.6	17	141.4	75.4
Al Hiorey	110.73	96.6	87	53.2	49.6
Total	4486.7	1277.9	28	954	67.2
Average	640.95	182.56	28	136.3	67.2

Source: Survey results, January 2020
Feddan = 4200 m^2 Sack = 90 kg

4.2.3 Importance of sesame compared to other crops

Many crops produced in Gadarif state beside sesame, the most important one is sorghum. It comes in the first in term of the planted area in the sample. Many producers grow sorghum instead of sesame because it has good productivity and easy in harvesting. The second crop was sunflower and sesame crop come in third and then millet. Also, melon seeds, cotton and groundnuts are grown in small areas.

Table (4.8): Importance of sesame compared to other crops planted (%)

Areas	Sesame	Sorghum	Groundnut	Millet	Melon seeds	Sun flower	Cotton
AL Shouwak	24	55		21			
Al Greisha	13	42		44			
Doka	10	29	4	2	8	32	15
AL Hawata	25	59			16		
Glea Al Nahal	12	34		21	33		
Al Gadarif	11	71		18			
Al Hiorey	56	27		17			
Average	22	45	4	21	19	32	15

Source: Survey results, January 2020

4.2.4 Distribution of sesame production

Sesame is grown for commercial purpose, as table (4.9) shows that 65% of the production in the sample was marketed. Marketed surplus is determined by deducting household consumption, Zakat and reserved seeds from the total production, it was about 618 sacks per farmer. The home consumption was 2% from production and the farmer stored around 25% from total production as reserved seeds for the next cropping season. Zakat represented about 8%.

Table (4.9): Distribution of sesame production (sack)

Areas	Total production	Zakat	Household consumption	Reserved seeds	Marketed surplus
AL Shouwak	249	17	3	105	124
Al Greisha	50	5	1	21	23
Doka	161	13	5	29	114
AL Hawata	203	15	3	35	150
Glea Al Nahal	97	9	2	16	70
Al Gadarif	141	11	3	25	102
Al Hiorey	53	5	2	11	35
Total	954	75	19	242	618
Percent (%)	100	8	2	25	65

Source: Survey results, January 2020

4.3 Analysis of Sesame Value Chain

The overall objective of the value chain analysis (VCA) is to describe the direction and volume of goods and services from producers to consumers and to determine the distribution of the value added, profits and margins between the actors. Analysis of sesame value chain in Gadarif State includes;

1/ Functional analysis to provide a detailed profile of sesame value chain structure through identifying the main actors in the value chain and their activities, quantified physical flows and mapped the value chain. Then determine the rules, regulations and coordination that governance and controls the sesame value chain.

2/ Quantitative analysis in which budgets constructed to different actors including cost structure, price component, profitability and gross margins and then financial ratios and marketing margin indicators were calculated.

4.3.1 Functional Analysis of the Sesame Value Chain

Functional analysis provides a detailed profile of the sesame structure through identification, description and quantification in physical terms of the sequence of operations concerning commodity production, processing, marketing and final consumption (Bellù, L. G., 2013). There are many steps required to complete a functional analysis; setting boundaries of value chain, identifying the main actors and their activities, mapping the flows and volume of the products in addition to setup the rules controlling the value chain.

4.3.1.1 Boundaries of the value chain

A value chain is often defined as the sequence of value-added activities, from production to consumption, through processing and commercialization. There are many products produced from sesame and reached to final consumers through different chains, the study concentrated only on sesame seeds and processing sesame to oil. There are different

options identified in the study area, it involved the main key actors in which the traders or wholesalers play a key role in the distribution of sesame from producers to processors or exporters. The options differ according to the products passed through the chain.

Option 1: Sesame seeds flow which started from Input suppliers - farmers - wholesalers - exporters- consumers in other countries.

Option 2: Sesame edible oil flows started from input suppliers – farmers – wholesalers - traditional processors - oil retailers - local consumers.

Option 3: Sesame cake flows started from input suppliers – farmers – wholesalers – traditional processors - cake traders - animal breeding consumer.

Option 4: Sesame edible oil and cake flow started from input suppliers – farmers – wholesalers - modern processors – foreign consumers (oil & cake). This option unfortunately is not covered in the study because the data about it is not available.

4.3.1.2 Identifying the main actors and their activities

The value chain actors are those directly involved in value chain activities. They include inputs providers, producers, wholesalers, processors, exporters, retailers and consumers. Actors in the value chain added value through marketing costs such as transportation, loading, cleaning, packaging, sorting, storage, pests control and weight loss. There are different institutions involved in the chain and give support activities to the actors as the State Ministry of Agriculture, Agricultural Bank, Research Institutions and private companies selling pesticides and herbicides.

4.3.1.2.1 Inputs suppliers

Inputs include seeds, labor, farm equipment, fertilizers, pesticides and sacks. Table (4.10) shows the inputs suppliers of sesame in the study area. It is cleared that most of the farmers bought their inputs from the markets. About 53% of the sample farmers bought sesame seeds from the

market, 44% of them used their reserved seeds from previous season and 2% provided their seeds from some companies in Gadarif state. Just (18) farmers from the sample treated their seeds chemically and they bought the chemicals from the markets, except 22% of them provided it from the special companies. Only (27) farmers from the sample used herbicides and pesticides in their farm activities most of it from the market and the some companies especially herbicides. While only 7% of them provided their herbicides and pesticides from State Ministry of Agriculture. As for the sacks the farmers bought from the markets and only small number provided them from the banks.

Table (4.10): Inputs suppliers of sesame in the study area (%)

Kind of inputs	Markets	Reserved	Bank	Companies	Ministry of Agriculture
Seeds (N=150)	53	44	0	2	0
Seed treatment (N=18)	78	0	0	22	0
Herbicides (N= 27)	48	0	0	44	7
Insecticides (N= 27)	89	0	0	4	7
Sacks (N=150)	99	0	1	0	0

Source: Survey results, January 2020

* (N) Number of farmers used the inputs

4.3.1.2.2 Farmers

Farmers are the first link in the marketing chain, there are two types of farmers in the study area small and large scale farmers basically the main distinction between them is the size of land holding and capital. The roles of farmers in sesame production include land preparation, cultivation, weeding and harvesting. The farmers depend on machines in the preparation and planting of sesame and on labor in weeding and harvesting. A few farmers of the sample sold sesame in their farm whereas 49% of them preferred to transfer it to near village markets to the traders or collectors. Those collectors transported it to the cities they called primary collectors they sell to processors, exporters, regional traders. Half of the examined farmers transported sesame themselves directly to city markets

where the assemblers or wholesalers have well-established businesses and capacity to handle large volume of sesame. Horizontal linkages of farmers are limited and farmer cooperatives or associations have limited functions if not non- existent in many regions such that dissemination of market information and promoting non-organic fertilizers and chemical pesticides could be a challenge.

4.3.1.2.3 Assemblers/ Wholesalers

Assemblers or wholesalers are the first connection between farmers and other actors in the value chain in the study area their role is to collect sesame from the farmers. About 7% of them in the sample purchased sesame directly from the farms, 30% collected it from the villages and transported to the cities. 63% of them purchased sesame from the city market after the farmers delivered it to the cities. The wholesalers sold sesame to the exporters, traditional and modern processors. A significant proportion of the crop is auctioned in Al Gadarif city by the wholesalers they act as middlemen or brokers, this leads to raise the prices of sesame without adding any value.

4.3.1.2.4 Exporters

Exporters delivered sesame to consumers outside the country and provided foreign currency to the country. They screen, clean and bag sesame-seeds into 50kg bag. The bagged sesame-seeds is then packed into 20 and 40 metric ton containers and transported to the shipping lines for onward shipment to the export destinations. A few exporters in the sample bought the sesame from the village markets whereas 80% of them prefer to purchase it directly from the wholesalers in Al Gadarif city to avoid transportation and to select good sesame varieties from the collection.

4.3.1.2.5 Oil processors

Sesame oil is produced primarily from red sesame seeds, three types of extractors are being used, the traditional manual (camel-driven),

small-motorized, and large-capacity oil extractors. Traditional and small motorized processors handle limited quantities of sesame-seeds and processed into oil. Cake was a result from processing as a bi-product and it is used for feeding the animals. 27% of the processors in the sample bought sesame from the village markets and 73% bought it from the wholesalers in the city. Large capacity processors processed large quantities of sesame seeds and export oil and cake to outside for foreign consumers.

4.3.1.2.6 Oil and cake traders

They bought oil and cake directly from processors in small quantities and sold it in the retail markets for local consumers and animal breed consumers.

Table (4.11): Functional analysis of the sesame value chain

Stages	Functions	Agents	Outputs
Input supply	Supply of inputs	Ministry of Agriculture (Federal and state), Banks, private companies.	Seeds, chemicals, sacks
Production	1/ Production of sesame 2/Primary marketing	Farmers Village collectors	1/ Production of sesame 2/ Sesame delivered to village and city markets
Assembling	Transportation and Collection of sesame from different farmers	Village collectors, wholesalers	Sesame seeds delivered to wholesalers in city markets and auctions
Export	Transport and export sesame seeds to foreign markets	Exporters, foreign consumers	Sesame seeds delivered to international markets
Processing	Transforming sesame seed to oil and cake	Traditional and modern processors	Sesame oil and cake delivered from millers and factories to local markets.
Retail	Transport oil and cake to final sales	Oil retailers, animals breeding, local consumers	Oil and cake delivered to final consumers

Source: Survey results, January 2020

4.3.1.3 Mapping the volume and flows of sesame value chain

Farmers planted sesame for commercial purpose, so they preferred to deliver their produce to the markets by themselves. From table (4.12) it is cleared that the average quantities delivered per sample farmer was 312.6 ton. Only 11% was sold in the farm whereas fifty percent of the volume sold in the village markets and about 39% sold in city markets. Many rural collectors act as middle agents, they collect sesame from different farmers and sold it without adding value. Wholesalers purchased sesame from the rural and urban collectors in the village or city markets but only 7% of them purchased about 34.6 ton directly from the farm. 57% of sesame collected from the city markets and 27% from village markets. The exporters delivered an average of 260.8 ton of sesame, 62% of it from city markets and 38% from village markets. Processors handle small quantities of sesame as they have traditional factories, the average purchased quantities was about 1.08 ton mostly from village markets.

Table (4.12): Average of purchased quantities of sesame/ actor (ton)

Actors	Purchase place			Total
	Farm	Village markets	City markets	
Farmers	34.65 (11%)	157.4 (50%)	120.6 (39%)	312.65
Wholesalers	34.65 (16%)	57.78 (27%)	120.6 (57%)	213.03
Exporters	-	99 (38%)	162 (62%)	260.8
Processors	-	0.63 (58%)	0.45 (42%)	1.08

Source: Survey results, January 2020

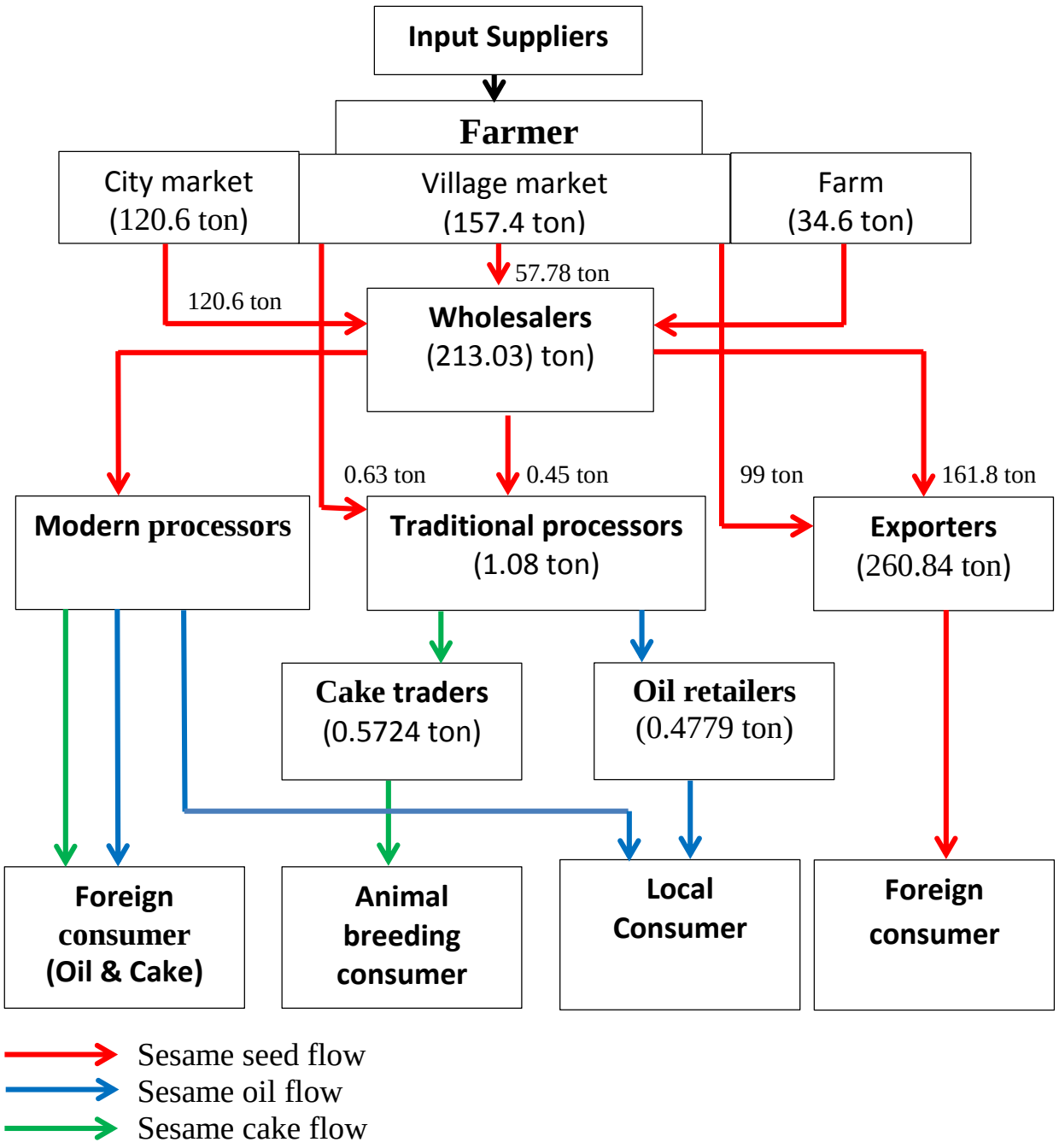


Figure (4.1): Flow chart of the sesame value chain in Gadarif state, Sudan

Source: Drawn by researcher January, 2020

4.3.1.4 Governance: coordination, regulation and control

Value chain analysis investigates the role of the institutions in regulating the value chain and creating the legal environment that ensures its functioning (Bellù, L. G., 2013).

According to STDF, 2017 there are different institutions and organizations in Sudan interact among the different agents of sesame value chain and they set-up the rules that governing them as:

1/ Ministry of Agriculture and Forestry (MOAF) is the main actor who plays a vital role in controlling agricultural products by building producers' awareness and enforcement of its different acts and regulations on agricultural products, including the sesame-seed.

2/ Federal Pesticides and Pest Control Product Act 1994 (Amendment has been done and is under the process in the Ministry of Justice for adoption).

3/ Federal Agricultural Fertilizers Act 2010

4/ Federal Seeds and Species Protection Act 2010

5/Plant Protection Directorate (PPD) is responsible for plant health and pesticides management in Sudan. It works under Ministry of Agriculture and it has a Pesticides Inspection Section as well as 18 out stations in the States. It provides import licenses for active compounds and controls the use of pesticides. However, effectiveness of the control system is limited by lack of equipment, training and applicable legal framework in distribution and use. The PPD is recognized by the International Plant Protection Convention (IPPC) as the National Plant Protection Organization for Sudan, and is authorized to issue the phyto-sanitary certificates.

6/ Quality Control and Export Development Unit, responsible for coordinating the quality control of export agricultural products to support exporters and official control bodies in ensuring that exported products meet international standards of safety and quality.

7/Research on agricultural products in Sudan is carried out by the Agricultural Research Corporation Sudan (ARC) under the Ministry of Agriculture and Forestry where its mission is to plan and implement research for sustainable production system in Sudan.

8/The Federal Ministry of Health (MoH), Directorate of Environmental Health, employs Public Health Officers, including in regional branches of the Ministry. They operate under the Food Control Act 1973 which gives power to the Federal Authority to supervise food control activities. Each State also has its own Environmental Health Ordinance.

9/The Public Health Laboratory can undertake some food safety tests in relation to pathogens, mycotoxins, heavy metals, pesticides and veterinary drugs residues.

10/The Sudanese Standards and Metrology Organization (SSMO) under the Ministry of the Council of Ministers, was established in the year 1992 and issues standards including for food, it includes members from various stakeholders such as industries, business, research centers, universities, ministries, labor associations, consumer protection associations and exports to guarantee a wide range of consultation. The organization has issued more than 1,000 food standards following CODEX and ISO recommendations, including code of practices, guidelines, sanitary requirements and measures of food establishments and transportation vehicles. According to the Specifications Act of 2008, the SSMO standards are considered to be mandatory in relation to imports and exports, and are enforced by the SSMO, which grants export certificates in relation to exported consignments of sesame and other commodities. To support this service the SSMO operates laboratories in Khartoum and Port Sudan. Some of the technical standards issued by SSMO on food standards that relate to the sesame-seed production and exports include:

- Maximum levels of mycotoxins in sesame-seed (SDS2928:2005),

- Sesame (SDS116:2009)
- Sesame Oil (SDS0047:2009)
- Information on package or label of the food commodities (SDS28890:2007)

A national standard was explicitly developed for sesame-seed (SDS116:2015) that covers packaging, labeling, shelfing, transport, storage, and sampling these national standards should be assessed to quality and compliance with international standards.

4.3.2 Quantitative Analysis of the Sesame Value Chain

The purpose of the quantitative analysis of a value chain at market prices is to appraise costs, revenues, and margins (value added and net benefits) of each activity in each segments of the value chain on the basis of prices actually paid and received by economic agents (Bellù, L. G., 2013). The quantitative analysis builds essentially on the functional analysis because it requires identify the key elements of the value chain (the economic agents and their activities) and the quantification of the physical flows of the sesame among agents. The analysis buildup of cost structure of different inputs categories at each stage of value chain and prices decomposition. Financial indicators were used to measure the financial situation of actors and profitability, also gross margin indicators were used to measure market performance.

4.3.2.1 Production cost of sesame seed

Different costs were incurred by farmers in producing sesame crop it was found that one feddan cost the farmer about 4188 SDG. This season was characterized by high infections of pests and diseases which led to low productivity. It reached to 66.7 kg per fed. So, the cost of producing one ton amounts to 62881 SDG (table 4.13). Variable costs represent about 76% from total production costs whereas fixed costs represent only 24%.

Table (4.13): Farm production cost of Sesame (SDG)

Items	Cost/fed	Cost/ton	%
Variable costs	**3199.8**	**48044.4**	76
Seeds	115.8	1739	3
Seed disperse	1.4	21	0
Herbicides	169.8	2550	4
Pesticides	43.9	659	1
Machinery costs	610	9159	15
Packing material	57	856	1
Hired labor operations	1556	23363	37
Labor feeding	215	3226	5
Zakat	431	6471	10
Fixed costs	**988.1**	**14836.8**	24
Permanent labor salaries	253	3799	6
Manger cost	172	2583	4
Land rent	520	7808	12
Camp maintenance	43	648	1
Total cost	**4188**	**62881**	**100**
Yield (sack)	0.74		
Yield (kg)	66.6		

Source: Survey results January 2020

Sesame crop is labor intensive, the agricultural operations that utilized labor are cleaning, weeding, harvesting, threshing and sacking. Hired labor costs were found as the highest producing cost. It accounted about 37% from total costs. Scarcity of labors and high wages per day raise the cost of manual operations. Total man-days for labor operations equal 5.4 days/fed, it equals 80.3days/ton (see appendix 5). Man-days for each operation is calculated by multiplication of the number of labor per area by actual working period (Penot E, Husson, 2010). The total labor cost was 23.3 thousand SDG per ton. Harvest cost was the highest cost in the labor operations' cost. It represented about 31%, followed by first weeding cost 28% (see appendix 6). The harvest required a large number of labor distributed throughout the field at the same time. Hala A., (2010) reported from El Hadari (1970) that "the most expensive factors that contributed

towards increasing the cost of production were the weeding and harvesting operations".

The second highest production cost was machinery cost it was 15% from production costs. More than half of the farmers in the sample have their own machines and the rest rent. The highest cost to the producers who owned machines was the maintenance cost. It represented about 37% followed by the salaries of the tractor drivers and their assistants and lastly comes fuel and oil cost (see appendix 7). For producers who rent machines, the highest cost reported was land preparation cost which represents 36% from total rent cost (see appendix 8). Though the cost of machinery used in sesame production was derived from both costs of owned and rented machines by taking the average (see appendix 9). Comparing the two costs between own and rent machines the study found that doing agricultural practices by renting machines was more expensive than doing it by owning machines. The total cost of renting machines was 10.5 thousand SDG to produce ton whereas it was 7.79 thousand SDG per ton in owned machines. This reflects the importance of possessing machines in minimizing cost of production.

Sesame inputs include seeds, seeds dispersers, herbicides, insecticides and sacks. The cost of inputs represents about 9% from total production cost (see appendix 10). Herbicides cost was found the highest one, followed by sacks and then insecticides. All of them are imported goods and they are affected by devaluation in SDG currency. In case of seeds most of the farmers used reserved seeds from previous season except the large farm owners who used certified imported seeds.

Zakat is taken from farmers whose production reached Nisab - 6 sacks and 20 malua – (Hala, 2010). So it is considered as a cost for the farmers and it represents about 10% from production cost. Land rent is the fixed cost and it represents about 12% from total production cost. There are

other fixed costs as permanent labor salaries and manger cost which calculated as opportunity cost for the times he spent in the farm (see appendix 12).

4.3.2.2 Production cost of sesame oil and cake

Sesame seed processed to the edible oil by different methods either by mechanical pressing or by camel driven. In both methods, the traditional processors used small quantities of raw sesame. Sesame cake is a bi-product resulting from extraction of sesame oil. Based on the analysis, it was found that one ton of sesame seeds produced about 442.7 kg oil and 530 kg cake. Processing sesame to oil results in big losses, it reached about 2.7% from ton. The losses are due to packing of oil in the containers or sometimes the pressing is not very hard and left some oil in cake. So, losses costs represent the highest cost for traditional processors which constituted more than half from production cost. Processing cost comes as a second cost represents about 31% and then labor wages cost which is about 12%.

Table (4.14): Production cost of sesame oil and cake (SDG)

item	cost/ton	Percent
Processing cost	1403	31
Maintenance	250	6
Labor wages	555.5	12
Losses cost (2.7%)	2307.3	51
Total production cost	4515	100

Source: Survey results January 2020

4.3.2.3 Marketing costs along value chain actors

Marketing costs are incurred when commodities move from the farm to the final market, whether they are moved by farmers, intermediaries, cooperatives, marketing boards, wholesalers, processors, exporters or retailers. The components of marketing costs are simply include handling costs, transport costs, storage cost, taxes and marketing

fees, physical losses equivalent in value terms, cleaning (FAO, SIFSIA, 2011).

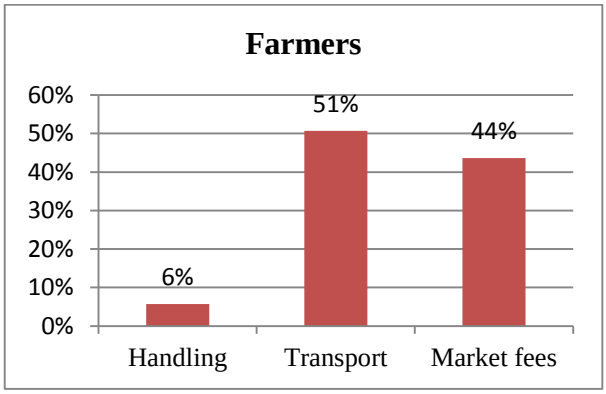
Sesame products were delivered through three options of value chain to different logistics destinations. Sesame seeds delivered to export destination while oil and cake delivered to the local markets. From table (4.15) it appeared that transport cost was the highest marketing costs facing the farmers when they sold their crop and it was more than half of marketing cost. Market fees was the highest cost for the wholesalers which represent about 40% from adding cost, followed by transport cost 24%. For exporters 55% of the costs incurred due to physical losses from screening and re-sacking of sesame. They lost about 5% from ton. Port Sudan expenses which include specifications, port fees and standards fees, were the second marketing costs facing exporters. It was 13% from the adding cost, followed by transport cost 11%. Containers and sacks costs were the highest percentage of marketing costs for traditional processors. They represented about 68%, followed by transport cost 22%. For oil retailers the highest percentage of marketing costs reported was losses cost 47%. This loss comes as result of packing the oil, followed by taxes 19%. In case of cake traders, taxes were considered the greatest cost 36% from total marketing costs. This is followed by handling cost 24% and then transport cost 23%.

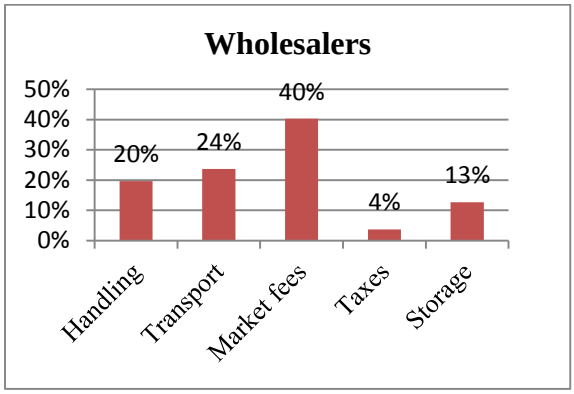
Marketing costs across actors of value chain revealed that exporters have highest marketing cost and they expended about 12.02 thousand SDG for one ton sesame. They are followed by traditional processors who expended about 3.2 thousand SDG for ton. It is also clear that physical losses and transport costs are the highest marketing cost faced the actors through the value chain.

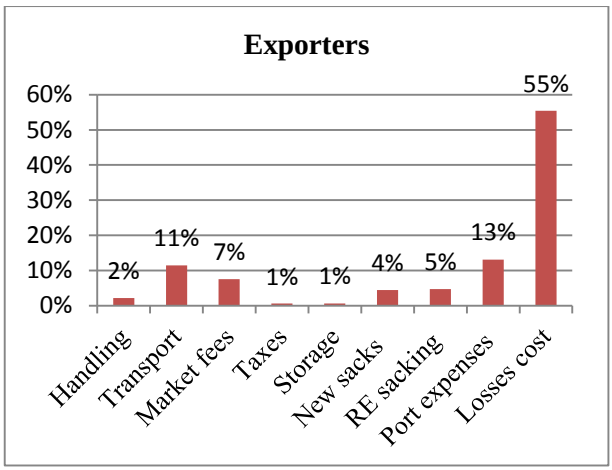
Table (4.15): Marketing costs of sesame value chain by actors (SDG/ton)

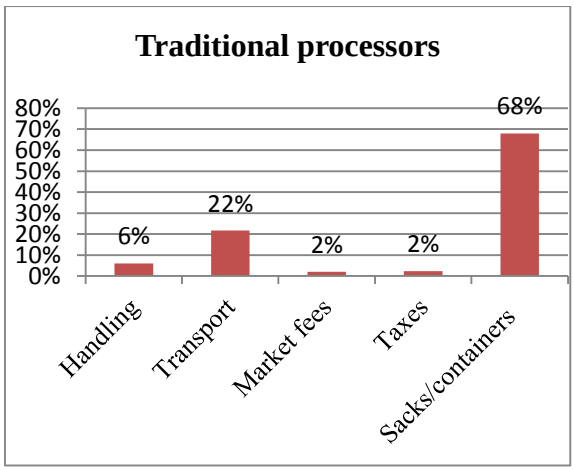
Items	Farmer	Wholesaler	Exporter	Processor	Oil retailer	Cake trader
Handling	110	291.2	259.5	197.1	200.2	230.8
Transport	979.9	351.2	1377.2	702.5	188.3	217.0
Market fees	843.3	596.8	900.5	66.3	130.6	156.4
Taxes		54.1	68.3	76.3	285.9	342.3
Storage		188.7	73.0			
Sacks/containers			535.9	2204.0		
Screening			567.8			
Port expenses			1578.0			
Losses costs			6666.3		717.2	
Total costs	1933.1	1482.0	12026.6	3246.3	1522.2	946.5

Source: Survey results January 2020









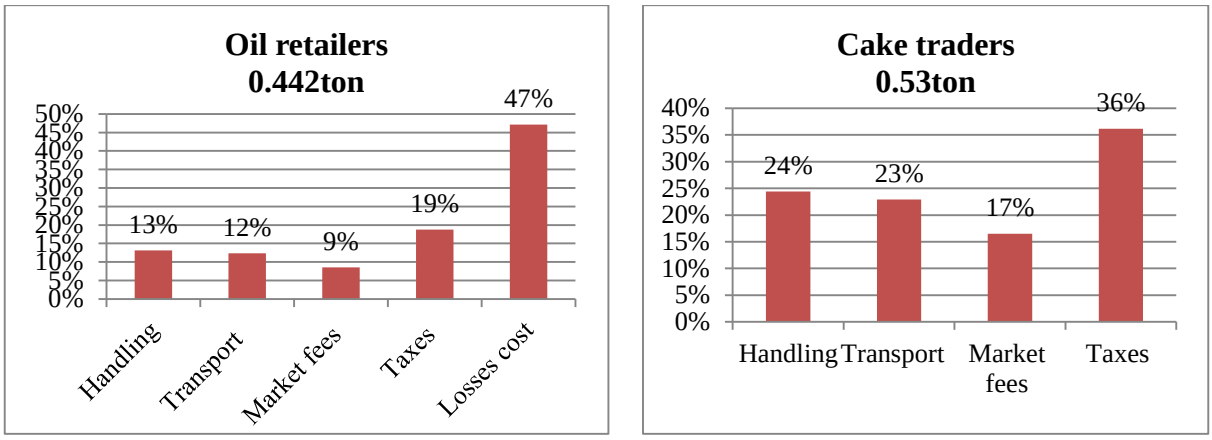


Figure (4.2): Marketing costs to different actors of sesame value chain (SDG/ ton)

Source: Survey results, January 2020

4.3.2.4 Revenues, profits and margins for different actors

Table (4.16) shows the total costs, total revenues, profits and marketing margins to all actors. It is clear that the exporters have the highest total costs and highest profit. They gained profit about 21.8 thousand SDG/ton. The second winner of the value chain actors was the wholesalers. They gained about 19.9thousand SDG/ton. Then come oil retailers, farmers, traditional processors and cake traders at the end. They gained about 13.9, 13.2, 11.2 and 3.2 thousand SDG from ton, respectively.

Table (4.16): Revenues, profits and margins (SDG/ton)

Items	Farmer	Wholesaler	Exporter	Processor			Oil retailer	Cake trader
				Total	oil	cake		
Selling price	78034.5	99440	133326.9		228947.5	32176.4	264000	40000
Quantity sold	1	1	1	0.9727	0.4427	0.53	0.4427	0.53
Revenue	78034.5	99440	133326.9	118409	101355	17054	116872.8	21200
Production costs	62881			4515	3865	650		
Marketing costs	1933.1	1482.0	12026.6	3246	2631	615	1522.2	946.5
Purchase price	-	78034	99440	99440	85118	14322	101355.1	17053.5
Total costs	64814.5	79516.4	111466.6	107201.6	91614.1	15586.8	102877.2	18000.0
Net profit	13219.9	19923.6	21860.3	11207.0	9741	1466.7	13995.6	3200.0
Marketing margin	15153.1	21405.5	33886.9	18968.6	16236.7	2731.9	15517.7	4146.5

Source: Survey results January 2020

The percentage share of value added, profit and gross margin were calculated within three options and compared in the figure (4.3). It is clear that in the three options of the value chain farmers added most of the values and received most of the gross margins. Paradoxically, the exporters have highest percentage share of profit 40% in sesame seed value chain, followed by wholesalers 36% and the farmers received only 24%. In sesame oil value chain wholesalers gained the highest percentage share of profit 33%. They are followed by oil retailers 27% then the farmers 22% and finally the processors 18%. While in cake value chain, cake traders gained the highest percentage share of profit 34% followed by wholesalers 30% and lowest percentage share of profit received by processors 16%.

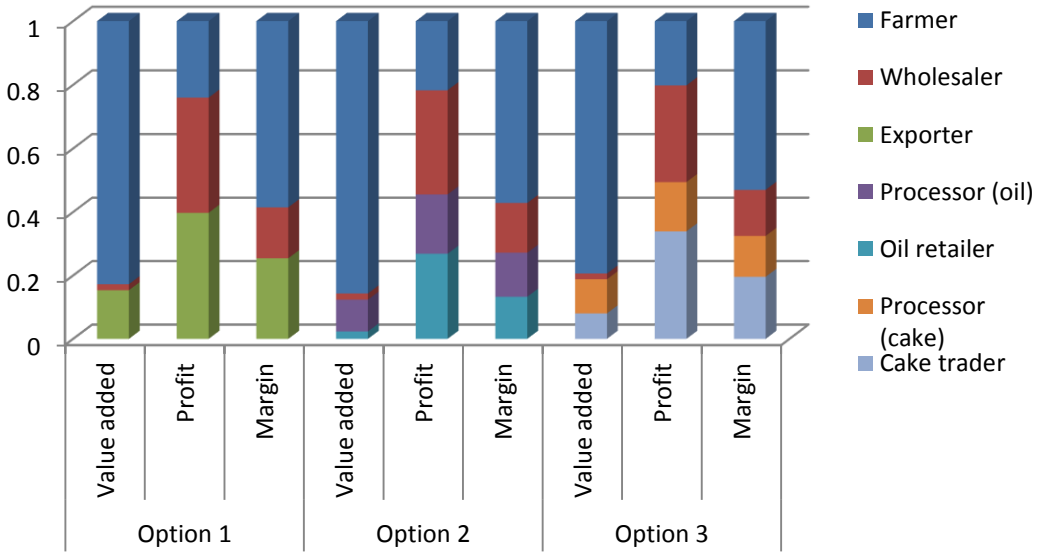


Figure (4.3): Percentage share of value added costs, profits and margins for all actors in sesame value chain (2019/2020)

Source: Survey results, January 2020

4.3.2.5 Financial ratios of value chain by stages

Profitability of the value chain actors compared by calculating certain ratios included in table (4.17). The percentage of profit margin is the percentage of profit from selling price. It indicates that wholesalers

gained high percent (20%) followed by farmers, exporters and lastly the traditional processors whose profit represents only 9% from the selling price. Also, it is noticed that the coefficient of private profitability, which calculated by dividing revenues by total costs, was found greater than one (CPP >1) to all actors. This indicates that all stages from production to marketing, exporting and processing were efficient and profitable. The highest CPP was found in wholesale stage 1.25 and the lowest CPP found in processing stage. The ratio of return for one SDG invested and calculated by dividing revenues by variable costs was found highest to the oil retailers. This followed by wholesalers and then cake traders, 76.8, 67.1 and 22.4 SDG respectively. Those results supported the previous findings that the wholesalers and traders are profit maximizers. Actually the oil retailers benefit a lot from selling the empty containers of oil. Return of one SDG invested to the farmer was found very low compared to other actors, for one SDG return only 1.56 SDG which means the farmer gained small profit. This is actually due to low productivity of sesame in addition to high costs. Comparing exporters and traditional processors values, it was found that the processors return about 15 SDG for one SDG invested whereas exporters return only 11 SDG for one SDG invested. This may be attributed to the fact that the export markets are more affected by devaluation of local currency in addition to high variable costs of export.

Table (4.17): Financial ratios of value chain for different actors

items	Farmer	Wholesaler	Exporter	Processor	Oil retailer	Cake trader
Net profit margin %	17	20	16	9	12	15
Coefficient of private profitability (CPP)	1.20	1.25	1.19	1.10	1.14	1.18
Return for 1 SDG invested(SDG)	1.56	67.10	11.09	15.26	76.78	22.40

Source: Survey results January 2020

4.3.2.6 Marketing Margin Indicators of Value Chain by Options

4.3.2.6.1 Total Gross Marketing Margin TGMM

Table (4.18) compares different coefficients of value chains in different options. It can be seen that the TGMM as currency was very high in seed value chain (option 1) it equaled 55.3 thousand SDG for ton of seeds. In option 2, it equaled 50.0 thousand SDG per ton of sesame oil, whereas in option3, it was 9.9 thousand SDG. When comparing total gross marketing margin as percentage of consumer price, it was found that option 3 had a highest TGMM (47%) then option 2 (43%) and lastly option 1 (41%). This indicates that as long value chain between producer and consumer as the higher percent of TGMM which implies that the market margin becomes wide and price becomes high for consumers and low to producers.

4.3.2.6.2 Total Gross Profit Margin (TGPM)

It is calculated by subtracting TGMM from total operating expenses for all actors and found that it was highest in option 2. It equaled 43.0 thousand SDG for ton of oil whereas it reached 39.8 thousand SDG for ton of sesame seeds and for cake it was 7.9 thousand SDG.

4.3.2.6.3 The Net Marketing Margin (NMM)

It is computed from the difference between percentage shares of gross marketing margin and total marketing costs as the percentage of retail price in the chain. Accordingly, option 3 had the highest NMM which constituted 38% of net income then option 2 with 36% and option 1 with 30%.

4.3.2.6.4 Producer Gross Margin (PGM)

It is the share of producer price in the consumer price. The producers had highest percentage share in exporting price (FOB price) in option 1 which constituted 59% then in sesame oil price was about 57% and cake price was about 53%. Hala A., (2010) found that the farmer's

share in FOB price was about 75% which is higher than the share of this study. This indicates that marketing margins between producers and final consumers was increased due to increases in the transaction costs.

4.3.2.6.5 Markup

It is the amount of currency added to the cost of products to get the selling price. In other word, markup means percentage of selling price that is added to the cost to get the selling price. The Markup ratios can be used as indicators of competitive pressure. Markup is calculated by dividing the difference of retail price and producer price by producer price. High markup was found in option 1 (71%) then option 2 (55%) and option 3(2%).

Table (4.18): Marketing margin indicators in the different options

Items	Option 1	Option 2	Option 3
Total gross marketing margin (TGMM) (SDG)	55292.4	50077.1	9961.3
Total gross profit margin (TGPM) (SDG)	39850.7	43001	7908
Total gross marketing margin (TGMM)%	41	43	47
Net marketing margin (NMM) %	30	36	38
Producer's gross margin (GMMp) %	59	57	53
Total Markup %	71	55	2

Source: Survey results January 2020

4.4 Export Parity Price

Value chain analysis can be used to formulate competitive strategies; to understand the sources of competitive advantage; to identify and develop the linkages and international ships between activities that create value (Prescott C. Ensign, 2015). The export parity price at production (or farm) level (EPPF) provides the maximum production costs for a given commodity to be competitive on the international markets (USDA, 2008). This can be calculated to assess the potential of a domestic produced commodity on the international market. Though, the export parity price at farm gate was used to measure the competitiveness of the sesame

using two scenarios of exchange rates. Scenario 1 with official exchange rate 45 SDG/$ (at January 2020), in which the government obligates the exporters to transfer 10% of their earnings to Central Bank of Sudan. Scenario 2 with exchange rate of parallel market (90 SDG/$). FOB price was used as a benchmark for the world prices. It converted to border price by multiplied with exchange rate. First, the export parity price at wholesale level (EPPW) is computed by subtracting all the costs incurred to bring the commodity from the wholesale points to the border. It includes the export taxes, transport, handling, storage and any other transaction costs from the border. Second, export parity price at farm gate (EPPF) is computed by subtracting all costs incurred to bring sesame to wholesale points. Then, the EPPF was compared with production costs. If EPPF is less than one it was not preferable to export.

Table (4.19) illustrates the calculations of export parity price at farm gate with two scenarios. FOB price was 1481 US$/ton after converted to border price by multiplied with the exchange rate it was 66.6 thousand SDG/ton for scenario 1 and 133.3 thousand SDG/ton for scenario 2 . Export parity price at wholesale level equals (57.9, 121.2) thousand SDG/ton with exchange rates 45, 90 respectively. After deducting all marketing costs from farm gate to wholesale points, the export parity price at farm gate level (EPPF) equals 54.5 thousand SDG in scenario 1 and 117.8 thousand SDG in scenario 2. Comparing EPPF with production cost which a mounted 62.8 thousand SDG/ton, it is clear that it was less than one in scenario 1 (0.8). This confirmed that export of sesame with exchange rate 45 SDG/$ is not profitable to the exporters. However to encourage and enhance the exporters to extend their business, the government should purchase the proceeds of the exports immediately upon receipt at the exchange rates declared.

Table (4.19): **Export parity price at farm gate of sesame seeds with two scenarios**

Items	Scenario 1	Scenario 2
FOB price ($/ton)	1481	1481
Exchange rate (SDG/$)	45	90
Border price (SDG/ton)	66645	133290
Losses from screening (5%)	3332.25	6664.5
Exporters price (SDG/ton)	63312.75	126625.5
TMC to the wholesale level (SDG/ton)	5360.2	5360.2
Export parity price at wholesale level	57952.5	121265.3
TMC to the farm gate (SDG/ton)	3415.1	3415.1
Export parity price at farm gate (EPPF) (SDG/ton)	54537.4	117850.1
Production cost (PC) (SDG/ton)	62881	62881
Comparison EPPF/PC	0.87	1.87

Source: Survey results, January 2020

4.5 Linear Regression Analysis

Linear regression analysis was done to estimate the socioeconomic factors that affected producer's profitability. Ten predictor variables were used in the model. These are: farmer age, secondary and graduate level of education, occupation, experience, yield, time of sale, sale place, selling price, harvest cost and transport cost. Profit per feddan was the dependent variable. The statistics version 20 of Statistical Package for Social Sciences (SPSS) was used to analyze the data for 150 farmers.

The results of the model summary showed that 63.9% of the variations of the dependent variable obtained due to the independent variables included in the model. The R Square in a multiple regression explained variance that can be contributed to all predictors in a progression it gives explanatory power (Timothy Plotts, 2011). The ANOVA table revealed that the variations in the dependent variable was a statically significant (p= 0.000) which is less than 0.05 significant level. This means that the socioeconomic factors presented in the model influenced producer's profitability by 63.9%. Zubaidah O & Fazleen A, (2020) reported in their study that "according to Frost (2017) a smaller R-squared value is not always a problem and a higher R-squared value is not

necessarily good due to the outcome variables, such as the human behavior, which are unpredictable. In addition, a moderate value of R-squared indicates a good model and otherwise; an extremely high value of R-squared indicates a biased mode".

An important step in a multiple regression analysis is to ensure that the assumption of no multi-collinearity has been met. Multi-collinearity is a statistical phenomenon in which two or more predictor variables in a multiple regression model are highly correlated (Timothy Plotts, 2011).The level of multi-collinearity can be assessed by looking to certain conditions; Pearson Correlation Coefficient of predictor variables should be more than 0.80, the variance inflation factor (VIF) more than 10 and R^2 more than 90% (Magabe, 2016). As table (4.20) shows none of the correlation coefficients (r) reached 0.80. This indicates no variables are closely related. Also, all VIF values range between 1.054 and 2.387 which means less than 10 and R^2 equals 0.639. Hence multi-collinearity cannot be suspected (For more details see appendixes 13-14-15).

Table (4.20): Regression coefficients of profit per feddan

Variables	Coefficients	Sig	Correlation (r)	VIF
(Constant)	-7543.864	0.001**		
Age	-639.735	0.216	-.105	1.330
Education	224.098	0.642	.039	1.376
Occupation	576.524	0.424	.068	1.426
Experience	-71.142	0.003**	-.251	1.436
Yield	62.057	0.000***	.635	2.198
Harvest cost	-.312	0.002**	-.259	1.054
Transport cost	.879	0.878	.013	2.387
Time of sale	955.822	0.041**	.173	1.278
Sale place	-1319.219	0.167	-.117	1.339
Selling price	74.405	0.004**	.240	1.089

Source: Survey results, January 2020

R= 0.799 R^2=63.9% Adjusted R^2 =61.3% F=24.6 DW=2.09

***significance at (p< 0.00) ** significance at (p< 0.05)

The estimated equation of the factors affected producer's profitability can be written as follow:

Profit (y) = -7543.864+62.057(yield) -0.312(harvest cost) + 74.405(price) - 71.142(experience) + 955.822(time of selling) + Std. error of estimate

Table (4.20) of regression coefficients indicates that from ten predictor variables only five have significant effect on the producer's profit. Yield of sesame was highly significant at $p< 0.00$ level. Other four variables were significant at $p<0.05$ level. These were harvest cost, farm experience, selling price and time of selling. All predicted variables have an expected signs, except the farmer age, experience and transport cost.

Yield of sesame or productivity showed positive and statically significant relationship with the profit per feddan. Coefficient of correlation implies moderate correlation ($r= 0.635$). The regression coefficient of yield was ($B= 62.057$). It revealed that when there is an increase in one unit of the yield (when other predicators are constant) the profit increases by 62.05 units.

Harvest cost negatively affected producer's profitability as it is expected. It influences the profit by 0.312 which means increase in harvest cost by one unit, the profit decreases by 0.312 units and this conform the previous results of production costs.

Farm experience was statically significant with the profit but it has negative influence not as expected ($B= -71.142$) that means increase in the years of farm experience, the profit decreased by 71.142 units. This may be attributed to the fact that the younger farmers are more active in business than older ones and adopted new innovations. This agrees with Magabe, (2016) result. He reported that "as the age of respondent increases, the probability of participating in sesame business decreases" and the farm experience increases with the age of the farmers.

Selling price had positive coefficient and significant relationship with profitability (B= 74.405). The coefficient is greater than yield's coefficient that means, the prices have strong influence on profit. By delivering sesame to village or city markets, the farmers will have access to gain better prices. Moreover, if the farmers sold directly to exporters or processors they will maximize their profits.

Most of the farmers have no abilities to store sesame for long time. Also most of them want to repay loans taken for the season and to pay for the labor. So the farmers prefer to sell their crop early after harvest during the lean season. In this period the supply of the crop in the markets is very few. So the farmer can determine good prices especially with presence of high purchasing power. This will affect the profit positively. This result agrees with Kindie A, (2007) result, he indicated that time of sale is expected to affect the marketable supply of sesame positively because, a farmer that supplies his sesame to the market soon after harvest is assumed to get better prices than a farmer supplies lately.

4.6 SWOT Analysis

A SWOT analysis was used to describe the challenges and constraints of the sesame value chain beside the strengths and opportunities. SWOT is an acronym for "Strengths, Weaknesses, Opportunities and Threats. Strength and weakness are internal factors whereas the opportunities and threats are external factors. Table (4.21) summarizes the results of SWOT analysis at different chain activities identified from the survey.

4.6.1 Weaknesses and threats in the sesame value chain

Sesame crop in Gadarif state faces several constraints and challenges starting from production and extended through wholesale, export, processing and retail. At the farm level, about 90% of the sampled

farmers reported that the pests and diseases lead to big losses of the crop. Unfortunately, the farmers have limited pesticide knowledge and there was inappropriate use of pesticides. Sesame production is labor intensive by nature and seeks huge labor from land preparation to threshing, however shortage and scarcity of labor is the critical problem mentioned by 77% of the sample farmers. Most of the farmers still use traditional seed varieties bought from the markets or reserved from previous seasons and this result in low productivity. Improved varieties of sesame seeds are mostly imported and are expensive for smallholder farmers to buy. About 61% of the farmers said that providing the required inputs was also considered as big constraints to them. Distribution of rains was another constraint affected the season, this is reported by 51% of the sample. About 44% of the sample indicated that low prices of sesame at harvest time frustrated the farmers because most of them don't have facilities to store their crop. Another constraint faced the farmers was the shortage of finance. About 35% of the farmers indicated that the source of finance is either by themselves or borrowing from the bank. The self-financing is provided through personal saving or selling of crops and animals.

At the collection and trading level, high fees and taxes considered a big problem as about 40% of the sample reported that. Also, about 37% of the sample said that many brokers between farmers and traders were the main constraint because they increased the transaction costs. Furthermore, high transportation costs and absence of marketing facilities especially good storage facilities resulting in high quality and quantity losses as well as price volatility were indicated as marketing constraints.

At exporting level also many brokers mentioned as main problem by 93% of the sample because they raised the prices for them. High transportation costs, high port expenses, high losses from screening were all constraints faced the exporters. In addition to that 80% of the exporters

considered the speculations between traders and banks are big threats and constraint. Moreover, some exporters commented about the mismatch of Sudanese sesame to specifications and international standards, a thing which limits the export destinations.

Processing activities constrained by high processing cost which reported by 40% of the sample and also high losses from raw materials and oil which reached about 2.7% per ton.

At the retailing level, high taxes and fees and handling costs were the main constraints.

4.6.2 Strengths and opportunities in sesame value chain

Sesame has become an important export commodity of the country and provides foreign currency. It is continued to be competitive in spite of all challenges that are due to some advantages and opportunities. Stakeholders in the survey identified different strengths and opportunities in favor of sesame in different stages of value chain. For example, in the production level the main advantages mentioned were suitable growing conditions, high participation of women, good local varieties, available of local and international markets and different uses of sesame.

In the marketing stage, the actors stated that there are different marketing channels at national, regional and international levels, besides high purchasing power and increasing demand for sesame for multiple uses.

Exporters of sesame reported that sesame is highly desirable from international markets and presence of auction in Gadarif state helped in buying and selling the crop. Also the private sector encourages sesame export in addition to that it’s a source of foreign currencies.

In the processing stage, the main advantages mentioned were that the sesame oil is very preferable oil due to its contents and hence it’s high

purchasing power. More advantages are the availability of raw materials and its processing provides jobs for labor.

Table (4.21): Summarizes of SWOT Analysis

Strengths	**Weaknesses**
Production stage: • Suitable growing conditions • Employment oriented/ women • Good local varieties • Improve farm income **Marketing stage:** • High purchasing power • Local and international markets **Export stage:** • Highly desirable • Presence of auction • foreign currencies **Processing stage:** • High oil contents • Availability of raw materials • Provides jobs	**Production stage:** Pests and diseases Inappropriate use of pesticides Labor intensive Low productivity Shortage of finance **Marketing stage:** Absence of marketing facilities Quality and quantity losses **Export stage:** High losses Mismatch of the international standards **Processing stage:** High losses Lack of finance
Opportunities	**Threats**
Production stage: • Different uses of sesame • Access to markets **Marketing stage:** • Multiple uses **Export stage:** • Private sector • New markets **Processing stage:** • High demand for oil • High demand for cake	**Production stage:** Distribution of rains/environmental conditions Expensive inputs Low prices at harvest **Marketing stage:** High fees and taxes High transportation costs Price volatility **Export stage:** Many brokers High transportation costs High port expenses Speculations between traders and banks Low exchange rate **Processing stage:** High processing costs Import oil

Source: Survey results, January 2020

CHAPTER FIVE
Summary, Conclusions and Recommendations

Chapter Five
Summary, Conclusions and Recommendations

5.1 Summary

Sesame crop is a very important cash crop in Sudan, it is produced in semi-mechanized rain fed sector especially in Gadarif state. Sesame sector is exposed to different challenges and constraints that hinder its role. The study aimed to detects the contributions of all value chain actors and determine the factors influencing profitability. Moreover, the study aimed to identify the major opportunities and challenges in different stages in order to design appropriate intervention measures. The study depended on primary data collected by a questionnaire from farmers, traders, exporters and traditional processors. Also, secondary data was collected from different related institutions.

The major findings are summarized as follows:

1. Socioeconomic characteristics of the actors in the value chain revealed that half of the actors belonged to the active age ranging between 20- 60 years and they had primary and secondary level of education.
2. The majority of the respondents have got a good experience and they were specialized and devoted to their jobs. Most of the farmers produced sesame in their own farms and used their own machines in cultivation.
3. The results showed that the average planted area of sesame was 182.6 feddans per farmer and the average yield was very low this season 2019/20. It was 67 kg. It was found that about 65% of the production was marketed.

4. Key actors were identified in the study area included inputs suppliers, producers, wholesalers, traditional processors, exporters, traders and consumers.
5. There were different options of value chain identified in the study area according to the activities of the actors. Three options were traced. The first was the sesame seed value chain, in which the actors involved were input suppliers, farmers, wholesalers, exporters, foreign consumers. The second option was the sesame oil value chain and the actors were input suppliers, farmers, wholesalers, traditional processors, oil retailers and local consumers. The third option was the cake value chain and the actors were input suppliers, farmers, wholesalers, traditional processors, cake traders and local animals breeding buyers.
6. Farmers incurred total costs of about 64.8 thousand SDG to produce one ton of sesame and they gained a profit about 13.2 thousand SDG/ton which represented about 17% from revenues.
7. Total marketing costs incurred from exporting one ton of sesame equals 15.4 thousand SDG and the profit obtained equals 55 thousand SDG. The profit obtained from processing one ton of raw sesame equals 50.9 thousands SDG from oil and 9.6 thousands SDG from cake.
8. Among all options the farmers added largest share of value added and got highest gross marketing margins whereas the highest percentage share of profit received by exporters in option1, wholesalers in option 2 and cake traders in option 3.
9. Financial indicators cleared that the coefficient of private profitability (CPP) was greater than one to the all actors. This indicates that all enterprises of sesame (production, marketing, exporting and processing) were profitable.

10. Return for one SDG invested to the farmer was found very low compared to other actors which mean that the farmer gained small profit.
11. Results from marketing margin indicators showed that TGMM was high in cake value chain (option 3), it counted to 47% and the lowest in sesame seed value chain (option 1).
12. Producer's share in consumer price was the highest in exporting sesame seed. It was 59% from FOB price.
13. Calculation of export parity price at farm gate level revealed that exporting sesame was not incentive with official exchange rate (45 SDG/$).
14. Results of linear regression analysis on profit per feddan as dependent variable revealed that 63.9% of the variation of the dependent variable obtained due to the independent variables included in the model.
15. From ten predicted variables only five were found to have significant effect on the producer's profit which are; selling price, yield, harvesting cost, farm experience and time of sale.
16. The study identified some challenges and opportunities in sesame value chain from SWOT analysis, the opportunities revolved on suitable conditions for growing, employment oriented, availability of the markets and high demand for value added products. Whereas the challenges concentrated on lack of improved seeds varieties, infection of pests and diseases, many brokers, high transportation costs, high losses, absence of marketing facilities and high processing costs.

5.2 Conclusions

The importance of the present study is that the agricultural sector plays a significant role of income and employment for majority of

smallholders. So the study is interested in the distribution of the profits of sesame between actors of the value chain in Gadarif state. The results revealed that the key actors in the value chain were inputs suppliers, producers, wholesalers, exporters, traditional processors, traders and consumers. The study focused on various issues related to socioeconomic characteristics of the actors because they are considered as the key factors affecting agricultural production and producer's profitability. It was found that nearly half of the actors were in economically age ranging between 41-60 years. The majority have secondary and university level of education. This means they have abilities to take decisions on crop cultivation, marketing, finance, resources allocation, and new agricultural technologies adoption. In addition to that all actors in sesame value chain were specialized and devoted on their jobs. Also, the study revealed that the structure of sesame value chain was well functioning and the crop marketed in huge volume through value chain options and delivered to different logistics destinations. It is clear that most of the value added in the value chain was due to high transportation costs and costs due losses. Also, the study proved that sesame enterprises (production, marketing, export and processing) were profitable in all stages. Farmer’s share on the consumer price depends largely on the total gross marketing margins between the farmer and the final consumer. If the farmers sold the crop directly to the exporters or processors their profits will increase. Policy of transferring 10% of the exporter’s earnings to the Bank of Sudan with official exchange rate was not incentives to the exporters and they were complained about it. The farmer’s profitability was affected positively by productivity, selling price and time of sale and negatively by harvesting cost and the experience of the farmers. Finally, the study confirmed that sesame was a competitive crop and profitable and it has many strengths and opportunities in spite of existence of some challenges in each stage. Therefore certain interventions

and policy actions are needed to overcome these challenges to upgrade and improve sesame enterprises. These interventions can take place by the government, private sectors or the civil society as the NGOs or other communities.

5.3 Recommendations

Based on the research findings and conclusions, the following policy action recommendations have been suggested:

1. Develop good varieties of sesame with high productivity and resistance to diseases.
2. Improve post-harvest management system to reduce quantity and quality losses.
3. Rural roads should be constructed by the government to enable the farmers in the rural areas to transport their products easily to urban markets.
4. Raise farmers' skills by education and training programs to improve their knowledge about the farm technologies, agricultural information and marketing.
5. Improve the efficiency of the marketing system by providing credit facilities, marketing information system and use of the effective price policies.
6. To encourage and support the exporters, the government should purchase the crop immediately upon receipt at the exchange rates declared.
7. Activating the role of the commercial attaché in embassies to strengthen export promotion and increase export share in existing destinations and new markets.

8. Encourage investments in the manufacturing of sesame oil by providing credit facilities and new technologies to traditional processors to expand their enterprises.

5.4 Areas for further research

The study focused only on export sesame seed value chain and processing sesame to the oil and cake by the traditional methods of processing. Therefore, there are some areas suggested for further research as:

- Analysis the potentiality of processing sesame to oil by modern technologies processing.
- Future research should undertake to investigate the factors influencing export sesame oil.
- Comparative study between exporting sesame seed and exporting sesame oil. This will provide better information about comparative advantages of value added and profits.

REFERENCES

References

1. Ali Showgi, (2013) - An analysis of Sesame crop value chain, case study of University Kordofan region, Sudan- M.Sc. degree, Kenyatta– Kenya.
2. Abebe T. N. (2016)- Review of Sesame Value Chain in Ethiopia - (International Journal of African and Asian Studies
   ISSN 2409-6938 - Vol.19: 36- 47 - www.iiste.org
3. Azad Rahman et al., (2019), Market analysis of Sesame seed CQ University, Australia.
4. Alvi I. et al, (2020), Agricultural value chain analysis/ Sudan, World Bank group.
5. Bellù, L. G., (2013),Value Chain Analysis for Policy Making Methodological Guidelines and country cases for a Quantitative Approach , EASYPol Series 129, http://www.fao.org/easypol
6. Chemonics , (2002) - Overview of the Nigerian Sesame Industry, Chemonics International Inc. Washington, USA
   https://www.agmrc.org/media/cms/Sesame_subsector_overview_4CC9DED606F8A.pdf
7. Elfadil I., (2015), Analysis of Factors Constraining the Competitiveness of Sesame Export in the Sudan, Agricultural Economics Working Paper Series ,No 1, Department of Agricultural Economics, Faculty of Agriculture, Khartoum University, Sudan.
8. Eldigail Mawahib H., (2018), Gadarif state map, Prevalence of dengue fever virus, antibodies and associated risk factors among residents of El-Gadarif state, Sudan, Eldigail et al. BMC Public Health, 18:921. https://doi.org/10.1186/s12889-018-5853-3.
9. Estifanos Tassew, Agricultural marketing, For Agricultural Economics Students (3rd year), Course code AgEc 3103, unknown year and university.
10. FAO, SIFSIA, (2011), Price and Market-Structure Analysis for Some Selected Agricultural Commodities: Marketing Costs and Margins, Food Security Technical Secretariat / Ministry of Agriculture (FSTS) FAO- Sudan Integrated Food Security Information for Action (SIFSIA).
11. FAO. (2021). Special Report –FAO Crop and Food Supply Assessment Mission (CFSAM). Rome.

https://doi.org/10.4060/cb4159en

12. FME, (2013) - SWOT analysis strategy skill- www.free-management-ebooks.com/dldebk-pdf/fme-swot-analysis.pdf
13. John C. Keyser, (2006). Background paper for the Competitive Commercial Agriculture in Sub–Saharan Africa (CCAA) Study, Description of Methodology and Presentation of Templates for Value Chain Analysis, PART 1.
14. Gurel & Merba, (2017) -SWOT ANALYSIS: A Theoretical Review https://www.researchgate.net/publication/319367788_SWOT_ANALYSIS_A_THEORETICAL_REVIEW
15. Hala Ahamed, (2010), The Economics of Sesame Production and Marketing in Gadarif and North Kordofan Rain-fed Sector (Sudan), Ph.D. degree, University of Khartoum, Sudan.
16. Timothy Plotts, (2011), Multiple Regression Analysis of Factors Concerning Superintendent Longevity and Continuity Relative to Student Achievement, Seton Hall University Dissertations and Theses (ETDs). 484. https://scholarship.shu.edu/dissertations/484.
17. Kaplinsky and Morris (2001) – A hand book for value chain research – Institute of Development Studies, University of Sussex, Brighton. https://www.ids.ac.uk/ids/global/pdfs/VchNov01.pdf
18. Katanga Y. N.et al. (2018), Profitability analysis of sesame value chain along Jigawa- Kano Axis, Nigeria, FUDMA Journal of Agriculture and Agricultural Technology, Vol. 4 No. 2: 227-234.
19. Kindie A, (2007), Sesame Market Chain Analysis: The Case of METEMA WOREDA, North GONDAR ZONE, AMHARA NATIONAL REGIONAL STATE, M.Sc. degree, Department of Agricultural Economics, School of Graduate Studies, HARAMAYA UNIVERSITY , Ethiopia.
20. Kothari C. R., (1990), Research methodology, methods and techniques, second revised edition, New Age International (P) Ltd., Publishers, India
21. Kumuar & Nain, (2013) - Agriculture in India: A SWOT analysis - Article in Indian Journal of Applied Research https://www.researchgate.net/publication/244992809_Agriculture_in_India_A_SWOT_analysis

22. Klaus F. & Monika H. (1997). Comparing Measures of Competitiveness, Discussion Paper No. 2. Institute of Agricultural Development in Central and Eastern Europe.
23. Luigi C., et al, (2018), Special report, Crop and Food Supply Assessment Mission to the Sudan, FAO, Rome. http://www.fao.org/publications
24. Linn T., (2013) - Value Chain Analysis of Sesame in Magway Township Myanmar. - Research Working Paper Series NO 5, Mekong Institute. http://www.mekonginstitute.org/uploads/tx_ffpublication/minzas_wps_2013_5_vc_Sesame_magway.pdf
25. Latruffe, L. (2010), "Competitiveness, Productivity and Efficiency in the Agricultural and Agri-Food Sectors". OECD Food, Agriculture and Fisheries. Working Papers No 30 OECD Publishing. http://dx.doi.org/10.1787/5km91nkdt6d6-en
26. Munyua.B et al, (2013), Open Sesame: A Value Chain Analysis of Sesame Marketing in Northern Uganda, Socioeconomics Discussion Paper Series, Number 6, International crops research institute for the semi-arid tropics, Nairobi, Kenya. http://oar.icrisat.org/7095/1/SDPS-6_OpenSeasame_Munyua_2013.pdf
27. Myint D. et al (2020), Sustainable Sesame (Sesamum indicum L.) Production through Improved Technology: An Overview of Production, Challenges, and Opportunities in Myanmar, http://www.mdpi.com/journal/sustainability.
28. Magabe, (2016) – Economic analysis of Sesame value chain in Masasi district, Mtwara region, M.Sc. Degree, University of Agriculture, Morogoro, Tanzania http://suaire.suanet.ac.tz:8080/xmlui/bitstream/handle/123456789/1645/RYOBA%20EMMANUEL%20MAGABE.pdf?sequence=1&isAllowed=y
29. M4P, (2008). Making value chains work better for the poor, a tool book for practitioners of vale chain analysis, version3, Department for International Development.UK. http://aciar.gov.au/files/node/14580/making_value_chains_work_better_for_the_poor_a_to_14413.pdf
30. Myin T. & Aung Y. M. (2019), Assessment of Value Chain Management of Sesame in Pwint Phyu Township, Magway Region, Myanmar - Journal of Economics and Sustainable Development - Vol.10: 117-128. www.iiste.org.

31. MOA & FSTS, (2016), Annual Crop and Food Supply Assessment Mission for Sudan.
32. M. A. Monayem Miah *et al*, (2014). Assessment of Socioeconomic Impacts of Oil Seed Research and Development in BANGLADESH- Duration: June 2011 to February 2014, Agricultural Economics Division Bangladesh Agricultural Research Institute, Gazipur , PIU-BARC, BARC complex Farm gate, Dhaka-1215.
33. Nang'ole EM, et al., 2011). Review of guidelines and manuals for value chain analysis for agricultural and forest products. ICRAF Occasional Paper No. 17, World Agroforestry Centre, Nairobi. http://www.worldagroforestry.org/downloads/Publications/PDFS/OP11160.pdf.
34. Nuha E. S. (2016), Economic Analysis of the Competitiveness and Cropping Pattern of Small-Scale Farms in the Rain-Fed Sector of Gadarif State – Sudan, Ph.D. degree, Sudan University of Science and Technology.
35. Prescott C. E.,(2015),Value chain analysis and competitive advantage, Journal of general management, Vol27:18-42.
36. Penot E, Husson, 2010. Economic calculations for assessing agricultural systems Cost benefit analysis and farm level real budget analysis. "Cirad" Agricultural research for development. UMR innovation.
37. STDF, (2017) – Upgrading the Sudanese Sesame seeds value chain, - STDF project Grant Application Forum, MOA, FAO, STDF, MI,UNIDO.
38. Steven K. Thompson, (2012), Sampling, third edition, John Wiley & Sons, Inc., Hoboken, New Jersey, p 59-60.
39. USDA, 2008. Import/Export Parity Price Analysis. FEWS NET Markets Guidance, No 1 May 2008.
40. http://www.fao.org/faostat.
41. Zubaidah O & Fazleen A, (2020) unraveling the factors affecting agriculture profitability enterprise: Evidence from coconut smallholder production, Accounting 6 (2020) 493–500. www.GrowingScience.com/ac/ac.html

المصادر العربيه:

1. ابو عصار احمد حسن، (2020)، دليل انتاج الحبوب الزيتيه، إدارة نقل التقانه ونقل المعرفه ،هيئة البحوث الزراعيه بالتعاون مع الادارة العامة للارشاد الزراعي ونقل التقانة، وزارة الزراعة والموارد الطبيعية .
2. بنك السودان، (2003- 2020)، الموجز الإحصائي للتجاره الخارجيه.
3. بنك السودان، (2019) ، التقرير السنوي رقم 59.
4. سحر محمد نجيب حسين عبدالباقي، (2014)، إقتصاديات إنتاج محصول الخيار في البيوت المحمية للتصدير بالتر كيز على قياس القدرة التنافسية، بحث مقدم لنيل درجة الماجستير في الاقتصاد الزراعي، جامعة السودان للعلوم والتكنولوجيا، كلية الدراسات العليا قسم الإقتصاد الزراعي.
5. وزارة الزراعة والغابات، إدارة الإحصاء الزراعي، (2000-2020)، السلاسل الزمنيه للمحاصيل الرئيسيه في السودان .
6. وزارة الزراعة والغابات، إدارة الإحصاء الزراعي، (2018) السمات العامه للموسم 2019/2018.

APPENDIXES

Appendixes

Appendix (1)

Percentage share of areas cultivated of sesame in the semi- mechanized sector and traditional sector to Sudan during the period (2000-2020)
(In thousand feddan)

Years	Semi-Mechanized	Traditional	Sudan	Share of semi-mechanized	Share of traditional
2000/2001	3746	1555	5301	71%	29%
2001/2002	2793	1961	4754	59%	41%
2002/2003	1035	1761	2796	37%	63%
2003/2004	2501	1918	4419	57%	43%
2004/2005	2429	2108	4537	54%	46%
2005/2006	805	1822	2627	31%	69%
2006/2007	3746	1555	5301	71%	29%
2007/2008	2140	2276	4416	48%	52%
2008/2009	1780	2193	3973	45%	55%
2009/2010	1905	2668	4573	42%	58%
2010/2011	1938	2288	4226	46%	54%
2011/2012	1384	2634	4018	34%	66%
2012/2013	4238	3502	7740	55%	45%
2013/2014	1446	1402	2848	51%	49%
2014/2015	3469	4295	7764	45%	55%
2015/2016	2328	3429	5757	40%	60%
2016/2017	2184	4501	6685	33%	67%
2017/2018	3236	4529	7765	42%	58%
2018/2019	5720	4997	10717	53%	47%
2019/2020	6590	8203	14793	45%	55%
Average	2770.7	2979.9	5750.5	48%	52%

Source: Ministry of Agriculture and Forestry- Agric. Statistics department

Appendix (2)

Percentage share of sesame production in Gadarif state to the Total semi-mechanized sector and total Sudan during the period (2000-2020)
(In thousand metric tons)

Years	Gadarif	Total semi-Mechanized	Total Sudan	share of Gaderif to semi-mechanized	share of semi-mechanized to Sudan	share of Gaderif to Sudan
2000/2001	75	226	282	33%	80%	27%
2001/2002	46	193	296	24%	65%	16%
2002/2003	27	61	122	44%	50%	22%
2003/2004	114	259	401	44%	65%	28%
2004/2005	55	171	277	32%	62%	20%
2005/2006	46	107	263	43%	41%	17%
2006/2007	75	226	282	33%	80%	27%
2007/2008	70	194	350	36%	55%	20%
2008/2009	68	185	318	37%	58%	21%
2009/2010	64	138	248	46%	56%	26%
2010/2011	74	211	363	35%	58%	20%
2011/2012	35	101	187	35%	54%	19%
2012/2013	153	301	562	51%	54%	27%
2013/2014	74	96	205	77%	47%	36%
2014/2015	145	377	721	38%	52%	20%
2015/2016	62	177	329	35%	54%	19%
2016/2017	77	236	525	33%	45%	15%
2017/2018	104	449	782	23%	57%	13%
2018/2019	145	592	960	24%	62%	15%
2019/2020	98	597	1209	16%	49%	8%
average	80.35	244.85	434.1	33%	56%	19%

Source: Ministry of Agriculture and Forestry- Agric. Statistics department

Appendix (3)

Average yield of Sesame in Gadarif state, semi-mechanized sector, traditional sector during the period (2000-2020) (In Kilogram/feddan)

Years	Gadarif	Semi-mechanized	Traditional	Sudan
2000/2001	78	72	41	63
2001/2002	70	88	65	78
2002/2003	82	85	53	65
2003/2004	124	119	88	106
2004/2005	80	87	64	76
2005/2006	134	153	96	113
2006/2007	78	72	41	63
2007/2008	147	110	88	99
2008/2009	148	119	94	107
2009/2010	111	115	60	82
2010/2011	130	132	79	103
2011/2012	117	108	84	96
2012/2013	180	82	88	84
2013/2014	117	95	121	107
2014/2015	130	127	102	114
2015/2016	90	109	83	95
2016/2017	149	112	87	103
2017/2018	126	149	97	121
2018/2019	135	132	97	116
2019/2020	90	126	114	120
Average	115.8	109.6	82.1	95.55

Source: Ministry of Agriculture and Forestry- Agric. Statistics department

Appendix (4)

Percentage of export quantities of Sesame from production and values during the period (2003-2020)

Years	Production (000 tons)	Quantities export (000 tons)	%	Values (million US $)
2003	401	108.6	27%	74.3
2004	277	218.3	79%	178.6
2005	263	154.6	59%	118.5
2006	282	219	78%	167
2007	350	111.7	32%	92.7
2008	318	96.7	30%	141.8
2009	248	137.6	55%	143.3
2010	363	224.1	62%	167.2
2011	187	211.8	113%	223.2
2012	562	208.9	37%	223.5
2013	205	242.7	118%	472.3
2014	721	299.7	42%	466.3
2015	329	307.3	93%	453.4
2016	525	467.6	89%	379.3
2017	782	550.4	70%	412.7
2018	960	704.5	73%	576.1
2019	1209	582.1	48%	771.6
2020	1146	688.8	60%	788.7
Average	507.1	307.5	61%	325.0

Source: Ministry of Agriculture and Bank of Sudan

Appendix (5)

Man-days of producing Sesame by labor operations and areas

Labor operations	AL Shouwak	Al Greisha	Doka	AL Hawata	Glea Al Nahal	Al Gaderif	Al Hiorey	Average	
								Days/fed	days/ton
Cleaning	0.60	1.1	0.8	0.7	0.8	0.7	0.9	0.81	12.1
Spray pesticides	0.05	0.04	0.01		0.01	0.1	0.02	0.04	0.6
First weeding	1.23	1.9	1.5	1.6	1.3	1.5	1.03	1.44	21.6
Second weeding	1.17	1.1	1.2	1.4	0.4	0.9	0.7	0.98	14.7
Harvest	0.9	2.9	1.4	1.3	1.5	1.1	0.8	1.42	21.3
Threshing & Sacking	1.4	0.8	0.6	0.8	0.4	0.4	0.3	0.67	10.0
Total	5.33	7.88	5.51	5.80	4.41	4.70	3.75	5.35	80.3

Source: field survey, January 2020

Appendix (6)

Average labor costs by operations and areas (SDG)

Labor operations	AL Shouwak	Al Greisha	Doka	AL Hawata	Glea Al Nahal	Al Gaderif	Al Hiorey	Average		%
								Cost/fed	cost /ton	
Cleaning	120.50	227.0	169.4	197.4	80.4	136.4	158.4	156	2337.0	10
Spray pesticides	17.90	39.2	11.7		33.5	51.4	3.1	26	392.4	2
First weeding	368.60	476.9	459.2	398.9	386.3	524	451	438	6574.2	28
Second weeding	291.80	340.3	296.8	288.1	90.5	222.4	200.3	247	3711.3	16
Harvest	460.8	588.2	506	518.7	414.5	485	357.9	476	7145.2	31
Threshing & Sacking	273.3	205.4	253.4	281.8	170	200	109	213	3202.3	14
Total	1533	1877	1697	1685	1175	1619	1280	1556	23362.5	100

Source: field survey, January 202

Appendix (7)

Average costs of owned machines by areas (SDG)

Items	AL Shouwak	Al Greisha	Doka	AL Hawata	Glea Al Nahal	Al Gaderif	Al Hiorey	Average		%
								Cost/fed	cost /ton	
Annual maintenance	178.5	292	255.6	203.5	253	127	45.2	193.5	2906.0	37
Fuel for machines	49.4	214	127	92.2	65.5	60	249.3	122.5	1839.1	24
0il and greases	46.9	70.6	51.6	31.5	41	24	173.4	62.7	941.7	12
Drivers salary	48.6	207	82.9	130.5	152.4	89	271	140.2	2105.1	27
Total	323.4	783.6	517.1	457.7	511.9	300	738.9	518.9	7791.9	100

Source: field survey, January 2020

Appendix (8)

Average costs of rent machines by operations and areas (SDG)

Mechanized operations	AL Shouwak	Al Greisha	Doka	AL Hawata	Glea Al Nahal	Al Gaderif	Al Hiorey	Average		%
								Cost/fed	cost /ton	
Cleaning	240		266.6	282	160	148	150	207.8	3119.6	30
Preparation	332	270	316	321.6	186.3	172.0	147.5	249.3	3743.9	36
Planting	356.7	280	126.7	321.0	186.0	168	139	225.3	3383.5	32
Spray pesticide	116		36.5	14.4	46.0	3.0	4.0	36.7	550.3	5
Crop cutting	5.2	50.4	13.0		13.4	22.0	14.0	19.7	295.3	3
Total	1049.9	600.4	758.8	939	591.7	513	454.5	701.0	10526.2	100

Source: field survey, January 2020

Appendix (9)

Average costs of machinery (SDG)

Items	AL Shouwak	Al Greisha	Doka	AL Hawata	Glea Al Nahal	Al Gaderif	Al Hiorey	Average	
								Cost/fed	cost/ton
Cost of owned machines	323.4	783.6	517.1	457.7	511.9	300	738.9	518.9	7791.9
Cost of rented machines	1049.9	600.4	758.8	939	591.7	513	454.5	701.0	10526.2
Average	686.65	692	637.95	698.35	551.8	406.5	596.7	609.9	9159.1

Source: derived from appendix (7) and (8)

Appendix (10)

Average costs of inputs by areas (SDG)

Items	AL Shouwak	Al Greisha	Doka	AL Hawata	Glea Al Nahal	Al Gaderif	Al Hiorey	Average		%
								Cost/fed	cost/ton	
Seeds	105.7	119.5	128.7	143.1	116.9	124.0	72.8	115.8	1739	30
Seed disperser	1.6	1.4	1.5	1.3	0.8	1.5	1.4	1.4	21	0.4
Herbicides	232.1	287.4	178.0	169.8	254.2	35.9	31.1	169.8	2549	44
Insecticides	87.7	40.0	21.6	80.4	20.1	51.0	6.2	43.9	659	11
Sacks	93.3	73.3	51.9	50.2	45.5	62.0	23.1	57.0	857	15
Total	520.5	521.6	381.6	444.8	437.6	274.4	134.6	387.9	5824	100

Source: field survey, January 2020

Appendix (11)

Other cots by areas (SDG)

Items	AL Shouwak	Al Greisha	Doka	AL Hawata	Glea Al Nahal	Al Gaderif	Al Hiorey	Average		%
								Cost/fed	cost/ton	
Zakat	432	571	410	335	426	486	355	430.7	6467.2	67
Labor feeding	70.0	222.0	350.0	271.0	215.0	166.0	210.0	214.9	3226.1	33
Total	502.0	793.0	760.0	606.0	641.0	652.0	565.0	645.6	9693.3	100

Source: field survey, January 2020

Appendix (12)

Average fixed costs (SDG)

Items	AL Shouwak	Al Greisha	Doka	AL Hawata	Glea Al Nahal	Al Gaderif	Al Hiorey	Average		%
								Cost/fed	cost/ton	
Manger cost	99	294	145	175	175	203	113	172.0	2582.5	17
Permanent labor salary	166	458	147	201	202	191	406	253.0	3798.8	26
Land rent	349	500	866	259.2	917.0	548.2	200.0	520.0	7807.6	53
Camp maintenance	60.0	34.2	59.6	37.6	34.5	42.0	34.0	43.1	647.6	4
Total	674	1286	1218	673	1328	984	753	988.1	14836.4	100

Source: field survey, January 2020

Appendix (13)

Regression model summary[a]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.799[a]	.639	.613	2506.19567	2.092

Appendix (14)

ANOVA table

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	1544301484.556	10	154430148.456	24.587	.000[b]
Residual	873061327.046	139	6281016.741		
Total	2417362811.602	149			

Appendix (15)

Regression Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
	B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF
(Constant)	-7543.864	2303.907		-3.274	.001					
Age	-639.735	514.996	-.073	-1.242	.216	.041	-.105	-.063	.752	1.330
Occupation	576.524	718.811	.049	.802	.424	-.052	.068	.041	.701	1.426
Experience	-71.142	23.232	-.187	-3.062	.003	-.160	-.251	-.156	.697	1.436
Time of sale	955.822	462.712	.119	2.066	.041	-.078	.173	.105	.782	1.278
Sale place	-1319.219	949.230	-.082	-1.390	.167	-.166	-.117	-.071	.747	1.339
Sale price	74.405	25.531	.155	2.914	.004	.294	.240	.149	.918	1.089
Yield	62.057	6.397	.733	9.701	.000	.734	.635	.494	.455	2.198
Harvest cost	-.312	.098	-.166	-3.165	.002	-.097	-.259	-.161	.949	1.054
Transport cost	.879	5.709	.012	.154	.878	.566	.013	.008	.419	2.387

Secondary& graduate education	224.098	481.168	.028	.466	.642	.120	.039	.024	.727	1.376

a. Dependent Variable: profit/fed

Appendix (16)

Problems faced the farmers in the sesame production and marketing

Problems	Frequency	percent
Rain and its distribution	77	51
Weather changes	11	7
Low yield	57	38
Lack of improved seed	18	12
Lack of labor and high cost	116	77
Lack of machines	22	15
Lack of pesticides	31	21
High inputs cost	92	61
Shortage of finance	53	35
Pests and diseases	135	90
Cultivation sorghum instead of sesame	11	7
Low prices at harvest time	66	44
Multiple brokers in the sale	23	15
High fees	14	9
High transport cost	36	24

Source: field survey, January 2020

Appendix (17)

Problems faced traders, exporters and processors

Problems/Actors	Traders	Exporters	Processors
Multiple brokers	37%	93%	13%
High transport cost	30%	80%	20%
High fees and taxes	40%	73%	33%
High prices	30%	67%	27%
High storage cost	10%		
Lack of finance from the banks	13%		
Mismatch of specifications and standards	7%	27%	
Absence of marketing facilities	27%	53%	
High losses from screening		37%	
Low international prices		53%	
Lack of finance from the banks		27%	7%
Lack of sorting and packaging services		20%	
Speculation between merchants and banks		80%	
Low exchange rate for export		13%	
High processing cost			40%
Competition of imported oils			13%

Source: field survey, January 2020

Appendix (18)

Advantages and opportunities of sesame

Items/Actors	Farmers	Traders	Exporters	Processors
Suitable climate	20%			
Easy planting	27%			
Provide job/ participation of women	36%			33%
Multi -usage of sesame	46%	23%		
Availability of local and international markets	29%		100%	
Multiple marketing channels		37%		
High purchasing power		27%		40%
Presence of private sector		33%	100%	
Presences of auction			93%	
Government support			13%	
The ability to enter new international markets			80%	
Availability of raw materials				47%

Source: field survey, January 2020

Appendix (19)

جامعة السودان للعلوم والتكنلوجيا

إستبيان لبحث دكتوراة بعنوان

Analysis of value chain and competitiveness of sesame crop in Gaderif State/Sudan

استمارة المزارع

القسم الاول:الخصائص الاقتصاديه والاجتماعيه:

1. المنطقه : 2. المحليه: 3. عمر المزراع:
4. المستوى التعليمي:1/امي 2/ اساس 3/ ثانوي 4/ جامعي 5/ فوق الجامعي
5. مهنة الزراعه:1/ مهنة رئيسيه 2/ مهنه ثانويه 6. سنوات الخبره في الزراعه:....

القسم الثاني: المساحات المزروعه والانتاجيه موسم2020/2019:

المحاصيل	السمسم	الذره	الفول السوداني	الدخن	اخري	المساحه الكليه
المساحه المزروعه بالفدان						
الانتاجيه بالجوال للفدان						
وزن الجوال بالكيلو جرام						

القسم الثالث: تكاليف الانتاج لمحصول السمسم موسم 2020/2019:

1/ نوع الحيازه: 1/ ملك 2/ إيجار 3/ اخري (تحدد)

2/ المده التي يقضيها صاحب المزرعه في العمل المزرعي:.....ساعه في اليوم

3/تكلفة إيجار الفدان بالجنيه:.....

4/ العمل الالي:1. الآلآت المستخدمه في العمليات الزراعيه لهذا الموسم:

1/ كلها ملك 2/كلها إيجار 3/بعضها ملك والبعض إيجار

2. تكلفة العمل الآلي:

تكلفة الآلآت المملوكه		تكلفه الآلآت المؤجره	
البند	**التكلفه بالجنيه**	**العمليه الزراعيه**	**التكلفه بالجنيه**
الصيانه السنويه للآلآت		النظافه(ساعه)	
الوقود للفدان		عمليات تحضير الارض (ساعه)	
الزيوت والشحوم للفدان		الزراعه (ساعه)	
مرتبات سائقين وزياتين في الشهر		رش المبيد (فدان)	
اخري (تحدد)		نثر سماد(فدان)	
		قطع المحصول (فدان)	
		اخري (تحدد)	

5/ تكلفة العماله الموسميه: بالجنيه

العمليه الزراعيه	عدد العمال	عدد الايام	تكلفة العامل
نظافه اوليه(فدان)			
رقاعه (فدان)			
شلخ (سروله) (فدان)			
نثر سماد (فدان)			
رش مبيد (فدان)			
كديب اول (فدان)			
كديب ثاني (فدان)			
حت (فدان)			
تعبئه (جوال)			
اخري (تحدد)			

6/ تكلفة المدخلات الزراعيه:بالجنيه للفدان الواحد

نوع المدخل	عدد الوحدات	تكلفة الوحده	مصدر المدخل
التقاوي (كيلو)			
معفرات البذور (كيلو)			
مبيدات الحشائش (لتر)			
مبيدات الحشرات (لتر)			
أسمده (كيلو)			
مواد تعبئه (جوال)			
اخري (تحدد)			

7/ تكاليف اخري:

البند	التكلفه بالجنيه
راتب الوكيل في الشهر	
راتب الخفير في الشهر	
غذاءات العمال الموسميين وترحيلهم	
تكلفة التمويل	
تكلفة التامين(تحدد المساحه المؤمنه والتكلفه)	
اخري (تحدد)	

القسم الرابع:التسويق والتخزين

1. تكاليف التسويق بالجنيه

البند	المزرعه	سوق القريه	سوق المدينه	الصادر
مكان بيع المحصول				
تاريخ البيع (الشهر)				
الكميه المباعه(جوال)				
الفاقد(جوال)				
الزكاه (جوال)				
الترحيل (جوال)				
رسوم السوق				
سعر بيع المحصول(جوال)				
سعر بيع التبن(فدان)				

2. الكميه التي تستهلكها الاسره (جوال):.....

3. هل تم تخزين المتبقي من محصول السمسم؟ : 1/ نعم 2/ لا

4. تكاليف التخزين بالجنيه

البند	مخزن عادي	مطموره	صومعه	اخرى (تحدد)
نوع التخزين				
الكميه المخزنه (جوال)				
تكلفة التخزين (جنيه)				

القسم الخامس:المشاكل والمعوقات والمزايا لزراعة السمسم:

الرقم	المشاكل والمعوقات والمزايا	
1. مشاكل الزراعه		
1	الامطار وتوزيعها	
2	التغيرات المناخيه	
3	تدني الانتاجيه	
4	عدم توفر التقاوي الجيده	
5	عدم توفر العماله وارتفاع تكلفتها	
6	عدم توفر الاليات	
7	عدم توفر الاسمده والمبيدات	
8	ارتفاع تكلفة المدخلات الزراعيه	
9	عدم توفر التمويل في الوقت المناسب وارتفاع تكلفته	

10	عدم توفر حصادات اليه	
11	الافات والامراض	
12	التوجه لزراعة الذره بدلاً عن السمسم	
2. مشاكل التسويق		
1	تدني الاسعار عند الحصاد	
2	تعدد الوسطاء في البيع	
3	الرسوم العاليه	
4	ارتفاع تكلفة الترحيل	
3. مزايا زراعة السمسم		
1	توفر المناخ الملائم	
2	سهولة زراعته وحصاده	
3	مشاركة المراه في العمل	
4	تعدد استخدامات السمسم	
5	توفر سوق محلي وعالمي	

Appendix (20)

جامعة السودن للعلوم والتكنلوجيا

إستبيان لبحث دكتوراة بعنوان

Analysis of value chain and competitiveness of sesame crop in Gaderif State/Sudan

إستماره التجار/ تجار جمله

القسم الاول: الخصائص الاقتصاديه والاجتماعيه

1. المنطقه 2. المحليه: 3. العمر:
4. المستوي التعليمي:1 / امي 2/ اساس 3/ ثانوي 4/ جامعي 5/ فوق الجامعي
5. مهنة التجاره: 1/ مهنه رئيسيه 2/ مهنه ثانويه
6. سنوات الخبره:

القسم الثاني: التكاليف والهوامش التسويقيه لمحصول السمسم (التكاليف بالجنيه)

البند	المزرعه	سوق القريه	سوق المدينه
مكان شراء المحصول			
الكميه المشتراه (جوال)			
سعر الشراء(جوال)			
الرفع والتنزيل(جوال)			
الترحيل (جوال)			
الفاقد(الكميه)			
الزكاه(جوال)			
رسوم السوق			
الضرائب			
التخزين			
	معاصر ومصانع	مستهلك محلي	مصدر
جهة البيع			
سعر البيع (جول)			

وزن الجوال= .....كيلوجرام

القسم الثالث:المشاكل والمعوقات والمزايا لتسويق السمسم:

الرقم	المشاكل والمعوقات والمزايا في تسويق السمسم	
1. المشاكل والمعوقات		
1	كثرة الوسطاء	
2	ارتفاع تكلفة الترحيل	
3	ارتفاع الرسوم والضرائب	
4	ارتفاع الاسعار	
5	البيئه التسويقيه غير جيده	
6	ارتفاع تكلفة التخزين	
7	عدم وجود تمويل من البنوك	
8	اخري	
2. مزايا تسويق السمسم		
1	تعدد القنوات التسويقيه	
2	وجود قوه شرائيه عاليه	
3	تعدد استخدامات المحصول	
4	مشاركة القطاع الخاص في التسويق	
5	اخري	

تلفون المستجوب:

Appendix (21)

جامعة السودن للعلوم والتكنلوجيا

إستبيان لبحث دكتوراة بعنوان

Analysis of value chain and competitiveness of sesame crop in Gaderif State/Sudan

إستماره المصدرين

القسم الاول: الخصائص الاقتصاديه والاجتماعيه

1. المنطقه : 2. المحليه: 3. العمر:

4.المستوي التعليمي:1/ امي 2/ اساس 3/ ثانوي 4/ جامعي 5/ فوق الجامعي

5.مهنة التجاره (التصدير) 1/ مهنه رئيسيه 2/ مهنه ثانويه 6. سنوات الخبره:

القسم الثاني: التكاليف والهوامش التسويقيه لصادر السمسم (التكاليف بالجنيه)

البند	المزرعه	سوق القريه	سوق المدينه
مكان الشراء			
تاريخ الشراء			
الكميه المشتراه (طن)			
سعر الشراء(طن)			
الرفع والتنزيل(جوال)			
الترحيل الي المدينه (طن)			
التخزين			
رسوم السوق والضرائب			
الغربله (جوال)			
الفاقد(الكميه)			
مواد تعبئه (جوال)			
اعادة التعبئه (جوال)			
الترحيل الي بورتسودان (الطن)			
الرسوم في بورتسودان			
الضرائب في بورتسودان			
مصاريف بورتسودان			
اجور عمال			
سعر البيع Fob (دولار/للطن)			
سعر الصرف (جنيه/دولار)			

القسم الثالث:المشاكل والمعوقات والمزايا في صادر السمسم:

الرقم	المشاكل والمعوقات والمزايا في صادر السمسم	
1. المشاكل والمعوقات		
1	كثرة وتعدد الوسطاء	
2	ارتفاع تكلفة الترحيل	
3	ارتفاع الرسوم والضرائب	
4	ارتفاع الاسعار المحليه	
5	كثرة الفاقد من الغربله	
6	تدني الاسعار العالميه	
7	عدم توفر التمويل للصادر	
8	عدم وجود خدمات الفرز والتغليف	
9	عدم مطابقه المواصفات والمقاييس العالميه	
10	لا توجد خدمات تسويقيه جيده(شبكات تسويقيه مثلا)	
11	المضاربات بين التجار والبنوك	
12	انخفاض سعر الصرف	
1. مزايا صادر السمسم		
1	السمسم السوداني مرغوب عالميا	
2	وجود بورصه للمحاصيل	
3	دعم الحكومة للصادر	
4	دخول القطاع الخاص في الصادر	
5	امكانيه الدخول الي اسواق عالميه جديده	

- **تلفون المستجوب:**

Appendix (22)

جامعة السودن للعلوم والتكنلوجيا

إستبيان لبحث دكتوراة بعنوان

Analysis of value chain and competitiveness of sesame crop in Gaderif State/Sudan

إستماره المعاصر

القسم الاول: الخصائص الاقتصاديه والاجتماعيه

1. المنطقه : 2. المحليه:

3. مهنة التصنيع: 1/ مهنة رئيسيه 2/ مهنة ثانويه 4. سنوات الخبره:

5. نوع المعصره: 1/ بلدي (جمل) 2/ معصرة كهرباء 3/ مصنع حديث 4/ اخري

6. كمية الزيت المستخلص من الطن.....رطل

7. طريقة البيع: 1/ جمله 2/ قطاعي 3/ جمله وقطاعي

القسم الثاني: التكاليف والهوامش التسويقيه لتصنيع السمسم (التكاليف بالجنيه)

البند	المزرعه	سوق القريه	سوق المدينه
مكان شراء المحصول			
تاريخ الشراء			
الكميه المشتراه (جوال)			
سعر الشراء (جوال)			
الرفع والتنزيل (جوال)			
ترحيل السمسم الي المعصره (جوال)			
رسوم السوق			
الضرائب			
الغربله (جوال)			
الفاقد(الكميه)			
التخزين			
تكلفة التصنيع (طن)			
رسوم الانتاج			
صيانه المعدات السنويه			
اجور عمال في الشهر			
الضرائب			
الجركانات الفارغه (36 رطل)			
مكان بيع الزيت			
ترحيل الزيت الي السوق (جركانه 36 رطل)			
سعر بيع الزيت (جركانه 36 رطل)			

جوالات الامباز الفارغه			
كمية الامباز (جوال)			
ترحيل الامباز (جوال)			
سعر جوال الامباز			

القسم الثالث:المشاكل والمعوقات والمزايا لتصنيع السمسم:

الرقم	**المشاكل والمعوقات والمزايا في تصنيع السمسم**	
1. المشاكل والمعوقات		
1	كثرة وتعدد الوسطاء	
2	ارتفاع تكلفة الترحيل	
3	ارتفاع الرسوم والضرائب	
4	ارتفاع اسعار الشراء	
5	ارتفاع تكلفة التصنيع	
6	عدم توفر تمويل للتصنيع	
7	ارتفاع فاقد الغربله	
8	ارتفاع تكلفة العماله	
9	المناقسه من الزيوت المستورده	
2. مزايا التصنيع		
1	توفر المواد الخام(السمسم)	
2	وجود قوه شرائيه عاليه للمنتج (الزيت)	
3	وجود القطاع الخاص في الانتاج	
4	توفير فرص عمل	

- **تلفون المستجوب:**

Appendix (23)

جامعة السودن للعلوم والتكنلوجيا

إستبيان لبحث دكتوراة بعنوان

Analysis of value chain and competitiveness of sesame crop in Gaderif State/Sudan

إستماره تجار الزيوت

القسم الاول: الخصائص الاقتصاديه والاجتماعيه

1. المنطقه : 2. المحليه: 3. العمر:

4.المستوي التعليمي:1/ امي 2/ اساس 3/ ثانوي 4/ جامعي 5/ فوق الجامعي

5. مهنة التجاره: 1/ مهنه رئيسيه 2/ مهنه ثانويه

6. سنوات الخبره:

القسم الثاني: التكاليف والهوامش التسويقيه لزيت السمسم (التكاليف بالجنيه)

البند	معاصر	سوق جمله	سوق قطاعي
مكان شراء الزيت			
الكميه المشتراه (جركانه 36 رطل)			
سعر شراء الجركانه			
رفع وتنزيل (جركانه)			
الترحيل الي السوق (جركانه)			
رسوم سوق			
ضرائب			
الفاقد من الزيت (كميه)			
التخزين			
مكان بيع الزيت			
سعر بيع الجركانه			
سعر بيع الرطل (قطاعي)			
سعر الجركانه الفارغه(قطاعي)			

- **تلفون المستجوب:**