THE EFFECT OF COFFEE, OILSEED AND SESAME EXPORT ON ECONOMIC GROWTH OF ETHIOPIA

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DECLARATION AND APPROVAL

DECLARATION

This Thesis is my original work and has not been presented in any other university for the award of a degree and that all the sources that I used have been acknowledged.

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APPROVAL BY EXAMINING COMMITTEE

This Thesis has been submitted for examination with our approval as university supervisors.

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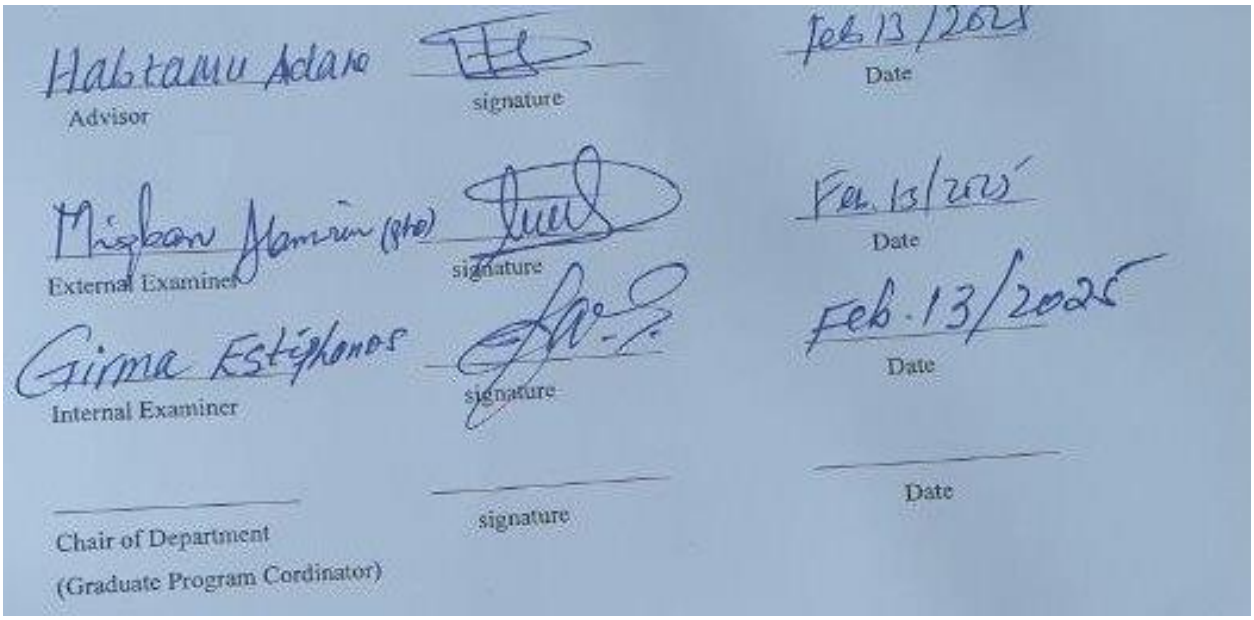

ENDORSEMENT

I here by certify that I have supervised and evaluated this thesis entitled ‘The Effect of Coffee, Oilseed and Sesame Export on Economic Growth of Ethiopia’ by Abinet Dagne prepared under my guidiance. I recommend the thesis to be submitted to final presentation.

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ABSTRACT

The study's objective was to assess the trend and impact of Ethiopia's agricultural exports coffee, oilseeds, and sesame on the country's economic growth during the preceding 20 years by looking at three key factors: the rate of long term adjustment, the trend of agricultural export and economic growth, and the existence of a causal relationship between agricultural export and economic growth. The primary agricultural products that have supported the nation's export economy are sesame, coffee, and oil seeds, notwithstanding its incentives. These products are characterized by price and quantity volatility and are not very competitive on the global market. The analysis was done by using co-integration model and Granger causality model. The analysis includes descriptive statistics and time-series data econometric techniques and ARDL model is used for analysis. The study's findings showed that coffee exports (lnCOFX), Sesame export (lnSMX), and gross domestic fixed capital formation (lnCA) proxy for investment has a significant and positive impact on Ethiopia's economic growth while Oilseed exports significantly and but negatively affect Ethiopia's economic growth and real exchange rate has a positive sign and is statistically insignificant in explaining economic growth in the long run. And there is a strong positive correlation between economic expansion and coffee and sesame exports. On the other hand, a unidirectional correlation was found between the export of oilseeds and economic growth, while a bidirectional correlation was found between the export of coffee and sesame and economic growth. Based on the findings, it is recommended that policies aimed at increasing the productivity and quality of these cash crops(coffee, oilseed and sesame) should be implemented to be better on balance of payment and to achieve the desired goal of economic growth.

Keywords: Coffee, Oilseed and Sesame

Table of Contents Pages

List Of Tables

List of figures

ACRONYEMS

ADF	Augmented Dickey-Fuller.
CSA	Central Statistics Agency
ERCA	Ethiopia Revenue and Custom Authority
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
LDC	Less Developed Country
LR	Likelihood Ratio
MoF	Ministry of Finance
NBE	National Bank of Ethiopia
SNNPR	Southern Nations, Nationalities, and Peoples Region
USAID	United States Agency for International Development
USD	United States Dollar
VAR	Vector Autoregressive
VECM	Vector Error Correction Model

CHAPTER ONE

1. INTRODUCTION

1.1. Background of the study

One of the main objectives of every economy in the world is economic development, and growth is required for a nation to reach the level of economic development that is intended. Likewise, a variety of things affect growth. How can nations attain this growth is the question. The idea of export-led growth, which contends that exports significantly contribute to growth promotion, offers one potential response to this query (Hamid et al., 2012). It is challenging for a nation to accelerate growth by adopting an export-led growth strategy because there is a strong association between rapid economic expansion and exports. For example, the external sector a higher contributor to the strong economic performance of the Asian Tigers in the late 20th century. Ethiopia is one of the least developed countries whose government has been working to create an export-friendly environment since recognizing the importance of exports (Ashenafi & Getaneh, 2014).

The prosperity of all other sectors of the Ethiopian economy is determined by the national economy, which is based mostly on agriculture. With about one-third of the GDP, two-thirds of employment, and over half of the value of merchandise exports , it is the most significant industry(FAO, 2021). The sector is known for low yields despite tremendous efforts, mostly because of minimal inputs and tiny regions. This is because the agricultural system is known for being rain-fed and for mixed farming, where the majority of the crops are grown for household use with conventional techniques (Kifle et al., 2017).

Most of land is cultivated by smallholder farmers using traditional farming methods. However, Ethiopia's development is based on the rural and agricultural sectors. Since agriculture is the main driver of the national economy, agricultural production also has a significant impact on the export industry. The country faces several challenges due to the dependence of the export sector on basic raw materials. For example, in 1983, the Ethiopian Socialist Interim Government (Derg) identified the low volume of exported products, limited level of export diversification, recurring economic crises, and artificial trade barriers of trading partners as the main obstacles to Ethiopian exports.

Ethiopian interim administration declared that export diversification and promotion were necessary following the downfall of the Derg dictatorship (Abay and Zewudu, 1999). Ethiopia has consequently drafts policies, such as export trade incentive programs, foreign exchange reserve programs, duty rebate schemes, voucher systems, bonded manufacturing warehouses, export credit guarantee programs, and programs for those who are fully engaged in exporting goods to overseas markets. The trade policy regime is now more liberal than it was prior to 1991 (Yishak, 2009). The export industry is highly reliant on agricultural production since the economy is primarily based on the agriculture sector.

The export industry's reliance on essential commodities presents the nation with a number of difficulties. Coffee is farmed mainly in two regions in Ethiopia, Oromia and the Southern Nations, Peoples, and Nationalities Region (SNNPR) in the South and West. Ethiopia is a major producer and exporter of coffee in Africa (Bart et al., 2014). But because there is little local investment in agriculture, the amount of coffee produced varies a lot year over year, and there are big price swings in the global coffee market. Conversely, Ethiopia's second-largest export source is oilseeds. Many oilseeds are produced in the nation, such as rapeseed, sesame, flax, niger seed, sunflower seed, soybean, and cotton seed. Sesame, flax, and niger seed are the principal export crops among them.

1.2. Statement of the problem

Without quotas or quantitative constraints, the African Growth and Opportunity Act (AGOA) has allowed qualifying African countries to access the U.S. market since 2000. African organizations and companies, big and small, now have the opportunity to trade with new markets and enhance the features of their commodities and products. Ethiopian exports have also benefited from the Africa, Caribbean, and Pacific-European Union (ACP-EU) and other agreements.

The development of interest in Africa is thought to have been sparked by the AGOA project. Sub-Saharan Africa can now participate more actively in international trade discussions thanks in

large part to AGOA, which is essential to the continent's integration into the multilateral trading system. Additionally, it has greatly aided in the growth of African nations, which has drawn interest from US businesses. Ethiopia now has more export prospects thanks to the African, Caribbean, European, and Pacific Association (ACP-EU) and other accords. The status of ACP-EU and AGOA has made favorable conditions for Ethiopia's overall economic development possible previously. Additionally, Ethiopia has been emphasized as a location for venture capital and development potential (Ethiopian Investment Agency, 2008). As of today, Ethiopia is not eligible for AGOA benefits; it was suspended from the program in January 2022, meaning it currently cannot access the duty-free market access provided by the African Growth and Opportunity Act (AGOA) to the United States.

Ethiopia is a significant exporter of coffee in Africa, producing the highest-quality Arabica coffee. It is the second-largest export product after oilseeds in terms of production. Ethiopia is significant to the global coffee community because it supports more than 3 million smallholder farmers. Sesame and Nigerian seeds, which are in high demand on the global market, are among the exports. Sesame and flaxseed are two of the world's major commodities produced in Ethiopia. Given the potential to increase current output and the increasing global demand for oilseeds, oilseeds may prove to be one of Ethiopia's main drivers of economic growth (Bemnet, 2004).

Even if there are opportunities in international market, the nation has not taken advantage of low-cost labor, vast fertile areas that may be used for production, processing, and export, as well as preferential market access provided by the US and EU through agreements like AGOA and EBA. As per the Ministry of Industry (2013), the government of Ethiopia is employing diverse tactics to enhance and progress the industrial sector, broaden the scope of the agricultural and industrial domains, boost the effectiveness of enterprise development, and augment both public and private investment, all of which are expected to augment the nation's export earnings. The devaluation of the currency will increase the nation's foreign exchange reserves and offer a solid foundation for domestic investment. It was anticipated that this would increase the competitiveness of the nation by redirecting spending from imported goods to relatively

domestic goods and replacing some imported goods. Exports will rise as a result of higher domestic production brought about by higher domestic investment.

In general, academics are encouraged to do research in this area by the aforementioned difficulties with Ethiopia's poor export growth rate, as well as the undiscovered issues of agricultural export contribution and lack of attention to agricultural exports. Finding and researching the factors that have a key effect on Ethiopia's export growth should make it easier to establish policies that would boost export growth and, eventually, overall economic growth. Thus, the goal of this article is to ascertain why Ethiopia's agricultural output, export growth, and economic contribution have received less attention and to offer dependable and current data that might enlighten policymakers on this matter.

1.3. Research Question

I). What is the trend of agricultural exports in Ethiopia?

II). What is the effect of coffee exports, oilseed exports and sesame exports on economic growth?

III). Do agricultural exports Granger cause economic growth in Ethiopia?

1.4. Objective of the study

This study's overall goal is to examine how agricultural exports, specifically coffee, oilseeds, and sesame, contribute to Ethiopia's economy. It does this by concentrating on the following particular goals.

i) To evaluate the historical trend of agricultural exports.

ii) To assess how exports of oilseeds, coffee, and sesame contribute to economic expansion.

iii) To investigate if exports of agricultural products and economic expansion are Granger causally related.

1.5. Justification of the Study

Understanding exports is crucial in creating jobs and influencing the expansion and improvement of the Ethiopian economy. International trade policy makers would find great use for the material in this study as they establish policies pertaining to integrated sectors, including agriculture. By analyzing the role of diversification in lowering export volatility and offering pertinent information on the three commodities to domestic and foreign potential investors who are interested in investing capital in the sector, this study is also anticipated to support policy makers' efforts to encourage the progress of the industry. The chosen industry promotes economic expansion.

1.6. Scope of the study

The purpose of the study is to examine how some Ethiopian export items are affected by export factors. The study, which will run from 2002/2003 to 2022/23, will mostly rely on quarterly secondary data that it will receive from the Central Statistics Agency (CSA), Ethiopian Revenue Authority (ERCA), and National Bank of Ethiopia (NBE).\

1.7. Significance of the study

This study will assist the nation in reducing the difficulties associated with exporting particular goods and enhancing the caliber and volume of exports. It is anticipated that the study's findings will assist policymakers in identifying export vulnerabilities and estimating the short- and long-term effects of these factors on a nation's exports.

In order to help international trade players become feasible in international market, this study will assist in overcoming export difficulties. Through accurate estimation of the link between the dependent variable and the explanatory variables, this model is anticipated to contribute to the enhancement of Ethiopian products' performance in the global market. Furthermore, the study's findings can be helpful to pertinent government organizations including the Ministry of Trade, Ethiopian Quality and Standards Authority, and other relevant departments.

1.8. Organization of the study

There are five chapters in the study. The background of the study, problem statement, research questions, objectives, hypothesis, scope, significance, and paper organization are all included in the first chapter, which is the introduction. All pertinent literature is briefly reviewed in the second chapter. The research approach employed to carry out the study will be the main topic of the third chapter. The study's analysis and interpretation are covered in Chapter 4. Based on the research findings, judgments and recommendations are presented in the last chapter

CHAPTER TWO

2. Literature review

2.1. Theories of international trade

An important factor in a nation's economic development is international trade. It empowers a nation to increase the size of its market for products and services that are unavailable within its borders. Due to increased rivalry on international market brought about by international trade, consumers can now purchase cheaper goods because of the increased price competitiveness. Porter (1998) asserts that the productivity that can be attained in an economy would be substantially independent of the productivity that exists in other nations if there is no international competition. Nonetheless, foreign investment and trade present both chances and risks for raising or maintaining the level of national production. By removing the requirement to create all goods and services domestically, commerce with other countries can enhance productivity. Therefore, by importing goods and services where its local firms are less productive than their international counterparts and by specializing in industries and sectors where its domestic firms are relatively more productive, a country can raise the average level of productivity in its economy.

Explosive economic growth is frequently driven by diversification and export growth. The domestic economic incentive system adapts to areas where the nation has a comparative advantage when export sectors prosper. This is desirable from a resource allocation perspective. Successful exports also create dynamic efficiency gains through the exploitation of economies of scale, the introduction of advanced foreign technologies and business processes, and increased international competition. Export sectors are also associated with increased productivity, leading to wage premiums and job creation (2014).

Here is a list of various international theories:

i). Mercantilism:

In the 17th century, mercantilism was one of the earliest attempts to develop an economic theory. This concept holds that a country's wealth is based on how much gold and silver it possesses. In its most basic form, mercantilists held that nations should boost their stockpiles of gold and silver by promoting exports and discouraging imports. Stated differently, foreign nations would be obliged to reimburse you for the difference in gold and silver if they purchased more things from you (exports) than they did from you (imports).

Every country aimed to avoid a trade deficit, which occurs when the value of imports surpasses the value of exports, and create a trade surplus, which occurs when the value of exports surpasses the value of imports. Every country sought to avoid two situations: a trade surplus, which occurs when the quantity of products exported exceeds the quantity of goods imported, and a trade imbalance, which occurs when the amount of goods imported exceeds the amount of goods exported. You can see why mercantilism was so successful if you take a closer look at world history, specifically from the 1500s to the late 1800s. When new nation-states began establishing themselves in the 1500s, their leaders aimed to fortify their states by growing their armies and state institutions. These leaders were able to increase the amount of gold and riches in their nations by encouraging trade and exports. One tactic several of these new nations employed to boost exports was to impose import restrictions. We call this strategy "protectionism."

ii). Absolute Advantage

In The Wealth of Nations, published in 1776, Adam Smith questioned the dominant theories of commerce at the time. Adam Smith, An Investigation into the Origins and Nature of National Wealth (London: W. Strachan and T. Cadell (1776). Economists and scientists edited the most recent edition. Absolute advantage, a novel theory of trade put forth by Smith, centered on a nation's capacity to produce anitem more effectively than its rival. Smith thought that government intervention or policy shouldn't control or restrict trade between nations. He maintained that market forces should drive trade to occur naturally. In a hypothetical two-country scenario, country A would have an advantage and could concentrate on

becoming an expert in producing that good if it could produce it faster, cheaper, or both than country B. In a similar vein, nation B might concentrate on specialization if it was more adept at producing a different good. As a country's labor force grows more proficient at carrying out comparable tasks, it will become more efficient through specialization. Due to high motivation to create quicker and more effective production techniques to boost specialization, production will also become more efficient. Smith contends that since trade benefits the people of both nations, it ought to be promoted. He believed that a country's wealth should not be judged by the quantity of gold and silver it owns, but rather by the quality of life enjoyed by its people.

iii). Comparative Advantage:

An argument against the theory of absolute advantage is that some countries may be better at producing both goods and thus have an overall advantage. On the other hand, other countries may not have such an advantage. In response to this difficulty, the British economist David Ricardo developed the theory of comparative advantage in 1817. Ricardo reasoned that trade and specialization can still occur between the two countries even if Country A has a clear advantage in producing a good. A country has a comparative advantage in producing a good if it can do so at a lower opportunity cost compared to another country. This means that even if one country is less efficient overall (producing fewer goods per unit of input), it may still be relatively better at producing a specific good compared to other goods. There is a slight difference between these two theories. The emphasis of comparative advantage is relative. Absolute advantage looks at absolute performance advantages overall, while comparative advantage refers to relative performance advantages

iv). Heckscher-Ohlin Theory (Factor Ratio Theory):

The theories of Smith and Ricardo did not assist nations in determining which goods would benefit them. According to these theories, nations and producers would be forced to choose which items they could produce more effectively if markets were free and open. Eli Heckscher and Bertil Ohlin, two Swedish economists, concentrated on the idea that nations could obtain a comparative advantage by manufacturing commodities that made use of their abundant resources in the early 1900s. Their theories relied on the elements of a nation's production land, labor, and

capital which supplied the money needed to invest in factories and machinery. They reasoned that supply and demand determine the cost of any factor or resource. Cheaper factors are those that are in higher supply than demand. The cost of factors that are in higher demand than supply will increase. Their idea, sometimes referred to as the factor ratio theory, states that because of their greater supply, nations will manufacture and export things that need more resources, factors, or less expensive manufacturing elements. Rather, nations will import items that are more in demand for resources but are in limited supply.

2.2. Agricultural export performance of developing countries

The effect of economic integration on the success of agricultural exports has generated a lot of interest in academia. According to Che et al. (2015), Fuchs and Klann (2013), and Qureshi (2013), the primary concerns were the dynamics of regional integration and the static and dynamic effects on the customs union hypothesis. The impact of trade liberalization on export growth in developing nations has been the subject of numerous research, although the findings have been conflicting.

While some research (Bleaney and Wakelin 2002) indicated a favorable association between trade liberalization and export performance, other studies (Greenaway et al. 1999) found little to no relationship. Africa's agricultural output is mostly natural and highly reliant on rainfall. The export potential of locally produced agricultural products in Africa is quite restricted, and farmers in Africa find it difficult to compete on price with large-scale farmers in industrialized nations who have an abundance of agricultural products in Africa (Mkpado, 2013). A strong reliance on primary exports with significant price volatility, low income elasticity, high output unpredictability, and generally low yields are some other concerning agricultural trends and features shared by African nations. African agriculture is not-capitalized, notcompetitive, and inefficient when compared to other developing nations. The industry is comparatively weak, its production lagging behind other areas, and its numerous problems are frequently the cause of its diminishing productivity. In a similar vein, the majority of sub-Saharan African nations derive nearly all of their foreign exchange profits from fundamental raw resources.

2.2.1. The export trajectory of Ethiopia

For nations like Ethiopia, trade abroad offers a number of benefits. Trade's indisputable benefit is that it enables nations to focus on products and services where they have a competitive advantage, so increasing output and consumption. Ethiopia's development approach draws some inspiration from East Asia, where rapid economic growth was attained by creating new export markets and allocating public funds for development. The four tiger economies of East Asia South Korea, Taiwan, Hong Kong, and Singapore are excellent models of economies that have followed growth policies driven by exports and produced remarkable outcomes. In recent decades, many emerging nations have attempted to emulate the East Asian economic model. Since 1992, Ethiopia, like other emerging nations, has pursued prosperity driven by exports. Because of the majority of its nations only produce a limited number of standardized goods, Africa has not fared well overall in terms of export diversification. Ethiopia's economy and export composition remain significantly dependent on the agriculture sector due to the export-led growth plan.

When examining Ethiopia's export revenue, the top five products are oilseeds, coffee, gold, vegetables, flowers, and sesame, all of which bring in more than $100 million a year. Although coffee remains the most important product, these other items are also growing more and more significant. Exports with exceeding $10 million in sales per year have also increased dramatically. Significant growth has also been seen in exports with yearly sales exceeding $10 million, which now encompass a variety of goods like cotton, processed meats, vegetables, apparel and textiles, spices, leather goods, and minerals. Although the majority of this diversification takes place inside a single industry, the overall findings indicate a notable departure from conventional monochromatic export sectors (Wondemhuneg, 2011).

2.3. GDP and Exports

Numerous theoretical and empirical research have examined how exports affect a country's GDP growth. Several authors have carefully examined the theoretical underpinnings. According to Dawson et al. (2010), the export income literature is dominated by the export-led growth

hypothesis for a number of reasons. First, the international trade multiplier causes export growth to translate into income growth, according to Keynesian short-run considerations. Second, the foreign cash obtained by exporting can support the import of capital, manufactured goods, and technological inputs, all of which contribute to the growth of income. Thirdly, in compliance with the endogenous growth idea made popular by Grossman and Helpman, growth is induced by positive externalities created by the export industry, such as more productive production techniques.

The link between exports and income has been the subject of several empirical investigations. Early research, such as that of Balassa (1978), whose estimate of the export elasticity of income is 0.05, typically supports the export-led growth hypothesis. The validity of this idea was widely accepted, most notably by the World Bank (1987). The export lead growth concept was supported by later Solo-type growth equations. Exports are used as an additional input in addition to labor and capital, which are the traditional inputs in an aggregate production function. Then, sources-of-growth equations are established, in which the growth rates of exports and conventional inputs dictate the growth of income.

However, there hasn't been much research done on how agricultural exports affect GDP growth or vice versa that is, does GDP growth cause agricultural exports to rise? GDP growth can be boosted by the expansion of manufactured exports but not by increasing the export of primary commodities, according to Levin and Raut's (1997) analysis of the relationship between GDP growth and manufactured and primary exports. Dawson (2005) found that the short-run agricultural export elasticity of GDP is similar to non-agricultural export elasticity and that the influence decreases with affluence. Dawson examined annual data for 62 developing nations from 1965-1974 and 1975-1984. Dawson (2010), on the other hand, uses annual data from 42 developing nations for the years 1970–2004 to investigate the long-term link between GDP and agricultural and non-agricultural exports. The results validate the export-led growth theory and establish a sustained correlation between GDP and exports.

2.4. Ethiopian Exports

The degree of economic development, the availability of resources, and the policies and plans for development are part of the elements that impact a nation's export composition. Ethiopia's export structure is mainly composed of agricultural products, accounted for more than 70% of all exports due to the country's less developed economy and heavy reliance on agriculture. Exports of manufactured goods, including apparel and textiles, are improving, according to recent trends.

The overarching objective of the industrial development plan is to use industrial development to achieve structural changes in the economy. In particular, the objective is to raise the GDP shares of the industrial and manufacturing sectors from 4% to 17% and 13% to 27%, respectively, by 2025 (MOI 2017). The improvement in industrial activity and the drop in global raw material prices, particularly for coffee, are to blame for this. Over the previous few decades, coffee has accounted for an average of 55–60% of all exports, making it the most popular export commodity, followed by oilseeds and chat. With the assistance and direction of the World Bank and the IMF, Ethiopia has increased the scope of its structural adjustment program (SAP) and liberalization since 1992 in an effort to reduce both internal and external economic imbalances. The new policy rule's primary goal is to gradually open the economy to foreign competition in order to gain access to new markets and boost export potential. Since then, to take proactive response for an increasingly dynamic global economy, the government has changed its policies to promote the industry. For a considerable time, oilseeds, vegetables, and other agricultural items were Ethiopia's top exports, then coffee. This study focuses on the economic impact of agricultural product exports, which are covered in more detail below.

2.4.1. Coffee Exports

Coffee is one of Ethiopia's most significant export goods, according to GAIN (2019). It is the primary source of foreign exchange for the nation. Ethiopia's economy enjoys a competitive edge in international market thanks to its wide range of coffee varietals, tastes, and environmentally sustainable production techniques. Despite trailing behind major coffee exporters like Brazil, Colombia, and Vietnam, the nation nevertheless commands a considerable portion of the global

market and is the second-largest exporter of organic coffee, behind Peru. Ethiopia has more than 400 exporters of coffee, 395 farmers who export coffee directly, and more than 30 import and export businesses that use foreign exchange to import cars and building supplies in addition to coffee. Ethiopia exports coffee to over 60 countries. According to coffee export data for 2017/18, the main export markets for Ethiopian coffee are Germany (22%), Saudi Arabia (16%), the United States (11%), Belgium (7%), Sudan (6%), and Italy (5%).

2.4.2. Oilseed Exports

Next to coffee in terms of export share, oilseeds are produced by more over three million smallholder farmers. Niger's real export is its seeds and soybeans, which are in high demand worldwide. One of the biggest producers of Niger and flax seeds worldwide is Ethiopia. Flax, castor beans, and safflower have significant export potential. Due to Ethiopia's increasing production potential and the increasing interest and demand for oilseeds in the global market, these goods are expected to be the main contributors of Ethiopia's economic growth. Limited amounts of groundnuts, safflower, canola, and many other oilseeds are produced.

2.4.3. Sesame Exports

In tropical and subtropical climates in Asia, Africa, and South America, sesame (Sesamum indicium) is grown. It is a member of the Pedaliaceae family (Lemlem, 2017). Although the precise location of sesame cultivation is unknown, Asia and India are good bets. Sesame has a rather high oil content (44%–60%). The plant is typically 60–120 cm tall, and the fruit is a decomposable capsule that is connected next to the stem. The capsule produces a large number of small seeds as it ruptures and dries. The fibrous husk, or husk, that covers the seeds can be white, brown, or black in color, depending on the type (CISANET, 2015). A resilient plant, sesame can thrive in a range of soil types. On the other hand, the crop thrives in rich, neutral-pH soils that have good drainage. Cultivating sesame requires soils that are not too wet or heavy in salt. A warm environment encourages crop development.

Leading producers of this crop in 2007 included Ethiopia, Uganda, Nigeria, Sudan, China, India, and Myanmar. Around 70% of the world's sesame production comes from Asia, making it the largest producer in the world (Musa, 2017). Greek sesame farms are the most productive in the world; in 2013, they produced 0.69 tons per hectare, while China and India were the top producers worldwide. China is the world's largest importer of sesame due to the significance of sesame oil as a component in Chinese cuisine. Other important importers of sesame include Turkey, the Netherlands, France, Japan, the United States, and Canada. According to data released by Oil World in 2017, Myanmar ranked first in sesame production, followed by India and China. Tanzania, Sudan, and Ethiopia are the major sesame-producing countries in Africa, respectively.

2.5. Empirical Literature Review

Using panel data from 1974 to 1995, the economic growth contribution of agricultural exports to the 62 least developed nations was determined. This study's analysis employed two theoretical models. Agricultural and non-agricultural exports were included as inputs in the first model, which was based on the agricultural production function. The second model was a dual economy model that separated each sector into an export and non-export category, with agricultural and non-agricultural sectors. The study's findings highlighted how exports of agricultural products affect economic expansion. Policies for export promotion should be balanced, according to studies (Dawson, 2005). Numerous scholars have carried out empirical research on Nigeria's agricultural exports and economic growth.

Oluwanseun et al. (2013) used time series data from 1980 to 2010 to examine if agricultural exports and economic growth have a long-term relationship. unit root and Johansen maximum likelihood cointegration tests result demonstrated that the elasticity of the long-run equilibrium link between agricultural exports and economic development. Nigeria's real GDP rises as a result. Using multivariate Johansen cointegration analysis, Ekiran et al. (2014) also examined the link between agricultural exports and economic growth from 1980 to 2012 and discovered that agricultural exports are a long-term predictor of economic growth. The study's findings suggest

that for the sustenance the country's economic growth, the Nigerian government concentrate on enhancing agricultural exports.

Victor (2015) used time series data from 1970 to 2012 to perform another empirical analysis on Nigeria's agricultural exports and economic growth. The variables included in this research included exogenous factors like trade openness index, inflation rate, and real agricultural exports, as well as endogenous variables like GDP, which gauges economic development as a function of real exchange rate. Economic techniques including the Johansen cointegration test and the Augmented Dickey-Fuller (ADF) unit root test were employed in this study's empirical investigation. The study's findings demonstrated that Nigeria's economy benefited from agricultural exports. According to the result it was suggested that the government reform program be methodical and long-lasting, independent of the future president's background in business. Agricultural production should be more desirable than other sectors.

Ekanayake(1999) investigated the causal relationship between export and economic development using the cointegration and error correction models. The authors used time series data from eight developing Asian countries between 1960 and 1997. The study discovered that all of the underdeveloped countries included in the study, with the exception of Malaysia, had a bidirectional causal relationship between expansion of export and economic progress. There is strong evidence of long-term Granger causality in every country. Nadeem (2007) offered an empirical analysis of the dynamic effects of economic shifts and trade policy liberalization on Pakistan's agricultural export performance. The authors looked at how internal supply and external demand affected agricultural export metrics. The results of the analysis shows that agricultural export indicators are more resistant to changes in internal factors.

The relationship between Pakistan's agricultural commodity exports and economic growth was examined by Shida (2008). Three simultaneous equations representing total income are estimated in this work using the three-stage least squares (3SLS) method. The independent variables in these equations comprise GDP, agricultural exports, foreign remittances, investment, and industrial exports. We discovered in this study that the GDP equation shows a positive and

statistically significant relationship with agricultural exports. In the end, a 1% increase in agricultural exports per person raises those exports by 0.22-0.36%. The GDP parameter in the GDP equation is significantly greater than the agricultural export parameter, as evidenced by the finding of a positive and significant association between GDP and the independent variable of GDP. The study's findings suggest two strategies for economic expansion: higher agricultural productivity and worker migration from agriculture to industry or services.

Johansen cointegration analysis was used to examine the effects of agricultural exports on microeconomic indicators in Pakistan utilizing secondary data from 1972 to 2008. The primary conclusion is that exports of agricultural products have a negative correlation with economic growth in Pakistan, whereas exports of non-agricultural products have a favorable correlation. According to Syed et al. (2015), Pakistan could attempt structural changes in agricultural exports by converting agricultural exports into value-added products, based on the empirical findings of this study.

Boansi et al.(2014) used cointegration analysis to look at the economic and policy underpinnings of Ghana's agricultural exports. This study was conducted to look at measures to maintain and grow Ghana's agricultural export business in an effort to fill the knowledge gap and provide recommendations for agricultural trade policy. The study uses Johansen's complete information maximum probability test to achieve its objectives. The study's conclusions show that while a country's manufacturing, trade, and marketing environments may be structurally weak, potential trade barriers may have similar long-term effects that diminish growth opportunities over the short- and long-terms. Ghana's agricultural product exports could rise even further if temporary limitations are implemented. The research findings show that addressing the inefficiencies in those sectors, increasing trade liberalization, improving agricultural export diversification, attracting foreign direct investment (FDI), and increasing domestic output are critical to sustaining and expanding Ghana's agricultural export industry. In order to establish the causal relationship between Jordan's economic growth and exports, the Granger causality test was utilized to ascertain the direction of the link between the two variables between 2000 and 2012. The results showed that while the opposite was not true, there was a direct relationship between

exports and economic growth. The results of the causality test showed that changes in economic growth played a role in explaining changes in exports.

2.5.1. Empirical Literature Review: Ethiopian case

Tigist Yifru (2015) investigates whether there is a sustained correlation between Ethiopian GDP and agricultural export from 1863 to 2004 using the Granger causality tests, co-integration analysis, and error correction model. The findings of the study showed that there is a positive and significant correlation between agricultural exports of these items and GDP, as well as a bidirectional relationship between exports of oilseeds and coffee and economic growth.

Netsanet Gizaw et al. examined in 2022 how Ethiopia's coffee exports affected the country's economic growth from 1980 to 2017. The results of the analysis show that although coffee exports have very little short-term effect, they have a large long-term encouraging effect on economic growth. The outcomes of the IRF and causality designate that there is a positive bidirectional association between Ethiopia's coffee exports and long-term economic growth. Additionally, it was discovered that the model's inclusion of the labor force, capital formation, non-coffee exports, and real effective exchange rates had favorable and noteworthy long-term effects.

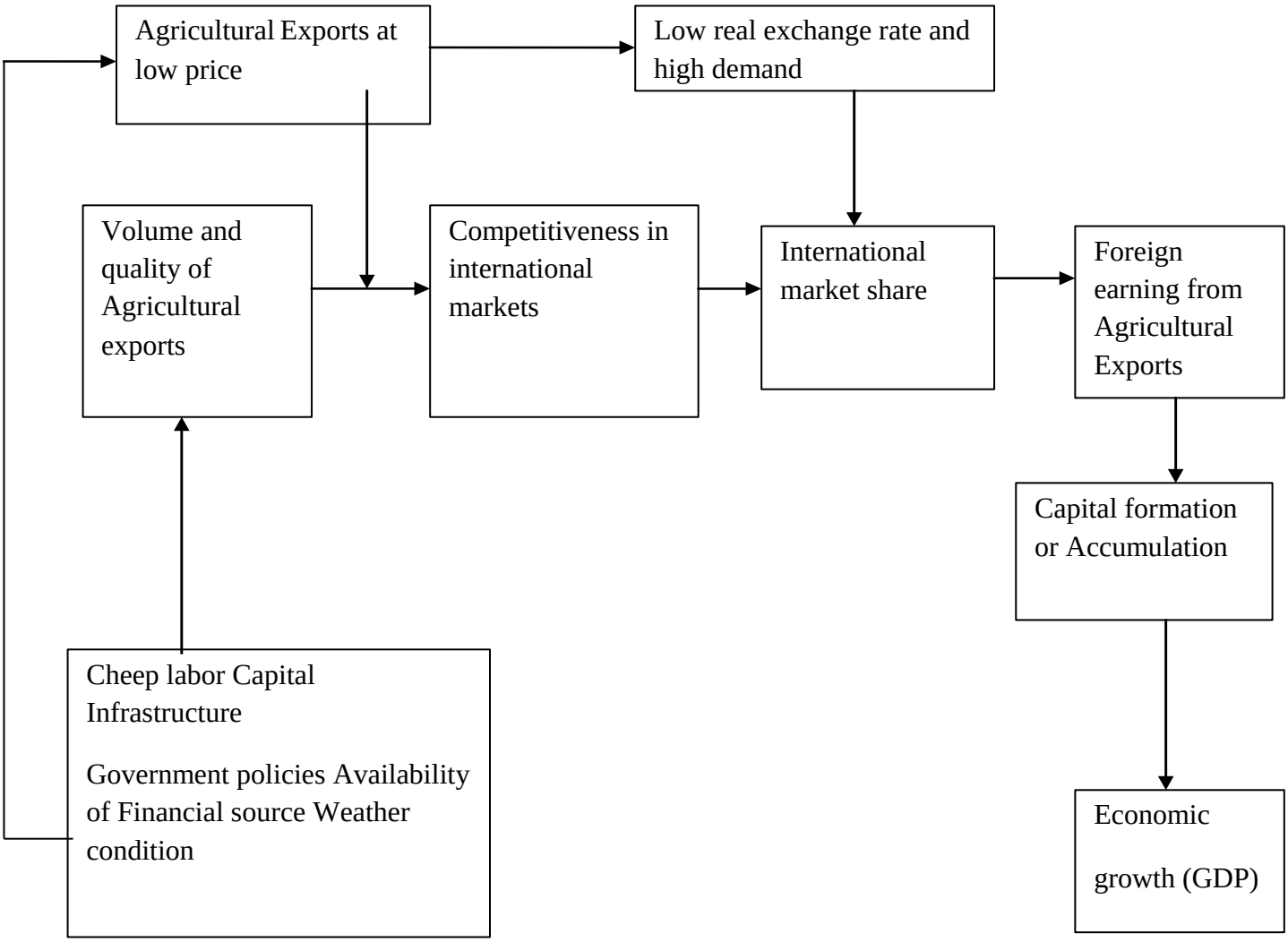
Tulu Belay (2020) examined Ethiopia's agricultural export results from 1983–1984, to 2017–18. The study evaluated the nation's agricultural export performance and looked at the short- and long-term factors affecting it. Co-integration and error correction approaches were used to analyze the long-run and short-run estimations, respectively. The data being used was sourced from the websites of the World Bank, NBE, ERA, CSA, UNCTADSTAT, IMF, and World Economic Outlook. The study's findings demonstrated that agricultural export performance benefited over time from trade openness, growth in infrastructure, real effective exchange rates for foreign direct investment, inflation, and fertilizer input. Inflation and foreign direct investment have statistically insignificant short-term influence on the profitability of agricultural

exports. All the other variables statistically significantly impactful to the country's agricultural export performance.

2.6. Conceptual framework

Only two inputs of production labor and land are plentiful in the majority of developing nations, including Ethiopia. One of the main industries in these nations is agriculture. Their export pattern is mostly driven by primary product exports, such as to Ethiopia. Because of their poor export performance, emerging nations do not have a surplus in their balance of payments. Ethiopia's insufficient investment in the export and agriculture sectors is the main reason of its low export performance. Agricultural products are a nation's primary export commodity, and a number of variables can influence how competitive they are on the global market and how much they contribute to economic expansion. Significant factors include global market prices, governmental regulations, the degree of organizational development, financial resource accessibility, and meteorological conditions. Improved agricultural output in terms of quantity and quality boosts agricultural products' competitiveness and market share abroad, as well as the revenue these products generate abroad. These factors collectively play a major role in capital formation and favorably impact GDP growth.

There is a direct and positive relationship between agricultural exports and economic growth. Growing economies have the ability to get improved agricultural inputs, which in turn boost productivity and after that it expands the potential and improvement of agricultural exports. Compared to capital, labor is inexpensive and readily available in Ethiopia. This lowers the cost of agricultural products and permits low-cost exports. Due to the low prices of Ethiopian exports, the real exchange rate likewise declines, which lowers the value of the Ethiopian Birr and raises demand for Ethiopian exports in the global market.


Agricultural Exports at low price
Low real exchange rate and high demand
Volume and quality of Agricultural exports
Competitiveness in international markets
International market share
Foreign earning from Agricultural Exports
Capital formation or Accumulation
Cheep labor Capital Infrastructure
Government policies Availability of Financial source Weather condition
Economic growth (GDP)

CHAPTER THREE

3. Data and Methodology

3.1. Research Design and Approach

The purpose of this study was to look into how well the three products that were chosen for export performed and how much they contributed to the Ethiopian economy. The Central Statistics Agency (CSA), Ethiopia Customs Authority (ERCA), and National Bank of Ethiopia (NBE) provided secondary data for the study. To analyze the data, econometric models were employed. The trends of the variables were also displayed using tables and graphs.

3.2 Data Sources

This study makes use of secondary data sources to examine the factors that influence the exports of Ethiopia's three main export commodities: oilseeds, coffee, and sesame. Based on quarterly data for 20 years, from 2002/03 to 2022/23, the analysis was conducted.

3.3 Model Specification

Based on the classical growth theory, which presupposes the presence of a productive economy, this study explores numerous forms of economic growth, including private acquisition, national expansion, and struggle. Productivity is based on capital, labor, land, and technology. The theory behind endogenous growth holds that while policies that restrict or alter currently operating industries that are profitable or exist because of protection or incentives delay growth, policies that foster openness, competition, change, and innovation accelerate growth. Using the straightforward formula Y = AK, where Y stands for production, A for technology, and K for capital, this theory postulates growing returns on capital. In this study, the Solow-Swan production function is a long-run economic model derived from neoclassical economics and is used as the basis for developing a firm growth model.

This model attempts to explain long-run economic growth by considering capital accumulation,

labor, and technology, and the Solow-Swan model is a useful threshold for many extensions due to its excellent mathematical results. Therefore, since Ethiopia has a significant economy and this study does not focus on the non-economic development of classical theory, the following neoclassical studies are adopted.

Y=f(L,K) ……..(1)

This production function is expanded by adding agricultural exports as follows:

Y_t=f(L_t,K_t,$COFX_t$,OLX_t,SMX_t). .....(2)

which can be rewritten by including, exchange rate and consumer price index (proxy for inflation) as control variables as follows:

$RGDP_t$=f($LF_tCA_tCOFX_tOLX_t$SM$X_tER_tCPI_t\mu$)…….(3)

Where RGDP t is annual real GDP, LFt is total labor force, CAt is gross domestic fixed capital formation, COFXt is coffee exports, OLXt is oilseed exports, SMXt is sesame exports, ERt is exchange rate, CPIt is as follows: index consumer price and error.

Finally we take the natural logarithm of both sides of Equation 3 is taken to derive Equation 4 to analyze the impact of agricultural exports on Ethiopian economic growth from 2002/03 to 2022/23.

$LRGDP_t=\beta_0+\beta_1LLF_t+\beta_2LCA_t+\beta_3LRER_t+\beta_4LCPI_t+\beta_5LCOFX_t+\beta_6LOLX_t+\beta_7LSMX_t+\varepsilon_t$…(4)

Here, LGDPt is the natural logarithm of real GDP, LLFt is the natural logarithm of the labor force, LCAt is the natural logarithm of GDP fixed capital formation, LRERt is the natural logarithm of the real exchange rate, and LCP is the natural logarithm of the labor force. Consumer Price Index, LCOFXt is the natural log of coffee exports, LOLXt is the natural log of oilseed exports, LSMXt is the natural log of sesame exports. $\varepsilon_t$is error term$\beta_0$is the constant term andβ_1, β_2, β_3, β_4, β_5, β_6, and β_7 are the parameters of independent variables to be estimated.

3.4. Definition of Variables and Expected Signs

Gross Domestic Product(GDP): As this study looks at the connection between real GDP and agricultural exports in Ethiopia, GDP is the dependent variable. Its definition is the entire value added by all economically active producers plus product taxes less any subsidies that aren't

factored into the product value. It is computed without accounting for the depreciation of assets that are man-made or the exhaustion and deprivation of resources.

Total Labor Force (LF): This variable assesses how the labor force affects economic growth since labor productivity fosters agriculture sector and is crucial to the relationship between exports and growth. According to neoclassical theory, total production rises in tandem with inputs (labor and capital).

Gross Domestic Fixed Capital Formation (CA): The term "gross domestic fixed capital formation" (previously "gross domestic fixed capital investment") refers to the building of roads, railroads, schools, hospitals, private residences, and commercial and industrial buildings; the acquisition of factories, machinery, and equipment; and land improvements (fences, ditches, drains, etc.). According to neoclassical theory, a rise in capital investment in production results in a rise in output volume. As a result, a positive correlation between GDP and economic growth is anticipated.

Real Exchange Rate (RER): The model incorporates the real exchange rate to account for pricing competitiveness in global markets and to pinpoint the indirect impacts of export channels on economic performance. It is argued that the global market for the products exported by emerging nations determines their export earnings. Therefore, fluctuations in the actual exchange rate can have a significant impact on small open economies like Ethiopia, which are impacted by shifts in pricing in the global market. Accordingly, it is anticipated that the real exchange rate and economic growth will positively correlate (Henriques and Sadorsky 1996).

Consumer Price Index (CPI): Data on three agricultural exports are expressed in exchange values across a number of years, and the index is used as an indicator of inflation. Thus, the effect of inflation is determined using the consumer price index. The cost of products and services for the typical consumer is reflected in the consumer price index, which may be adjusted frequently or fixed annually. It is therefore anticipated that there will be a negative correlation between economic growth and the consumer price index.

Coffee Exports (COFX): Ethiopia's primary export good is coffee. An significant driver of increased productivity is export growth. As a result, by concentrating investment in the agriculture sector, higher exports contribute to higher economic productivity. Furthermore, higher exports might loosen restrictions on foreign exchange, enabling the import of capital goods and fostering economic growth. Thus, when the economy grows, a positive relationship is anticipated.

Oilseed Exports (OLX): Owing to the high demand for oilseed on the international market, oilseed is a significant agricultural commodity that may be exported and has a growing economic worth. Oilseed exports are anticipated to positively correlate with economic growth since they are a significant source of foreign exchange and alleviate the foreign exchange restriction.

Sesame Exports (SMX): Sesame is a significant agricultural commodity that can be exported and has a high foreign exchange value, which raises the economy's overall productivity. Sesame exports are predicted to have a positive correlation with economic growth.

3.5. Data Analysis and Estimation Methods

A descriptive data analysis methodology based on data, graphs, charts, and tables was used to analyze the available data. Additionally, we estimate the parameters of the long- and short-term variables using autoregressive distributed lag (ARDL) as part of the econometric study. We examine the dynamic relationship with time series data within a single equation using the ARDL model.

3.6. Stationary Test (Unit Root Test)

One of the many presumptions that underpin the conventional classical estimate techniques utilized in practical econometric research is the stationarity of the variables. The variables are said to be covariantly (weakly) stationary if the mean and variance of the variable remain constant throughout time and the covariance between two periods depends only on the interval between the periods and not on the actual time at which this covariance is examined. The variance of a nonstationary series rises with sample size, and its means fluctuate over time

(Debel G., 2002). Numerous academic works have demonstrated that the majority of time series data exhibit non-stationarity. To prevent specious regression analysis, it is crucial to demonstrate stationarity before utilizing them in models. In this study, the Augmented Dickey-Fuller (ADF) test is applied to determine the level of data integration.

3.7. Cointegration Test

The idea of cointegration was first presented by Granger (1981). A long-term relationship between variables that is not stationary at the individual level but becomes stationary after the first difference is statistically known as cointegration (Gujarati, 2004). As a result, nonstationary series with stationary linear combinations can be studied using the cointegration theory. Cointegration is verified if the residuals exhibit steady behavior in level form (Engle and Granger 1987).

$\varepsilon_t = Y_t - \beta_0 - \beta_1 X_t$ .....(5)

For testing co-integration, we will use the following equation:

$\Delta\varepsilon_t = \mu + \varphi\varepsilon_{t-1} + \varepsilon_t$ ..... (6)

To test for co-integration, we set:

H_0=no co-integration(φ=0) H_1= co-integration ($\varphi \neq 0$)

Two methods that can be used to study cointegration of numerous equations are Johansen (1981) and Johansen Juselius (1990). The greatest eigenvalue of the probability matrix and the LR test value based on the trace value are the two statistics that are obtained from the Johansen cointegration process. The probability ratio is used by the Johansen test to assess cointegration. A set of r variables can have a maximum of (r-1) cointegrating relationships. The cointegration hypothesis is accepted if there are more cointegrating links than or equal to one. The cointegration hypothesis is accepted if the likelihood ratio is higher than the criterion; if not, it is rejected. A generalization of the Johansen procedure is as follows:

$\Delta y = \alpha\beta' y_{t-1} + \sum^{p-1} \Pi i \Delta y_{t-1} + \varepsilon_t$ .....(7)

t i=1

where y is a (K X 1) vector of normally distributed errors that is serially uncorrelated but has contemporaneous covariance matrix π. y is a (K X 1) vector of I (1) variables, α and β' are (K X

r) parameter matrices with rank r<K, and Π1,…, Π p-1 are (K X K) matrices of parameters. Johansen's method is dependent on the rank of Π and the origins of its properties. If rank (Π) = 0, then the equations in vector yt are a common VAR in first differences and the matrix is null (no co-integration). The vector process is stationary and the equations in yt are described in levels I (0) if Π has a full rank (Π = k). There is proof of a single co-integrating vector if rank (Π) = 1.

For a replacement (H1) of r 1 cointegrating vectors, the greatest eigenvalue tests the null hypothesis (H0) that the number of cointegrating vectors is r. The alternative is accepted and the null hypothesis of the cointegrated zero vector is rejected if the likelihood ratio value is higher than the critical value. Consequently, in order to ensure the veracity of the results, we employed the Angle and Granger cointegration tests in addition to Johansen's (1988) cointegration test, which highlights the importance of the biggest eigenvalue (λ_{max}).

3.8 Post-diagnosis Tests

We used the serial correlation test, heteroskedasticity test, normality test, and stability test to assess the stability and define the long- and short-term analysis.

CHAPTER FOUR

4. RESULTS AND DISCUSSIONS

The findings about the patterns and effects of coffee, oilseed, and sesame exports on the economic growth of Ethiopia from 2002–03 to 2022–23 are presented in this chapter. There are three primary sections to it. The trends are presented in the first section, the statistical analysis is interpreted in the second section, and the econometric analysis results are presented in the third section. This analysis was done to determine whether GDP and agricultural exports are causally related.

4.1. Ethiopian Agricultural Export Trends

The majority of Ethiopia's economy is derived on agriculture. Roughly 86% of export revenue is generated by it (CSA, 2007). Coffee, oilseeds, sesame, legumes, livestock goods (leather, live animals, and meat), fruits, vegetables, and flowers are among the nation's top agricultural exports at the moment. Among these, oilseeds, sesame, and coffee account for the majority of the nation's export revenue.

4.1.1. Trends in Ethiopian Coffee Exports

East Africa produces the majority of the continent's coffee, making up almost two thirds of total production. Ethiopia is the primary producer in East Africa, making up 51% of the continent's total production. Japan, the United States, Germany, and Saudi Arabia are the top exporters of Ethiopian coffee. The Ethiopian National Revenue Service reports that exports of coffee accounted for 25–25% of total coffee sales in 2002–03, with 126,127.58 tons sold for about 1.42 billion Birr, and 241,700.46 tons exported for approximately 71.4 billion Birr in 2022–23. These figures demonstrate a growing trend regarding coffee exports. It represents 5% of GDP and 30% of all exports. However, because of sporadic production slumps, fluctuating global pricing, and supply demands on the home market, Ethiopia's exports can be erratic.

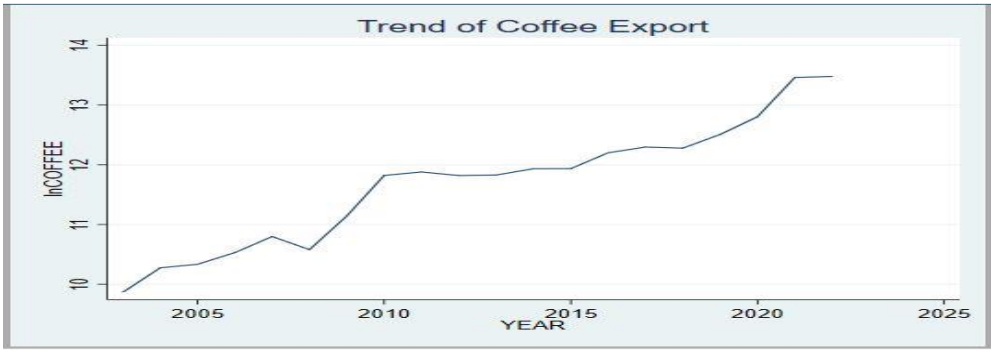


Figure 1 Trend of Coffee Export from 2002/03 to 2022/23

Source: Author's calculation based on data from NBE.

4.1.2. Ethiopian Oilseed Export Trends

The main uses of Ethiopian oilseed crops are in the manufacturing of medicinal components, confections, bakery goods, tahini, halva, and culinary oils. Groundnuts, soybeans, palm kernels, and coconuts are examples of oil seeds. Ethiopian oil seed exports rose from $22.4 million in 2002–03 to $148.4 million in 2022, a 15.1% rise. However, because there are few rural access roads and other forms of transportation, Ethiopia's oilseed exports are heavily dependent on rainfall and are vulnerable to periodic production decreases (Getahun, 2013).

Figure 2 Trend of Oilseed Export from 2002/03 to 2022/23

Source: Author's calculation based on data from NBE.

4.1.3 Ethiopian Sesame Export Trends

One of the first oilseed crops that has been domesticated in tropical and subtropical climates worldwide is sesame. In terms of foreign exchange revenues, coffee is Ethiopia's second-most important agricultural product after tea. Nonetheless, old production methods linked to poor levels of output and productivity are used to produce sesame in the majority of regions. Among the nations of Africa that cultivate and export sesame is Ethiopia. It offers premium sesame varieties fit for a range of uses. Ethiopia is home to various locations that grow sesame. Tigray, Amhara, portions of Oromia, Beni Hangul Afar, and southern nations, ethnic groupings, and peoples cultivate it as a staple crop. Ethiopian sesame types include the pale Humera variety, which is highly sought after on the global market, and the dark brown Welega form, which is less well-liked than the Humera type but still in great demand abroad. Ethiopia's exports were 31,534.68 tons over the same period and are predicted to reach 286,042.02 tons in 2022 (USAID, 2010). However, periodic production declines brought on by a high reliance on rainfall, high post-harvest losses, low use of improved inputs, a lack of or limited availability of roads and transportation for rural areas, unstable international prices, and a lack of bargaining power make Ethiopian sesame exports unstable. (Getahun, 2013).

Figure 3 Trend of Sesame Export from 2002/03 to 2022/23

Source: Author's calculation based on data from NBE.

4.2. Econometric Analysis

4.2.1. Unit Root Test and Integration Order

Testing for unit roots in the variables is necessary in order to generate meaningful regression with time series data. It is necessary for the variables to be stationary or cointegrated in order for the regression analysis to yield meaningful correlations. An integration order where the variables can be stationary is provided by the unit root test. Using Dickey-Fuller (1978) and Phillips' extended test, the test was run on all series (real GDP, total labor force, gross fixed capital formation, coffee exports, oilseed exports, sesame exports, exchange rate, and consumer price index). Perona (1988). The PP test is based on a nonparametric variant of the extended Dickey-Fuller test, whereas the ADF test is a parametric test (predefined parameters) with poor power. For the variables listed in the study's model, the results of the augmented Dickey-Fuller and Phillips-Peron tests are displayed in Tables 1 and 1, respectively. This indicates that level I(0) determines whether the unit root exists in the original data without differentiation, and first difference I(1) determines whether the unit root exists after differentiating the data.

Table 1: Unit Root Test at level form I (0)

Variables	ADF		Phillips-Peron (PP)	
	P-value	test- statistics	P-value	test -statistics
LGDP	0.0000	-6.612	0.0000	-6.396
LLF	0.5884	-1.387	0.5076	-1.552
LCA	0.3304	-1.904	0.2835	-2.007
LRER	0.3725	-1.816	0.3758	-1.809
LCPI	0.5515	-1.464	0.5205	-1.526
LCOFX	0.2665	-2.047	0.2704	-2.038
LOLX	0.5197	-1.528	0.5267	-1.514
LSMX	0.1024	-2.556	0.0747	-2.696
Values of Mackinnon test for ADF and PP: 1% = -3.750, 5% = -3.000, 10% = -2.630				

The outcome of the stationarity test of the variables at level form I (0) is shown in Table 1 above. The critical values of the Mackinnon test for ADF and PP are (-3.75) at 1%, (-3.00) at 5, and (-2.63) at 10%, which means that the null hypothesis of non-stationarity cannot be rejected even

at a 10% level for any of the variables. ADF and PP test statistics must be higher than the critical value, or put another way, the P-value must be significant at a particular degree of confidence, in order to reject the null hypothesis. All the variables do not have unit roots at levels since the null hypothesis was not rejected for any of the variables at any handy significant level, with the exception of LRGDP and LTOP for the ADF test and LRGDP, LTOP, and LSMX for PP. As a result, we can say that the data for each variable are not non-stationary at this level.

Table 2: Unit Root Test at level form I (1)

Variables	ADF P-value	t-statistics	Phillips-Peron (PP) P-value	t-statistics
LRGDP	0.000	- 6.612***	0.000	- 6.396 ***
LLA	0.0003	- 4.410 ***	0.0003	- 4.408***
LCA	0.000	- 6.113***	0.000	-5.766**
LRER	0.0382	-2.966***	0.0298	-3.058***
LCPI	0.0606	-2.784***	0.0177	- 3.241***
LCOFX	0.0006	- 4.217***	0.083	- 2.650 ***
LOLX	0.0162	-3.271***	0.0160	- 3.275***
LSMX	0.0008	- 4.139 ***	0.0008	- 4.136 ***
Values of Mackinnon test for ADF and PP: 1% = -3.750, 5% = -3.000, 10% = -2.630				

From the result in Table 2, the Augmented Dickey-Fuller (ADF) and the Phillips- Perron (PP) test statistics for the first differences of all series data except LCPI were significant at 0.5% level of significance and LCPI is significant at 10% level of significance. This showed that the series data is stationary at the first difference and hence the variables are considered as integrated of order one or I (1) process.

4.3. Test for Co-integration

Each variable's interfering integration order with the particular economic growth model has previously been determined. After integrating all variables in the I(1) order, the long-run link between Ethiopia's agricultural exports and economic growth is estimated using the two-step

process of Engel and Granger and the Johanson maximum likelihood method. It is necessary to define lags and assume a deterministic trend for the VAR when using the Johansen cointegration method.

The non-trend constant was assumed in the unit root test. Therefore, a non-trend constant is likewise included in the deterministic trend assumption of the VAR. The sequentially adjusted likelihood ratio (LR), Akaike information criterion (AIC), final prediction error (FPE), Schwartz information criterion (SIC), and Hannan-Quinn information criterion (HQIC) are examples of lag selection criteria that are used to determine the lag order. That being said, it is not unusual for various criteria to result in various maximum lag durations (Hang, 2011). In order to get over this issue, models are subjected to a range of lag orders, which are chosen using a variety of LR tests and criteria in addition to residual serial correlation and residual normality tests (Lutkepohl, 2005).

The appropriateness for these tests requires appropriate lag ordering. Thus, the lag time chosen in this study using the AIC (Akaike Information Criterion) and Schwartz Information Criterion fits these conditions, and the knowledge of economic theory that already exists was also applied. The lag lengths chosen in accordance with different information criteria are shown in the table below.

Table 3: Results of lag order selection criteria

Lags	LL	LR	FPE	AIC	HQIC	SIC
0	81.6954	NA	1.4e-14	-9.21193	-9.19215	-8.82563
1	NA	NA	-7.6e-37*	NA	-451.655	NA
2	3743.78	NA	NA	-451.972	-451.655	-445.791
3	3951.39	415.23	NA	-477.924	-477.607	-471.743
4	4008.8	114.81*	NA	-485.099*	-484.783*	-478.919*

*Indicates the lag length selected by the criteria LR: Sequential Modified Likelihood Ratio, FPE: Final Prediction Error

AIC: Akaike information Criteria, SBIC: Schwarz Information Criterion

HQIC: Hannan-Quinn Information Criterion

Table 3 shows that AIC, SIC, LR, and HQIC select four lag orders, whereas FP selects just one. As a result, as would be predicted, the information requirements produce contradicting delayed orders. From a theoretical perspective, though, 1 lag order makes sense given that the data are annual, and if we select l lags for each variable independently, we will obtain l lags for both criterion. As a result, the Johansen co-integration test was carried out with the supposition that the series had a constant and that the VAR had a single lag. The trace and maximum Eigenvalue statistics may, for the most part, produce contradicting findings.

Table 4 shows the co-integration test results for the economic growth model based on maximum Eigenvalues.

Table 4: Results of the test for the number of co-integration vectors

H0: rank=0 rank	Eigen value	λ_{max}	5%critical value	1%critical value
0	-	-	51.42	57.69
1	1	-	45.28	51.57
2	1	-	39.37	45.10
3	1	-	33.46	38.77
4	1	589.797	27.07	32.24
5	1	572.834	20.97	25.52
6	1	479.251	14.07	18.63
7	1	14.32	3.76	6.65
8	0.548			

Maximum statistics in Table 4 show that there are four co-integrating vectors (equation). Since the maximum values at rank (r=4,5,6,7) are greater than the 5% critical values, the co-integration rank null hypothesis (r=0) are supported. The maximum values at ranks (r=4,5,6,7) are again higher than critical values at 1% critical value. The null hypothesis that there is no co-integration is thus rejected. Null Hypothesis: The unit root of residual exists.

Table 5: Unit root test of Residual

	Test-statistics	p-value
Augmented Dickey-Fuller test statistic	- 4.749**	0.0001
Phillips-perron (PP)	- 4.828**	0.0000

Test critical values:1% level, - 3.750, 5% level, - 3.000 10% level, - 2.630

The ADF test statistic and Phillips-Peron (PP) in absolute terms are greater than the set of critical values given by Davidson and MacKinnon(1993) at 5% and 10%, according to the data in Table 5. At 5% and 10%, the t statistics values are higher than the critical values. The null hypothesis that there is no co-integration is rejected for the entire model since the P-values are likewise less than 1%, indicating that the data is significant. There is a long-term link between the variables, as evidenced by the co-integration found using both approaches. Thus, long-term factors

influencing Ethiopia's economic growth include labor force, real exchange rate, consumer price index as a proxy for inflation, oilseed and sesame exports, coffee, and GDP formation.

4.4. Results of Long run relationship

The model can be anticipated once the order of integration has been established and co-integration between the variables has been demonstrated. As a result, the long-run model given in equation four was applied to determine the long-run parameters.

. The result is given in table 6.

Table 6: Long-run relationship between agricultural export and economic growth

Dependent:				
lnRGDP	Coef.	Std. Err.	T	P>t
_cons	1.24	0. 62	2.01	0.138
lnLF	2.36	0.157	15.09	0.001***
lnCA	0.397	0.093	4.28	0.023 ***
lnRER	-0.055	0.085	-0.65	0.564
lnCPI	-0.027	0.064	-0.43	0.696
lnCOFX	0.22	0.051	4.36	0.022***
lnOLX	-0.063	0.015	-4.26	0.024***
lnSMX	0.092	0.03	3.03	0.056

***significant at 1% Adj. R squared= 0.9303

Table 6's results indicate that, at the 1% level of significance, the significant variables were lnLF, lnCA, lnCOFX, and lnOLX, whereas lnRER and lnCPI were not significant. At almost 93%, the corrected R square is high. This indicates that almost 93% of the variance in the dependent variable was explained by the independent factors. The dependent variable, lnRGDP, and the four independent variables, lnCOFX, lnCA, lnLF, and lnSMX, have a substantial

positive connection. This implies that the dependent variable will rise in response to an increase in one of these independent variables and vice versa.

4.4.1 Impact of coffee exports on economic growth

Table 6 presents the results, which indicate that Ethiopia's economic growth is positively and significantly impacted by coffee exports (lnCOFX). Thus, a 1% rise in coffee exports results in a 0.2202% increase in the rate of economic growth. Said to be the oldest and most traded commodity is coffee, a significant cash crop. For almost 1,500 years, Ethiopia, the oldest coffee exporter in the world, has been exporting coffee (ECX, 2008). The Ethiopian government gives top priority to the cultivation and export of coffee and offers smallholder farmers advisory services on productivity-boosting measures. It offers a number of incentives, including exemptions from income tax and land tax, to motivate commercial farms to engage in coffee farming. In a similar vein, it offers coffee exporters a range of incentives to help them export big amounts of coffee quickly. Ethiopian coffee production and exports have increased as a result of the government's different initiatives (Yishak, 2009).

Paulo (2000) claims that since the late 19th century when it was severely impacted by the worldwide economic crisis in the late 1930s the coffee industry has been significant for numerous nations, including Brazil, Colombia, and Costa Rica. In a similar vein, Naula et al. (2013) emphasize the noteworthy advantages of coffee exports for Cameroon's economic expansion.

4.4.2. Impact of Oilseed Exports on Economic Growth

Table 6's oilseed export findings (lnOLX) demonstrate that oilseed exports significantly and negatively affect Ethiopia's economic growth; a 1% increase in oilseed exports reduces growth by 0.063%. It is doubtful that the observed association between oilseed exports and economic growth happened by accident given that the coefficient is statistically significant. Even though it defies assumptions, this suggests a systematic link. The following reasons shows a negative relationship:

I). The transfer of resources (labor, capital, etc.) from more productive sectors to the production and export of oilseeds, particularly during seasonal harvest seasons;

II). The distortion of domestic markets as a result of structural issues in the oilseed value chain, which jeopardize total export revenues.

III). Environmental Degradation: Extensive oilseed farming may result in biodiversity loss, soil deterioration, and deforestation. These environmental repercussions may have detrimental long-term effects on agriculture and the viability of the economy as a whole.

IV). Price Volatility: Changes in price in international market might cause oilseed prices to fluctuate greatly. Sharp price decreases might cause severe economic instability and diminished government income if a nation heavily depends on oilseed exports.(J. Baffes, 2007)

Sudan and India are currently the EU's top suppliers. Similar to China, India is prioritizing industrialization over agriculture, which may result in a decrease in the amount of oilseed supplied to the global market. Ethiopia can thus take advantage of the European market to augment its current suppliers and substitute them in a situation of a decrease in supply. Ethiopian farmers and traders merely need to ensure that seeds are sufficiently protected against contamination (Wijnands 2007).

4.4.3 Impact of Sesame Exports on Economic Growth

Table 8's sesame export statistics (lnSMX) demonstrate that sesame exports significantly and favorably influence Ethiopia's economic growth. Oilseed exports improve economic growth by 0.092% and decrease elasticity with a 1% increase. Ethiopia now supplies 90% more sesame to the global market than it did ten years ago. China, Israel, and Turkey are the main importers of Ethiopian sesame (Wijnands, 2007).

Exports of sesame to the European market are anticipated to rise in the long run. The majority of sesame used in bread and confectionery goods comes from Europe. Sudan and India are currently the EU's top suppliers. Similar to China, India is prioritizing industrialization above

agriculture, which may result in a decrease in the amount of sesame supplied to the global market. Therefore, Ethiopia has a fair chance to complement its current suppliers on the European market and replace them in situation of a reduction in supply. According to Wijnands (2007), Ethiopian farmers and traders are simply required to ensure that seed contamination is sufficiently prevented.

4.4.4. Impact of Labour Force (LLF) on Economic Growth

Long-term findings indicate a direct relationship between the labor force (lnLF) and economic growth. There is a strong and positive correlation. A 1% increase in the labor force raises the economic growth rate by approximately 2.36% over the long term, according to the labor force results (lnLF). This indicates that, according to this study, both the labor force expansion and economic growth are heading in the same direction. As aresult of this study, labor contributes a larger share of economic growth than capital does. This is due to Ethiopia's persistent labor force growth and status as Africa's second most populous nation.

By building more educational, technical, and training facilities and improving health facilities, especially in remote and impoverished locations, human capital can be increased. Furthermore, there has been a rise in government and private sector spending on health and education. Consequently, it is believed that one of the main drivers of economic growth is human capital.

This is consistent with the findings of Gemechu G. (2002) and Shewengizawu H. (2003), who used Ethiopia's exports, economic growth, and labor force as independent variables in their model to examine the role of diversification in lessening the effect of export volatility on Ethiopia's economic growth.

4.5. Post-estimation diagnostic tests for long-run relationship model

4.5.1 Autocorrelation test

A link between the error terms of time series observations is indicated by autocorrelation. As a result, autocorrelation can be seen in OLS estimates rather than BLU (Best Linear Unbiased) estimates, and the error covariance is not zero, which goes against the assumptions of the

classical linear model. The Breusch-Godfrey LM series correlation test was used in this investigation to determine autocorrelation. Bias prevents the Durbin-Watson test from being applied. The null hypothesis that there is no autocorrelation between the error terms across all observations in the time series is accepted, reflecting the lack of autocorrelation, if the likelihood of the F-statistic of the intervention equation is greater than 0.05. On the other hand, if the probability of the F-statistic of the intervention equation is less than 0.05, the alternative hypothesis of autocorrelation between the observed error terms is not rejected. The test results are shown in Table 7.

Table 7: Autocorrelation Test Results

Breusch-Godfrey Autocorrelation Test LM H0: No Series Correlation

F-Statistic	Df	Prob>F
2.208	1	0.1373

Results in Table 7 show that the probability F-statistic (0.1373) is greater than 0.05. Therefore, Ho does not deviate, which means there is no autocorrelation.

4.5.2 Heteroscedasticity Test

To determine whether the residuals are randomly distributed throughout the range of the independent variables, the heteroscedasticity test was employed. As a result, for every value of the independent variables, the error variance should be constant. The distribution of the OLS parameters is no longer normal if there is heteroscedasticity. The Breusch-Pagan-Godfrey test was employed in this investigation to assess heteroscedasticity. The rule of thumb is to reject the heteroscedasticity null hypothesis if the observed R2 and the likelihood of the F statistic are both less than 0.05. Conversely, the null hypothesis is not rejected, indicating the absence of heteroscedasticity, if the likelihood of the F statistic and the observed R2 are larger than 0.05. Therefore, homoscedasticity is the error.

Table 8: Heteroscedasticity Test

Heteroscedasticity Test: Breusch-Pagan-Godfrey

Ho: Constant Variance

F-statistic (chai2(1)) 0.01
Probability chi2(7) 0.9209

From Table 8, we deduced that the probability F-statistic (0.9209) is greater than 0.05, indicating the absence of heteroscedasticity. The test findings validate the model's homoscedasticity (constant variance) assumption. The basic OLS regression analysis's standard errors and hypothesis tests are deemed reliable even without further modifications to account for heteroscedasticity. The faults are homoscedastic as a result.

4.6. Granger causality test between economic growth and agricultural exports

It is instantly implied that there is long-run causation in at least one direction from agricultural exports to GDP or vice versa (Granger 1988) by the stationarity of the variables and the discovery of cointegration between agricultural exports and GDP. Thus, testing for long-run noncausality would be helpful after cointegration is identified. Table 14 displays the results of the long-run causal relationship between economic growth and agricultural exports (coffee, oilseeds, and sesame).

Table 9: Long-run causality test

Sample: 2002/03 – 2022/23

Null hypothesis	F-statistics	P-value
lnCOFX does not granger cause lnRGDP	9.024	0.003 **
lnRGDP does not granger cause lnCOFX	7.457	0.003**
lnOLX does not granger cause lnRGDP	4.456	0.035**
lnRGDP does not granger cause lnOLX	0.41	0.522***
lnSMX does not granger cause lnRGDP	6.9015	0.009**
lnRGDP does not granger cause lnSMX	0.68	0.41

***significant at 1%,** significant at 5%

The Granger Causality Test (1969) was utilized to examine the causal relationship between agricultural exports and the growth of the national economy. The null hypothesis, which should be rejected, states that economic growth is not the cause of Granger exports and that exports of oilseeds and coffee are not the cause of economic growth. Table 14 illustrates this point. Oilseeds should be discarded. Both the null hypothesis that sesame exports are not the cause of Granger economic growth and the null hypothesis that economic growth is not the cause of Granger sesame exports are not rejected. These findings imply that there is a bidirectional causal relationship operating in both ways between oilseed and coffee exports and economic growth. Exports of oilseeds and sesame have a unidirectional causal association with economic growth. This implies that economic growth might result from a rise in agricultural exports and vice versa. The export-led development theory and the presence of reverse causality are both supported by these findings.

The rise of agricultural exports, which in turn stimulates economic growth, is one of the primary factors driving Ethiopia's economic growth. The infrastructure required for higher-quality and higher-value agricultural exports will need to be built, so efforts should be concentrated on policies that boost GDP, such as increasing investment, import substitution, human capital development, and technological advancement. The outcomes also demonstrate the necessity of exporting more high-value agricultural products in order to achieve robust economic growth.

CHAPTER FIVE

5. CONCLUSION AND POLICY RECOMMENDATIONS

5.1. CONCLUSIONS

The purpose of the study is to analytically ascertain the contribution and influence of agricultural exports of specific commodities on economic growth of Ethiopia, using annual data from 2002/03 to 2022/23. Descriptive and temporal approaches are used, respectively, to evaluate the contribution of agricultural exports on GDP growth and to determine the trend of agricultural exports. The unit root test (ADF and PP test), the cointegration test (Johansen and Engle and Granger procedure), the Granger test (which establishes causality), the Breusch-Pagan heteroskedasticity test (Godfrey), the serial correlation test (which prevents errors and verifies the validity of estimates), and the Ramsey RESET test (which checks for misspecification) are used to analyze if there is a long-term correlation between economic growth and agricultural exports. The cointegration of real GDP and agricultural exports is investigated using series I (1) since the unit root test demonstrates that all variables are stationary at the first difference (1). The cointegration test results show a long-term link between GDP and agricultural exports.

Over the past few years, Ethiopia's agricultural exports have been increasing. The long-term results show a significant and favorable relationship between economic growth and coffee exports. Although there is a strong and negative correlation between economic growth and sesame exports, there is also a strong and positive correlation between Ethiopia's economic growth and sesame exports. It is discovered that the labor force has a positive and considerable impact on economic growth, and that the real exchange rate has a positive and significant impact on real GDP. Coffee and sesame exports have a positive and substantial link, according to the short-run coefficients of the variables, whereas exports of oilseeds have a significant negative relationship with economic growth. Lastly, there is a bidirectional Granger causal relationship between exports of coffee and sesame and economic growth. The assumption is that there is a unidirectional causal relationship between oilseed exports and economic growth because the sesame regression analysis's coefficients are statistically insignificant. This implies that to

achieve strong economic growth, measures aimed at increasing the export of agricultural products with high added value are required.

5.2. RECOMMENDATIONS

The study's policy recommendations state that in order to maximize advantages and lower the nation's trade imbalance, to improve economic growth, the government should broaden and support the export sector's base. The economy should coordinate efforts throughout the production channel and support export sectors, particularly agriculture exports, which are the backbone of the economy and employ a sizable labor force, in order to raise the percentage of coffee exports in economic growth. In order to support large-scale commercial farms, it is necessary to quickly deploy new technologies for producing coffee. This can be done by improving the current traditional processes, offering new potential land, and making sure that different export incentives are implemented for exporters. Due to the inelastic nature of the relationship between raw coffee exports and economic growth, the government should concentrate on exporting high value added coffee.

If the government focuses more on production routes and adds value to the product to maximize the export effect on economic growth, the impact of oilseed exports on Ethiopia's economic growth will be stronger. Instead of exporting raw resources, the government should concentrate on fostering an environment for high value-added oilseeds and spreading awareness about preventing seed adulteration, as the product's impact on economic growth is inelastic. Despite the fact that sesame exports have greatly boosted Ethiopia's economy, coordinated efforts are required to establish successful sesame marketing channels in order to meet the crop's high internal consumption and potential foreign demand.

The government should prioritize boosting large-scale agriculture, creating laws to enhance working conditions, making use of excess labor, and educating farmers about the proper use of pesticides and fertilizers in order to increase output and employment. Because exports of coffee and oilseeds and economic growth are correlated, the government should encourage agricultural exports by driving up the growth of non-traded commodities and services. This shows that to

achieve strong economic growth, measures aimed at increasing the export of agricultural products with high added value are required. To enhance the utilization of genetic resources and input acquisition, the Ethiopian government ought to allocate more funds and resources to agricultural research, development, and extension activities.

5.3. Policy implications

The following are the main policy conclusions that can be drawn from the varying effects of oilseed, coffee, and sesame exports on Ethiopia's economic growth:

- To enhance Coffee Exports the government should prioritize support for coffee production and marketing to leverage its positive impact on growth.
- The government should Increase funding for agricultural research to improve coffee and sesame yields.
- To Promote Sesame Exports the government should implement incentives and improve market access for sesame, capitalizing on its growth potential.
- To Encourage Diversification the government should promote crop diversification among farmers to mitigate risks associated with oilseed reliance.
- To Improve Investment Climate the government should foster a favorable environment for domestic and foreign investments through regulatory simplification.
- To Stabilize Inflation the government should implement monetary policies aimed at controlling inflation to protect economic stability.
- To Monitor Exchange Rates the government should regularly assess exchange rate policies to prevent negative impacts on export competitiveness.
- To Engage Stakeholders the government should Involve farmers and industry stakeholders in policy development for relevant and effective solutions.

REFERENCE

- Abay,Y. and Zewdu, T. (1999). Export Earnings Instability and Export Structure: The case of Ethiopia; Proceedings of the 8th Annual conference on the Ethiopian Economy,Addis Ababa.
- Assefa, M. (2017) Ethiopian Sesame Production and Marketing Overview. *EPOSEPA.* Addis Ababa, Ethiopia: EPOSEPA.
- Baffes, J. (2007) Oilseeds and Oilseed Products: Global Trade and Price Trends. *World Bank Policy Research Working Paper 4292*.
- Barbara, P. and Alberto, R. (2011). Exports, growth and causality: New evidence on Italy (1863-2004) The Economic History Society Annual Conference, University of Cambridge1-3 April 2011.
- Bleaney, Michael, and Katharine Wakelin. 2002. Efficiency, Innovation and Exports. Oxford Bulletin of Economics and Statistics 64: 3–15.
- Boansi, D., Lokonon, B.O.,Appah, J. and Gebremariam, G.G. (2014). Economic and policy Foundations of Agricultural Exports from Ghana: A co-integration Analysis. *International Journal of Development Research*, 4(6):1240-1248.
- Dawson, P.J. (2005). Agricultural exports and economic growth in less developed countries, *Journal of agricultural Economics*, 33:145-152.
- Edwards, Lawrence and Philip Alves (2005), South Africa ‘s Export Performance: Determinants of Export Supply, University of Cape Town School of Economics.
- Fuchs, Andreas, and Nils HendrikKlann. 2013. Paying a Visit: The Dalai Lama Effect on International Trade. Journal of International Economics 91: 164–77.
- GAIN 2019, a report on Ethiopian coffee annual report, report number GAIN 1904
- Greenaway, David, Wyn Morgan, and Peter Wright. 1999. Exports, Export Composition and Growth. Journal of International Trade and Economic Development 8: 41–51.
- Kasekende and Atingi-Ego (1999) Uganda's Experience with Aid Journal of African Economies, Vol. 8, Issue 4, pp. 617-649.
- Kebede, B. (2011) "Does Real Exchange Rate Matter for Ethiopia’s Exports? A Gravity Model Analysis". Unpublished MA Thesis, Addis Ababa University. pp 24-44
- Musa, K. (2017). Value Chain Analysis of Sesame in Ethiopia. *Journal of Agricultural Economics Extension and Rural Development: ISSN-2360-798X*, 620-631 Volume 5(5) Spring Journals.
- Nadeem, M. (2007). Pakistan Agricultural Export Performance in the Light of Trade Liberalization and Economic Reforms, Working Papers 45854, University of Balochistan, Commerce Department.

- Ousmanou N. (2003). Exports and Economic Growth in Sub-Sahara Africa: Is There a Connection? Faculty of Economics & Management. University of Yaounde II P.O.Box 1063 Yaounde, Cameroon.
- Ruba A. S., Thikraiat S. and Shatha A. (2014). The Causal Relationship between Exports and Economic Growth in Jordan. *International Journal of Business and Social Science.*5 (3):302-308.
- Sharma VM, et al. (2001) Quantitative target display: a method to screen yeast mutants conferring quantitative phenotypes by 'mutant DNA fingerprints'. Nucleic Acids Res 29(17): E86-660
- Shida, R.H. and Muhammed, E. K. (2000). An Analysis of the Linkage Between Agricultural Exports and Economic Growth in Pakistan. *Journal of International Food & Agribusiness Marketing*, 10 (4):13-29.
- Syed,W.A., Muhammed, A.U. and Rana,M.A. (2015). Agricultural Export and Economic Growth: Acase study of Pakistan. *Journal of public policy and Administration Research*, 5(8):88-96.
- Tigist Yifru (2015) impact of agricultural export of coffee, oilseed and pulse to economic growth of Ethiopia.
- Wondemhunegn Ezezew (2011). The Dynamics between Real Exchange Rate Movements and Trends in Trade Performance: The Case of Ethiopia. MPRA Paper 29161, University Library of Munich, Germany
- World Bank (2014) “Unleashing the Potential of Ethiopia’s Export Industry”

APPENDICES

LONGRUN AND SHORTRUN TEST RESULTS

```
. ardl lnRGDP lnSESAME lnLABOR lnCAPITAL lnCOFFEE lnCPI lnREER lnOILSEED, lags(1 1 1 1 1 1 1 1)ec

ARDL(1,1,1,1,1,1,1,1) regression

Sample:       2004 -       2022                 Number of obs     =         19
                                                  R-squared         =     0.9884
                                                  Adj R-squared     =     0.9303
Log likelihood =   88.13073                       Root MSE          =     0.0059
```

D.lnRGDP	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ADJ						
lnRGDP L1.	.6355329	.210446	3.02	0.057	-.0342001	1.305266
LR						
lnSESAME	.0915287	.0302084	3.03	0.056	-.004608	.1876654
lnLABOR	2.364597	.1566771	15.09	0.001	1.86598	2.863213
lnCAPITAL	.3966604	.0926856	4.28	0.023	.1016934	.6916274
lnCOFFEE	.2202974	.0505749	4.36	0.022	.0593455	.3812492
lnCPI	-.0274111	.0637811	-0.43	0.696	-.230391	.1755688
lnREER	-.0551134	.085315	-0.65	0.564	-.3266239	.2163971
lnOILSEED	-.0635772	.0149129	-4.26	0.024	-.1110368	-.0161175
SR						
lnSESAME D1.	.0088088	.0098749	0.89	0.438	-.0226175	.0402352
lnLABOR D1.	-.8845483	.6926972	-1.28	0.291	-3.08902	1.319923
lnCAPITAL D1.	.1098365	.0299472	3.67	0.035	.0145312	.2051418
lnCOFFEE D1.	.1553321	.0344855	4.50	0.020	.045584	.2650803
lnCPI D1.	-.1112284	.0535688	-2.08	0.129	-.2817082	.0592514
lnREER D1.	.0741512	.0603435	1.23	0.307	-.1178889	.2661912
lnOILSEED D1.	-.0264414	.0084093	-3.14	0.051	-.0532036	.0003208
_cons	1.244946	.6189922	2.01	0.138	-.7249635	3.214856

Unit root tests

```
. dfuller d.lnCAPITAL

Dickey-Fuller test for unit root                   Number of obs   =        18

                                 ------------ Interpolated Dickey-Fuller ------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)            -6.113            -3.750            -3.000           -2.630
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000

. dfuller d.lnCPI

Dickey-Fuller test for unit root                   Number of obs   =        18

                                 ------------ Interpolated Dickey-Fuller ------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)            -2.784            -3.750            -3.000           -2.630
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0606

. dfuller d.lnLABOR

Dickey-Fuller test for unit root                   Number of obs   =        18

                                 ------------ Interpolated Dickey-Fuller ------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)            -4.410            -3.750            -3.000           -2.630
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0003
```

```
. dfuller  lnRGDP

Dickey-Fuller test for unit root                   Number of obs   =        19

                                 ------------ Interpolated Dickey-Fuller ------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)            -6.612            -3.750            -3.000           -2.630
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000

. dfuller d.lnOILSEED

Dickey-Fuller test for unit root                   Number of obs   =        18

                                 ------------ Interpolated Dickey-Fuller ------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)            -3.271            -3.750            -3.000           -2.630
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0162

. dfuller d.lnREER

Dickey-Fuller test for unit root                   Number of obs   =        18

                                 ------------ Interpolated Dickey-Fuller ------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)            -2.966            -3.750            -3.000           -2.630
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0382

. dfuller d.lnSESAME

Dickey-Fuller test for unit root                   Number of obs   =        18

                                 ------------ Interpolated Dickey-Fuller ------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)            -4.139            -3.750            -3.000           -2.630
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0008
```

```
. dfuller dCOFFEE

Dickey-Fuller test for unit root                   Number of obs   =        18

                                 ------------ Interpolated Dickey-Fuller ------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)            -4.217            -3.750            -3.000           -2.630
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0006
```

STATA REGRESSION OUTPUT

```
. ardl lnRGDP dlnSESAME dlnLABOR dlnCAPITAL dlnCOFFEE dlnCPI dlnREER dlnOILSEED, lags(1 0 1 1 1 1 1 1)

ARDL(1,0,1,1,1,1,1,1) regression

Sample:        2005 -        2022                 Number of obs     =         18
                                                  F(  14,       3)  =   90359.41
                                                  Prob > F          =     0.0000
                                                  R-squared         =     1.0000
                                                  Adj R-squared     =     1.0000
Log likelihood =  104.85962                       Root MSE          =     0.0017
```

lnRGDP	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lnRGDP						
L1.	.9693376	.001264	766.86	0.000	.9653149	.9733603
dlnSESAME	-.0094537	.0026079	-3.63	0.036	-.0177531	-.0011542
dlnLABOR						
--.	-.6325363	.2386466	-2.65	0.077	-1.392016	.1269437
L1.	.2186441	.5225667	0.42	0.704	-1.444396	1.881685
dlnCAPITAL						
--.	.0290216	.0110337	2.63	0.078	-.0060927	.0641359
L1.	.0394415	.0096836	4.07	0.027	.0086239	.0702591
dlnCOFFEE						
--.	-.0050918	.0035917	-1.42	0.251	-.0165221	.0063385
L1.	-.0660954	.0046818	-14.12	0.001	-.0809951	-.0511958
dlnCPI						
--.	-.0121473	.0099373	-1.22	0.309	-.0437723	.0194777
L1.	-.0135366	.0136189	-0.99	0.394	-.0568781	.0298048
dlnREER						
--.	.0698537	.0109746	6.37	0.008	.0349276	.1047799
L1.	-.030606	.0121721	-2.51	0.087	-.0693431	.0081311
dlnOILSEED						
--.	.0090888	.0013791	6.59	0.007	.0046997	.0134778
L1.	.0054811	.0011055	4.96	0.016	.001963	.0089992
_cons	.3284089	.0290263	11.31	0.001	.2360344	.4207834

```
. ardl lnRGDP lnSESAME lnLABOR lnCAPITAL lnCOFFEE lnCPI lnREER lnOILSEED, lags(1 1 1 1 1 1 1 1)ec

ARDL(1,1,1,1,1,1,1,1) regression

Sample:       2004 -       2022                 Number of obs     =         19
                                                  R-squared         =     0.9884
                                                  Adj R-squared     =     0.9303
Log likelihood =   88.13073                      Root MSE          =     0.0059
```

D.lnRGDP	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ADJ						
lnRGDP						
L1.	.6355329	.210446	3.02	0.057	-.0342001	1.305266
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lnSESAME	.0915287	.0302084	3.03	0.056	-.004608	.1876654
lnLABOR	2.364597	.1566771	15.09	0.001	1.86598	2.863213
lnCAPITAL	.3966604	.0926856	4.28	0.023	.1016934	.6916274
lnCOFFEE	.2202974	.0505749	4.36	0.022	.0593455	.3812492
lnCPI	-.0274111	.0637811	-0.43	0.696	-.230391	.1755688
lnREER	-.0551134	.085315	-0.65	0.564	-.3266239	.2163971
lnOILSEED	-.0635772	.0149129	-4.26	0.024	-.1110368	-.0161175
SR						
lnSESAME						
D1.	.0088088	.0098749	0.89	0.438	-.0226175	.0402352
lnLABOR						
D1.	-.8845483	.6926972	-1.28	0.291	-3.08902	1.319923
lnCAPITAL						
D1.	.1098365	.0299472	3.67	0.035	.0145312	.2051418
lnCOFFEE						
D1.	.1553321	.0344855	4.50	0.020	.045584	.2650803
lnCPI						
D1.	-.1112284	.0535688	-2.08	0.129	-.2817082	.0592514
lnREER						
D1.	.0741512	.0603435	1.23	0.307	-.1178889	.2661912
lnOILSEED						
D1.	-.0264414	.0084093	-3.14	0.051	-.0532036	.0003208
_cons	1.244946	.6189922	2.01	0.138	-.7249635	3.214856