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Determinants of Agricultural Product Export
The Case of Sesame Seed Exports from Ethiopia

Nefisa Mohammed[1]

Abstract

This study was purposed on informing future trade policy decisions on how the sesame seed export can be improved in both volumes and value of exports. To achieve this, effort was made to identify and assess the magnitude and effects of key determinants of sesame seed exports from Ethiopia for the period 1970-2013 both in the short run and long run. The study involved separate consideration of value and volume of exports as explained variables, and sourcing of ways by which beneficial implications noted could be maximized for both variables, while minimizing adverse ones in the process .This study solely involved the use of secondary data obtained from different sources. Separate equation with value and volumes of exports as explained variables were estimated using Johansen cointegration and error correction method (ECM) for long run and short run relationship respectively. All descriptive and econometrics analysis were done through EVIEWS 5. Finally, both the short run and long run equation was tested for appropriate standard Gaussian assumptions, appropriateness of specification and stability of coefficients. Various factors were found to have a significant impact on values and volumes of sesame seed export amongst which: domestic production of sesame seed, terms of trade, net inflow of FDI were positively related in the long run. But, real effective exchange rate negatively related with both values and volumes of sesame seed. Export price of sesame seed only affected export values of sesame seed in the long run. The error correction term has also indicated that the short run equilibrium quickly reverted to the long run equilibrium for both values and volumes of export. The identified determinants have provided a guideline for future trade promotion in the sector. Accordingly, future strategy required to increase sesame seed export was recommended.

Key words: Sesame Seed, Cointegration, Value, Volume, Export

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[1]MSc, Woldia University

1: Introduction

1.1. Background of the Study

For developing countries like Ethiopia to achieve a rapid economic growth and development exports are generally perceived as a motivating factor for economic growth. The desire for rapid economic growth in developing countries is attained through more trade. Empirical and theoretical studies also confirm the role of exports in raising the economic growth and development of a country. For example, the study done by Debel (2002) in Ethiopia, found that exports can substantially contribute to economic growth of Ethiopia. Similarly, studies done in Libiya, Cameroon and Pakistan confirm the contribution of export to economic growth. Specifically, some studies were also found agricultural export have a positive contribution to economic growth (Khaled et al., 2010; Dr. Noula et al., 2013). Theoretically also, the classical economists like Adam Smith and David Ricardo have argued that international trade is the main source of economic growth and more economic gain is attained from specialization.

As the theoretical or empirical reviews indicate, export has crucial benefit to stimulate economic growth of a country. In line with this, studies are required in order to identify the main factors which affect export growth of countries. In response, studies have been done in order to capture the main determinants of export in general and agricultural export in particular of developing countries (Eyayu, 2014, Muhammad et al., 2006; Sharma, 2001; Idsardi, 2010; Juthathip, 2007).Even if most of the studies investigate determinants of aggregate export some studies like Eyayu (2014) and Idsardi (2010) investigated determinantsof agricultural export particularly. Eyayu (2014) investigated determinants of agricultural export in 47 sub Saharan African countries through panel data. Similarly, Idsardi (2010) tried to find out determinants of ten of the identified agricultural export products in South Africa.

Most of the studies concerned to investigate determinants of aggregate export after studies have emerged to study separately with in sectors like agricultural products export, manufacturing sector products and so on. This showed that single factors have different impacts on different sector exports. Similarly, single factors may have different impacts on different agricultural product exports. Since Ethiopia is agrarian country studying factors of agricultural products independently will help in order to formulate favorable policies for each commodity rather than dealing on aggregate exports. Accordingly, in Ethiopia Zelalem (2011); Hailegiorgis (2011) and Yared (2010) studied the determinants of coffee, oil seeds and textile export respectively. Even if the variables all used and their findings have similarities, we cannot say the findings are consistent from product to product. This fact anticipate researcher to conduct research on sesame seed export separately to able to design future trade policies of sesame seed and the results are expected to be different from the above studies.

As it is known Agriculture has always been the pace setter of the Ethiopian economy accounting for about 45 Percent of the Ethiopian gross domestic product, over 90 Percent export and 83 Percent employment (MOFED, 2011/12). The country agricultural products account 70.3% of the total products exported (Ibid). Ethiopia generated $1.22 billion from the exports of agricultural commodities in the first seven months of 2014/15 (UNDP, 2014). Major export agricultural products are coffee (21%), oilseeds (17%), gold (13%), Kchat (10%), pulses (9%), cut flower (7%), and live animals (6%) (Ibid).As apart from earning valuable foreign currency, it creates sustainable jobs; increases the adoption of advanced technologies and production practices as well as the enhancement of overall competitiveness of the agricultural sector.

Our focus, Sesame seed is among varieties of oil seeds grown in Ethiopia. It’s by far the most important both in terms of volume, value and export earnings. Ethiopia earned 641.5 million USD in 2014 from export of oil seeds (NABC, 2015). Out of the total exports of oilseeds the largest share is taken by sesame seed which accounts 88% of the total oil seed exports. It is the second commodity next to coffee in foreign exchange earnings (MOFED, 2011/12).

1.2. Statement of the Problem

Since there is no country which is self-sufficient, one nation has to trade with many others so as to enjoy goods and services with a comparative advantage in its production. This is the case with Ethiopia where a majority of her labor force is employed in the agricultural products such as coffee, oilseeds, gold, pulses, livestock, Kchat, flower and textile products…etc.

For several years Ethiopia has experienced an economic recovery from the exportation of agricultural products. But this sector was seriously affected by internal and external factors which led the country into serious crisis. This is basically from the fact that the country depends on solely on the proceeds from this sector for the wellbeing of nationals. For the fourth consecutive year of the GTP period in 2013, Ethiopia's export revenue has been lower than the target set by the government[1]. Over the past fiscal year the government targeted to earn USD five billion from exports, while the actual achievement stood at USD three billion[2]. The country's export has subsequently registered growth over the past few years, but international price decreases on major export items have contributed to a slight decrease in the growth rate and the WB report also indicated that exporters declined from 2,033 in 2010 to 1,800 in 2013 (WB, 2014).

Sesame seed is the main agricultural products in making foreign currency earnings. Over the last two decades, the quantity of sesame traded on the world market has more than double (FAO, 2014). Similarly, the quantity of Ethiopian sesame supplied to the world market has been increased (Ibid). This shows that world demand and supply of export is increasing. This in turn leads to rise in competition in international market since the size of the market increasing. In other way, the volume (amount) of sesame seed supplied to the world market from Ethiopia and foreign earnings (values) showed a fluctuating trend. For example, in the year 2001, 2008, 2010, 2015, the volume and values of export faced a dramatic decline (Based on FAO data manipulation).The decline in 2015 was very saviour and it almost accounted 23% decline from the previous year (MOT, 2015).The decline in sesame export may be associated with following shifts in market demand especially the main importer of Ethiopian sesame China to India and other relevant economic and policy indicators, as well as the country's slow adaptation to changes on market (Ibid). Therefore, an empirical study is required to determine future strategies of stimulating sesame seed export from Ethiopia.

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[1]http://www.dpworld-doraleh.com/china-ethiopias-top-export-destination/
[2]http://www.dpworld-doraleh.com/china-ethiopias-top-export-destination/

Even if effective improvements of the sesame subsector may require improvement in quality of exports, as well as increase in volume and value of exports, but there has been no study conducted on determinants of volume and value of export of sesame in the country. Achieving this, however, requires identification of existing associations between value and volume of sesame seed exports and key determinants of export trade, capturing the effect of quality through a competitive index. By this, the present study is proposed on informing future trade policy prescriptions on how the sesame seed exports dimension of the subsector can be improved through identification and assessment of the magnitude and effects of key determinants of sesame seed exports from Ethiopia for the period 1970-2013.

Thus, it would be of interest to study the past and present trend of sesame seed export values and volumes and determinants in Ethiopia. The above issue raised brings us to the focal point of this research work which is to examine the determinants of value and volume of sesame seeds exports. This problem is transformed in to the following research question:

How are likely the trends of sesame seed export in Ethiopia for the period 1970-2013?

What are the factors that affect sesame seed export in volume and value?

What strategies are required in order to increase sesame seed export in volume and value?

1.3. Objective of the Study

The general objective of this study is to identify and assess the magnitude and effects of key determinants on sesame seed exports of Ethiopia. In order to achieve the main objective of the study, the specific objectives are:

- To assess the trend of sesame exports volume and value of Ethiopia for the period 1970-2013.
- To identify the key determinants of volume and value of sesame seed export of Ethiopia.
- To recommend feasible trade policy to improve sesame exports of Ethiopia.

2. Methods and Materials

2.1 Sources of Data

The study used secondary data collected from different sources. All the data used in this study were gathered from the agricultural production, supply and trade database of FAO (FAOSTAT [3] and the United Nations Conference on Trade and Development Statistics (UNCTADSTAT[4]) and National Bank of Ethiopia (NBE) and World Bank (WB). Production of sesame, Value and volume of sesame seed export were gathered from FAOSTAT. The export price was calculated based on value and volume of exports as obtained. Data gathered from the UNCTADSTAT included foreign direct investment (Net inflows). Real effective exchange rate obtained from National Bank of Ethiopia. Data gathered from WB included measure of trade openness (TOT). Even though, sesame seed export from Ethiopia was commenced in 1961, due to unavailability of all variables from 1961 we used yearly data's covered from the period 1970 up to 2013 only.

2.2. Methodology of the Study

The study used descriptive and inferential analysis tools. In descriptive analysis we used tables, graphs and percentages in order to elaborate the findings. As inferential analysis tools Johansen cointegration and Engel Granger short run error correction methods were employed.

2.2.1 Model Specifications

In this study, two primary equations were estimated; one with value of exports as the explained variable, and the other with volume of exports as the explained variable. Use of two different explained variables will help to identify how the effects of the respective explanatory variables on one explained variable (volume of exports) translate into the other (value of exports).

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[3]FAOSTAT: Agricultural production, supply and trade database: Available:http://faostat.fao.org/site/342/default.aspx . Accessed online on January 28, 2014

[4]United Nations Conference on Trade and Development. Available: http://unctadstat.unctad.org/ReportFolders/reportFolders.aspx . Accessed online on January 28, 2014

Based on the empirical literature reviewed and objective of this study, our model was specified econometrically as follows holding the following a priori expectations (for both value and volume of exports):

$$EXPORTVALUE = f(PRODUCTION, \text{EXPORTPRICE}, \text{ REER}, \text{TOT}, \text{ FDI})$$

$$\text{EXPORTVOLUME} = \text{f(PRODUCTION, EXPORTPRICE, REER, TOT, FDI)}$$

(1)

At estimation stage taking logs of the variables in equation (1) and differentiating with respect to time gives the trend of exports of sesame seed as:

$$Ln(EXPORTVALUE_t) = \beta_0 + \beta_1 \ln(PRODUCTION_t) + \beta_2 \ln(EXPORTPRICE_t) + \beta_3 \ln(TOT_t) + \beta_4 \ln(REER_t) + \beta_5 FDI_t + \varepsilon_t$$

$$Ln(EXPORTVOLUME_t) = \beta_0 + \beta_1 \ln(PRODUCTION_t) + \beta_2 \ln(EXPORTPRICE_t) + \beta_3 \ln(TOT_t) + \beta_4 \ln(REER_t) + \beta_5 FDI_t + \varepsilon_t$$

Ln (EXPORTVALUE): Log of value of sesame exports

Ln (EXPORTVOLUME): Log of volume of sesame exports

Ln (PRODUCTION): Log of domestic production of sesame.

Ln (EXPORTPRICE): Log of export price of sesame seed

Ln (TOT): Log of Terms-of-Trade Index of exports (measure of trade openness)

Ln (REER): Log of real effective exchange rate.

FDI: Net inflow of Foreign Direct Investment

β ’ s are unknown parameters to be estimated, is time in years (1970-2013) and ε is random terms that are independently and identically distributed with mean zero and constant variance δ^2 Use of FDI in level instead of logging it is to make the specification externally valid. Some values under the scope of the study period (1970-2013) are negative. This could preclude logging for extended period. In addition, data for some countries from the developing world shows negative net inflows in a significant number of years, and using log of FDI may require modification of our specification in situations where researchers want to apply the exact equation in their study.

Sesame Seed Export

Sesame Seed export here is considered in terms of volume and values of export. A value of export is the annual values (in 1000US $) and Volume of export is Volume (In tons) of sesame seed exported from Ethiopia to the rest of the world.

Domestic Production (PRODUCTION)

Domestic production is production of sesame seed in Ethiopia annually. High production of sesame leads to high amount of sesame seed supply for export in turn leads to high value of export earnings. Thus, it is expected to have positive effect on sesame export.

Foreign Direct Investment (FDI)

FDI could represent a measure of production development in the export sector. It can be expected to contribute to the enhancing of a country's competitiveness on international markets by increasing the technological content of exports. FDI is included in this study as stock since FDI stock measures its productive capacity. As it is believed that transformation of the composition of exports increases with FDI, then the sign of this variable is expected to be positive.

Real Effective Exchange Rate (REER)

Since Ethiopians do not conduct all their trade with a single foreign country, policy makers are not so much concerned with what is happening to their exchange rate against a single foreign currency but rather what is happening to it against a basket of foreign currencies with which the country trade. The effective exchange rate as a measure whether price of the currency is appreciating or depreciating against a weighted basket of foreign currencies. The calculation of the average real effective exchange rate is based on the IMF definition of the real exchange rate that is real effective exchange rate as price of domestic currency against foreign currency:

$$REER = \sum_{i=1}^{n} \frac{(NEER_i)P}{p_i *}$$

Where i is each individual country trade with Ethiopia; n is number of countries trade with Ethiopia.

NEER is the nominal effective exchange rate, P* is the consumer price index of the foreign country (Here basket of foreign country trade with Ethiopia and P is the domestic consumer price index (Ethiopia in this case).

Appreciation of the real exchange rate enhances the competitiveness of the domestic goods for the foreign goods. On the other hand, depreciation in real exchange rate will decrease competitiveness of home goods in international markets due to higher domestic price from foreign price. Therefore, negative relationship is expected between real effective exchange rate and export growth.

Trade Openness (TRADEOPNESS)

Terms of trade is defined as the ratio of the price of imports to the price of exports (both in US currency) and favorable terms of trade are associated with increased export growth rates, so its effect is expected to be positive.

Export Price (EXPORTPRICE)

The export price here is the average price of sesame seed in the international market. The export price is calculated based on value and volume of exports as follows:

$$Export\ \text{price} = \frac{\text{Value of Export}}{\text{Volume of Export}}$$

The outcome will be $/ton.

The price of exports on the international market is one of the major determinants of export growth especially for countries which depend on exportation of agricultural products whose prices fluctuate from time to time. As a result, it assumed that it affects positively for the growth of country's export.

2.2.2 Estimation Procedure

The time series properties of the data set used in this study was first examined by employing vigorous tests for stationary. There are several methods of testing for stationary (example: tests of stationary based on Correlogram, the Box-Pierce,Q-statistic and the Ljung-Box (LB) statistic. This paper however employed the unit root test for stationary using the Dickey-Fuller as well as Augmented Dickey-Fuller (ADF) tests was carried out using E-Views.

After performing the unit root tests for stationarity, cointegration analysis was also employed to determine the long run relationship of the variables entering the values and volumes of sesame seed model independently. To determine the short run relationship of variables, error correction method was also employed. Finally, all assumptions of models for long run and short run equations were also analyzed.

2.2.2.1 Cointegration

Cointegration analysis can be used to evaluate the co-movement of a long-term value and volume of sesame seed export within an equilibrium model. Firstly, cointegration analysis establishes a long term relationship by calculating long-run equilibrium asset prices. Next, correlations within an error correction model are estimated. Therefore, stochastic trends common to the respective time series are found prior to the cointegration analysis.

Cointegration analysis was introduced by Engle and Granger in the early 1980s, with improvements and additions made in subsequent years. Cointegration is a modelling process that incorporates non-stationarity with both long-term relationships and short-term dynamics. To examine time series in financial data using cointegration, the time series in its level form should be non-stationary and integrated of order 1, written as I(1). Integrated of order 1 means the series becomes stationary after differentiating it once. Variables are said to be cointegrated if they are I (1) and have a linear combination which is stationary without the need to differentiate the data.

There are two main cointegration methods that have consistently been used throughout past studies which are: 1) Engle-Grangers Two Step Estimation Method; and 2) Johansen's Maximum Likelihood Method using either the Trace Statistic and/or the Maximum Engle value Statistic.

Our study used the Johansen's Method due to reasons mainly relating to the shortfalls of Engle-Grangers Two Step Estimation Method. The Two Step Estimation Method is very easy to run, however, it needs a larger sample size to avoid possible estimation errors and can only be run on a maximum of two variables (Brooks, 2008). It doesn't allow for hypothesis testing on the cointegrating relationships themselves, unlike Johansen's method (ibid). Since we are examining a total of 5 variables on export volume and value of export, we want the ability to examine them in a multivariate framework, allowing for the possible discovery of more than one cointegrating vector, which the Engle-Granger Method cannot accomplish. In this situation, Johansen's Method better suits the data, due to the fact that it examine more than two test variables, and can treat all test variables as endogenous.

2.2.2.1.1. Stationary Series and Stationarity Test

A variable is said to be covariance (weakly) stationary if the mean and the variances of the variable are constant over time and the covariance between two periods depends only on the gap between the periods, and not the actual time at which this covariance is considered whereas a non-stationary series has a different mean at different points in time and its variance increases with the sample size (Debel G., 2002).

According to Madala (1992), a time series is said to be strictly stationary if the joint distribution of any set of N observations $Y_1, Y_2, \ldots Y_t$ is the same as the joint distribution of $Y_{1+k}, Y_{2+k}, \ldots Y_{t+k}$ for all N and K. The distribution of Yt is independent of time and thus it is not only the mean and the variance that is constant but also all higher values of t are independent of t.

In time series analysis, most encountered series are in fact non -stationary. Contrary to the situation of stationary process which fluctuates around their mean, the reversion to a fixed value rarely occurs for non-stationary process. If a non-stationary time series is regressed on one or more non-stationary time series, the results are prone to spurious regression problems. This is a situation where results obtained suggest. There are statistically significant relationships between the variables in the regression model when in fact all that is obtained is evidence of contemporary correlations rather than meaningful causal relations (J. Gudeta, 2010).

Therefore, it is necessary to check whether or not the variables included in the model are stationary or not before going to regression analysis.

Stationarity of time series data is detected through unit root test. Unit-roots are important to detect the stationarity of time-series data. To test if the series used have unit-roots, we will apply a test based on the work of Fuller (1976) and Dickey and Fuller (1979, 1981). The Augmented Dickey-Fuller test is a similar but modified version of the Dickey-Fuller test which is used when error term is not a white noise. While testing for stationary, if a variable becomes stationary at level, then it is said to be integrated of order zero, I (0). And if the variable is stationary at its first difference, it is said to be integrated of order one I (1). Similarly, if a variable can be transformed to stationary series by differencing n times, then it is integrated of order n, I (n) (Verbeck, 2004).

2.2.2.1.2. Johansen's Cointegration Method

After completion of unit root testing on our time series, assuming all our time series are integrated of the same order, we conduct a bivariate Johansen test between each of our 6 indices The main analysis we conduct is a multivariate Johansen test on all 6 of the indices so that we can investigate cointegration involving all variables instead of analysis only at the bivariate level.

The Johansen process is a maximum likelihood method that determines the number of cointegrating vectors in a non-stationary time series Vector Auto-regression (VAR) with restrictions imposed, known as a vector error correction model (VEC). Johansen's estimation model is as follows:

$$\Delta X_t = \mu + \sum_{i=1}^{p} \Gamma_i \Delta X_{t-i} + \alpha\beta' X_{t-i} + \varepsilon_t \qquad (2)$$

Where

X_t = (n x 1) vector of all the non-stationary indices in our study

Γ_i = (n x n) matrix of coefficients

α = (n x r) matrix of error correction coefficients where r is the number of cointegrating relationships in the variables, so that 0< r< n. This measures the speed at which the variables adjust to their equilibrium. (Also known as the adjustment parameter)

β = (n x r) matrix of rcointegrating vectors, so that 0 < r< n. This is what represents the long-run cointegrating relationship between the variables.

In determining lag lengths for the Johansen's procedure, we chose between using Akaike's (AIC) and the Schwarz's Bayesian (SBIC) information criterion processes. The SBIC is usually more consistent but inefficient, while AIC is not as consistent but is usually more efficient (Brooks, 2008).As per Brooks (2008), SBIC will usually give a larger average variation in selected model orders and AIC is known to avoid this situation, therefore, our study prefers to use AIC over SBIC in determining lag lengths. Literature surrounding cointegration analysis have used both AIC and SBIC with neither alternative firmly agreed upon between studies.

Johansen (1991) defines two different test statistics for cointegration under his method: the Trace Test and the Maximum Eigen value Test. The Trace test is a joint test that tests the null hypothesis of no cointegration ($H_0 : r = 0$) against the alternative hypothesis of cointegration ($H_1 : r \geq 0$. The Maximum Eigen value test conducts tests on each Eigen value separately.

It tests the null hypothesis that the number of cointegrating vectors is equal to re against the alternative of r+1cointegrating vectors (Brooks, 2008).

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^{g} \ln(1 - \hat{\lambda}_i) \ldots\ldots\ldots\ldots \quad (3)$$

$$\lambda_{\max}(r, r+1) = -T \ln(1 - \hat{\lambda}_{r+1}) \ldots\ldots\ldots\ldots \quad (4)$$

A significantly non-zero Eigen value indicates a significant cointegrating vector.

3.2.2.2. Granger Causality Test

In multivariate time series analysis, causality test is done to check which variable causes another variable. Given two variables X and Y, X is said to Granger causes Y if lagged values of X predicts Y well. If lagged values of X predict Y and at the same time lagged values of Y predict X, then there is a bi-directional causality between X and Y.

According to Granger (1988), the existence of cointegration between X and Y must be checked before running causality test. If cointegrating relationship is found, then there must exist causality in at least one direction. To test for causality first the following cointegrating equations need to estimate through OLS.

$$X_t = \alpha_0 + \beta_0 Y_t + \xi_t \quad (5)$$

$$Y_t = \alpha_0 + \beta_0 X_t + \xi'_t \quad (6)$$

Assuming that X and Y are I (1), Cointegration implies that the residuals ξ and ξ' be I (0).

Having found that the variables X and Y are cointegrated, the error correction models are formulated as follows:

$$\Delta X_t = a_0 + b_0\xi_{t-1} + \sum_{i=1}^{M} C_{oi}\Delta X_{t-i} + \sum d_{oi}\Delta Y_{t-i} + \varepsilon_t \qquad (7)$$

$$\Delta Y_t = a_0 + b_0\xi'_{t-1} + \sum_{i=1}^{M} C_{oi}\Delta Y_{t-i} + \sum d_{oi}\Delta X_{t-i} + \varepsilon_t \qquad (8)$$

The error correction terms ξ_{t-1} and ξ'_{t-1} are the stationary residuals from the cointegration equations (5) and (6) respectively. By including these terms in equations (7) and (8), the error correction models introduce an additional channel through Granger causality can be detected. In equation (7) Y is said to Granger cause X not only if the d_0 's are jointly significant, but also b_0 is significant. The error correction model allows for the finding that Y Granger cause X as long as the error-correction term carries a significant coefficient even if the d_0 's are not jointly significant.

3. Result and Discussion

3.1 Descriptive Results

Table 4: Descriptive Statistics

	Export volume	Export value	Export price	Production	Trade openness	FDI	ER
Mean	62951.30	69928.50	849.0723	76003.77	0.282807	137.7955	5.756045
Median	19119.50	10741.00	800.8236	37500.00	0.212905	15.50000	2.651500
Maximum	317920.0	516206.0	2150.016	327741.0	0.598647	953.0000	19.76000
Minimum	246.00300	283.0000	234.4548	15634.00	0.108307	3.00000	2.070000
Observations	44	44	44	44	44	44	44

Table 3 shows the general features of the data. The maximum export volume and value of sesame seed export was 317920 ton and 516, 206, 000 USD dollars respectively. Similarly, the minimum amount of export volume and value of sesame seed was 246 ton and 283000 USD dollars per year respectively. The average export amount in the period 1970-2013 was 62951.30 ton per year, which was almost an account 82.83 % of the average produced sesame seeds. On average 699, 28, 000 USD Dollars was obtained per year from sesame seed export. During the period (1970-2013) averagely 76003.77 tons of sesame seed was produced. From this on average 82.83 % was provided for the export market with an average price of 849072.3 USD Dollar/ tone.

Trade openness displays the sum of import and export share of GDP. On average sum of import and export account 28.28 % of the average GDP of the country during 1970-2013.The maximum and minimum average shares of sum of import and export per year were 59.86% and 10.83 % of GDP respectively.

Trends of volume (quantity) and value of sesame seed export has shown a fluctuating trend through the year 1970-2013. In the first two years of 1970 both values and volumes of sesame seed export has shown a dramatic increase and then from 1973 up to 1979 shown a dramatic decrease in both values. Then after up to 1992 both showed short period fluctuations. The minimum export amount of sesame seed was recorded in 1992 and the minimum value of currency obtained from sesame seed export was recorded in 1993. This was the transition period of the country followed by the fall of Dergue regime. Even if the trend is fluctuating both values and volumes of export show increment through time since 1993, but after 2013 export quantity shown a decreasing trend.

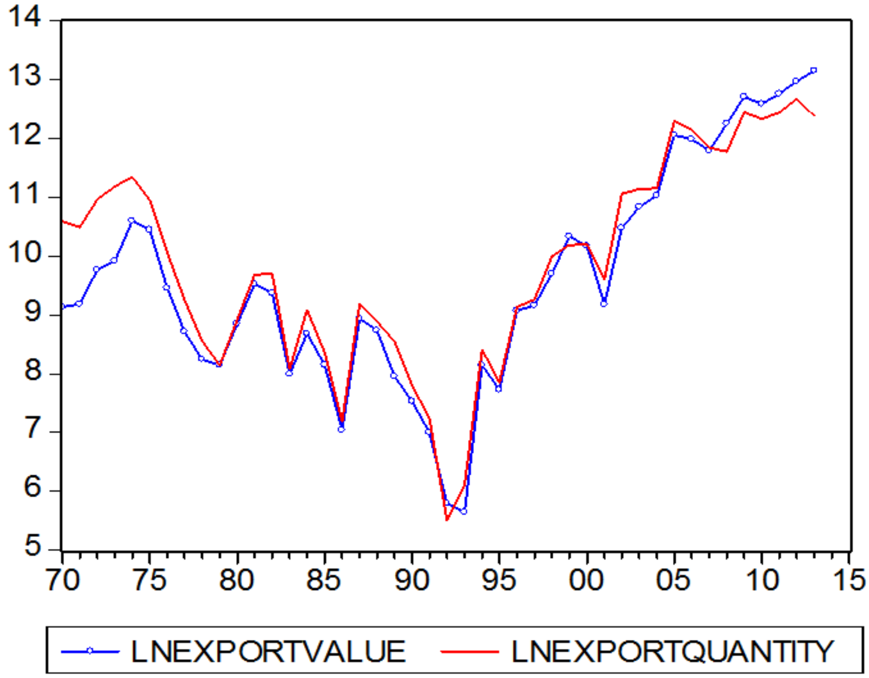

Figure 3: Trends of Export Value and Volume of Sesame Seed

3.2 Unit Root Tests

Our study has tested each time series individually to ensure non-stationarity at the levels, and also run the unit root tests on the first differences to ensure I (1). The Augmented Dickey-Fuller (ADF) test shows for all 6 indices that the level data was non-stationary; however stationarity was reached after the first difference. As discussed in the methodology section, this means all of our data is integrated of order one, I (1), a requirement for Johansen's cointegration analysis. Our test results are significant at the 1% significance level for the log transformations of export volume and values of sesame, export price, term of trade and FDI under all model specification options. The log transformation of exchange rate is also stationary at the 5% significance level.

Table5: The ADF Unit Root Test Results for Each Variables Independently

Variable		With intercept		With trend and intercept	
		At level	At 1st difference	At level	At first difference
LNEXPORTQUANTITY		-1.2495	-6.9614**	-1.8022	-7.0792**
LNEXPORTVALUE		-0.7465	-6.8298**	-1.5631	-6.9474**
LNPRODUCTION		-0.7761	-4.7187**	-0.8499	-5.1934**
LNEXPORTPRICE		-2.4074	-8.4383**	-3.3957	-8.3294**
LNREER		0.3766	-3.6799**	-2.4738	-4.03053*
LNTOT		-0.9002	-6.7233**	-1.9398	-6.6227**
FDI		0.0137	-10.2211**	-1.7763	-10.3514**
Critical values	At 1%	-3.5924	-3.5966	-4.1865	-4.1923
	At 5%	-2.9314	-2.9331	-3.5181	-3.5208

*Unit root is rejected at 5% critical level and ** Unit root is rejected at 1% critical level.

3.3 Estimation of the Long Run and Short Run Models

Having established the order of integration of the variables that enter the sesame seed export values and volumes model in the previous section, this section went step further in trying to determine the maximum number of cointegrating vectors that appropriately span the variables entering the VAR for the current `analysis. However, before proceeding to the Johansen's estimation procedure, a test for the appropriate lag length of the VAR was carried out.

Table 6: Lag Determination of VECM of Export Volume of Sesame and Its Covariates in Ethiopia

Endogenous variables: lnexport volume lnexport price ln production lnreeron lntotlnfdion

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-385.2468	NA	7.830352	19.08521	19.33598	19.17653
1	-176.5442	346.1409*	0.001753*	10.66069*	12.41606*	11.29990*
2	-147.3280	39.90515	0.002740	10.99161	14.25158	12.17871
3	-107.1781	43.08762	0.003091	10.78918	15.55374	12.52417

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level); HQ: Hannan-Quinn information criterion ; FPE: Final prediction error ; AIC: Akaike information criterion; SC: Schwarz information criterion

The results above show that the LR, FPE, AIC, SC and the HQ test all chose one lags. This means our export volume of sesame and its covariate multivariate model will be explained by one lag. The lag length for export volume equation was also similar (see in the Appendix, Table 11).

Once we have determined the number of lags, our next task is to test for cointegration amongst the variables. Therefore, following the stationarity testing, multivariate Johansen testing was carried out in order to determine the number of long run equation, as per the process outlined in the methodology section. Results for the 1970-2013 year sample periods are presented in the following sections.

Table 7: Johansen Cointegration Result-Trace Test

Trend Assumption: No Deterministic Trend (Restricted Constant)

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.657875	121.1527	103.8473	0.0022
At most 1	0.478285	76.10446	76.97277	0.0581
At most 2	0.372162	48.77786	54.07904	0.1366
At most 3	0.258652	29.22798	35.19275	0.1906
At most 4	0.221553	16.65802	20.26184	0.1458
At most 5	0.135985	6.138958	9.164546	0.1803

Trace test indicates 1 cointegratingeqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

The Trace Test in Table 6 indicates the existence of 1 cointegrating equation at the 5% significance level. This cointegrating equation means that one linear combination exists between the variables that force these indices to have a relationship over the entire 44 years' time period, despite potential deviation from equilibrium levels in the short-term. In order to confirm the results of the Johansen's Trace test, we displayed the results of the Maximum Eigen value test in Table 8 below.

Table 8: Cointegration Rank Test (Maximum Eigenvalue) for Export Values of Sesame Seed

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.657875	45.04828	40.95680	0.0164
At most 1	0.478285	27.32660	34.80587	0.2954
At most 2	0.372162	19.54988	28.58808	0.4474
At most 3	0.258652	12.56995	22.29962	0.5988
At most 4	0.221553	10.51907	15.89210	0.2894
At most 5	0.135985	6.138958	9.164546	0.1803

Max-eigenvalue test indicates 1 cointegratingeqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

The Maximum Eigen value Test also shows 1 cointegrating equations at the 5 % level confirming the Trace Test. Therefore, these two tests confirm a cointegrating relationship over the 44 years sample period. Similarly, the cointegration trace and rank test for export volume series have also similar result and the result is shown in the appendix (Table 12).

3.3.1 The Long-Run Equation

The result of Johansen approach cointegration test confirmed the existence of single long run equilibrium equation for both export volume and export value series. For our interest, Johansen cointegration test provided us with the estimation of the determinant of export volume and value of sesame long run equilibrium equation.

Since we have identified the existence of one cointegrating equation, we can say that a stable equilibrium relationship is present. The results are normalized on the LNEXPORTVALUE and LNEXPORTVOLUME. Due to the normalization process, for Eviews output the signs are reversed to enable proper interpretation.

Since all variables except FDI are used in the logarithmic form, the estimated coefficients can directly be interpreted as long term elasticity. Coefficients of the log transformed values of world domestic production of sesame seed, export price of sesame seed, real effective exchange rate, terms of trade significantly affect values of sesame export at 1% level of significance. Net inflow of foreign direct investment has also significance influence on export values of sesame seed export at 5% level of significance. Similarly, the above table result showed that except export price of sesame seed all are significantly affect sesame seed export volumes like sesame seed export values.

Table 9: The Long Run Cointegration Results of Sesame Seed Export Value and Volume.

CointegratingEq:	LNEXPORTVALUE	LNEXPORTVOLUME
PRODUCTION	-1.781782**	-1.781782**
	(0.16585)	(0.16585)
	[-10.7432]	[-10.7432]
LNEXPORTPRICE	-0.878215**	0.121785
	(0.28923)	(0.28923)
	[-3.03641]	[0.42107]
LNREER	6.899916**	6.899915**
	(1.29225)	(1.29225)
	[5.33947]	[5.33947]
LNTOT	-5.302701**	-5.302700**
	(0.83532)	(0.83532)
	[-6.34808]	[-6.34807]
FDI	-0.002830*	-0.002830*
	(0.00124)	(0.00124)
	[-2.28304]	[-2.28304]
C	-2.436073	-9.343826
	Wald(chi^2)=6266.337**	Wald(chi^2)=4286.421**
	P>chi2= 0.0000	P>chi2= 0.0000

Note: (d=differenced once) Adjustment coefficients (standard error in parentheses) [T-statistics in brackets]* Significant at 5 % level of significance ** significant at 1% level of significance.

The long run elasticity of sesame seed export value and volume with respect to production of sesame is 1.7817. It predicts that 1 % increase in production of sesame seed associated with 1.78% increase in value and volume of sesame seed export in the long run. This may be happen because the rise in production may increase supply of sesame products to the international markets and its gain from exporting more products.

World export price of sesame seed affects the values of sesame seed export positively in the long run as the expectation. The long run elasticity of export value of sesame seed with respect to export price of sesame seed is 0.8782. The values indicates that, a 1% increase in world sesame seed price leads to 0.88% rise in value of exported sesame seed from Ethiopia. This means that, 1 US $ increase in export price of sesame leads to 878US $ increase in export value. Contrary, the volume of sesame seed export is negatively affected by export price even though its impact is insignificant at 5% level of significance. This may be because when exports price of sesame rises world competition to sell sesame seed in the international market may rise and this in turn leads to a decrease in demand of Ethiopian sesame seed in the international market. Some studies done in Ethiopia have also found a significant relationship between export price and export of agricultural products. For example, the study done by Zelalem and Tekie (2011) on export supply of coffee through OLS estimation found that export price of coffee has a significant positive impact on export volume of coffee. In other studies Hailegiorgis (2010) couldn't find a significant relationship between export price and export performance of oil seeds from Ethiopia in the long run as well as short run even if the direction is positive.

The long run elasticity of both value and volume of sesame seed export with regards to real effective exchange rate of Ethiopia is equal to-6.8999. The value interpreted as, a 1% increment in the real effective exchange rate decreases the sesame seed export value and volume of sesame seed export by 6.90% per year in the long run. It coincides with the theoretical expectation that a fall in domestic prices due to exchange rate depreciation makes exports cheaper in the global market, and this consequent stimulates demand. Few studies done in different agricultural export products find different results on effects of nominal exchange rate and real effective exchange rate. Most of the studies done on raw agricultural products export have found a positive and significant contribution (Hailegiorgis, 2010; Samuel, 2012; Yusuf and Yusuf, 2007; Nwachuku, 2010) with nominal exchange rate. Similarly, in the manufacturing sector, textile industry export of Ethiopia founded negative relationship between nominal exchange rate and textile export (Yared and Mulat, 2010). The study done by Eyayu (2014) on 47 Sub Saharan African countries also found that real effective exchange rate affects agricultural export of SSA positively but the coefficient is insignificant. With happens some studies has also found negative relationship between export and real exchange rate (Sharma, 2000; Cline, 2004 and Kuwornu, 2009).

Measure of trade openness (TOT) was found to be significant in the estimation of sesame seed export value and volume at 1% level of significance. The sign of the long run elasticity of sesame seed with respect to terms of trade was positive, in conformity with the theoretical expectations of trade liberalization for export. These values reveal that 1% increase terms of trade associated with 5.3027 increases in both export value and volume of sesame seed export per year. The study done on manufacturing sector by Yared and Mulat (2010) confirmed that 1% trade liberalization (openness) affects the textile and apparel industry export positively by 11.79 Percent per year. In other studies conducted by David, et al. (2010) TOT yields positive impact for both the value and volume of exports of fresh pineapple from Ghana (David, et al., 2010). Other studies also confirmed that there is a positive relationship between export and terms of trade, for example, Ngouhouo (2013) in Cameroon, Agasha (2009) in Uganda, and Samuel (2012) in Ethiopia.

Under favorable domestic production and marketing conditions, foreign direct investment (FDI) stands fuelling export growth in less developed economies. As expected net inflow of FDI has a statistically significant and positive contribution to export value and volume of sesame seed in Ethiopia at 5% level of significance. The coefficients of FDI is equal to 0.0028, indicates that 1 % increase in net inflow of FDI leads to $e^{0.0028}$=1.0028% increase in export values and volumes of sesame seed from Ethiopia.

Generally, domestic production of sesame, world export price of sesame seed, real effective exchange rate, and terms of trade and net inflow of FDI significantly affect export values of sesame seed in the long run. In the same way, except export price of sesame seed all factors have the same impact as sesame values on export volume of sesame seed. All have the expected relationship with export values. But, export price relationship with export value is different from the theoretical expectation.

Looking at the overall goodness of fit of estimations of the model (Wald test), it can be concluded that the specified models explain the export value and volume of sesame seed to a sufficient extend. The results of various diagnostic tests like the Breush-Godfrey Lagrange Multiplier (LM) test for serial autocorrelation, the autoregressive conditional heteroscedasticity test, the Jarque-Bera test for normality, the White's test for heteroscedasticity and Ramsey's general test of model misspecification are reported and all tests did not detect any problem of serial correlation, heteroscedasticity, non-normality and model misspecification (See in the Appendix Table 15-22).

3.3.2. The Short-Run Equation

Having already obtained the long-run model and estimated the coefficients, the next step will be estimation of coefficients of the short-run dynamics that have important policy implications. Granger proved that cointegrated series can be modelled by ECM as well as the fact that variables entering an error correction mechanism are cointegrated. By building an ECM with the variables entering the cointegration equation, a relationship containing both the long and the short run information is obtained. Here the lagged differences of the listed variables capture the short run change in the corresponding level, while the error correction term (ECM) capture the long run adjustment impact.

Hence, an error correction model was estimated that incorporates the short-term interactions and the speed of adjustment towards long run equilibrium. In the error-correction model, the short-run disequilibrium is approximated by the first lag of the estimated long-run linear combination. In our case, the short run equation relates the differences of log transformed export volume and value of sesame seed export with the difference of LNPRODUCTION, LNEXPORTPRICE, LNTOT, LNREER, FDI and the error term in the lagged periods.

Before fitting the final model we have checked assumptions of the model. Accordingly, the results of diagnostic tests are reported and the tests did not detect any problem of heteroscedasticity, non-normality, serial autocorrelation and model misspecification (Table 24-26 and Figure 6).

The table below indicates that, in the short run equation, production of sesame have a significant positive coefficient at 1% level of significance like the long run equation. The short run elasticity of sesame seed export value and volume with respect to production of sesame are equal to 1.4572 and 1.8016 respectively. Therefore, a 1% increment of sesame seed production only rise the short run value and volume of sesame export by 1.46 % and 1.80% respectively.

Similarly, world sesame seed export price significantly affect export volume of sesame seed but not export value of sesame seed in the short run at 5% level of significance. The short run elasticity of sesame seed volume of export with respect to world sesame seed price is-0.9116; indicate that 1% increase in the price of world export price of sesame seed leads to decrease volume of sesame seed export by 0.91%. The increase in price of world sesame seed tends to increase value of sesame seed even if the coefficient is insignificant at 5 % level of significance.

In contrast to the long run export value and volume of sesame seed is less elastic with the change in the real effective exchange rate, terms of trade and net inflow of FDI in the short run. The short run elasticity of export value and volume sesame seed with respect to REER are 2.6633 and 2.6513 respectively; but insignificant at 5 % level of significance. This indicate that real effective exchange rate affects sesame seed export of Ethiopia positively but the insignificant coefficient indicates that appreciating the real effective exchange rate is little to do with enhancing sesame seed export of Ethiopia in the short run. The elasticity values are positive the same to the long run equation. Similarly, the direction of the relationship TOT and FDI with export value and volume of sesame seed is negative and unlike the long run relationship. The direction of the short run relationship of FDI with export value of sesame seed is the same to the long run relationship; which is positive. The short run elasticity coefficient of export value of sesame seed with respect to net inflow of FDI also positive.

Table10: Short Run Model (Error Correction Mechanism)

Variable	D(Lnexportvalue)	D(Lnexportvolume)
D(LNPRODUCTION)	1.4572** (0.4128) [0.0011]	1.8016** (0.4480) [0.0003]
D(LNEXPORTPRICE)	0.1043 (0.3638) [0.7760]	-0.9116* (0.3934) [0.0261]
D(LNREER)	2.6633 (1.5833) [0.1010]	2.6513 (1.7275) [0.1333]
D(TOT)	-1.2467 (0.8114) [0.1329]	-1.4566 (0.8867) [0.1089]
D(FDI)	0.00011 (0.0006)	-0.0005 (0.0006)

	[0.8537]	[0.9389]
ECM(-1)	-0.5948** (0.1229) [0.0001]	-0.4925** (0.1284) [0.0005]
R-squared	0.4441	0.4231
Adjusted R-squared	0.3690	0.3451
S.E. of regression	0.63398	0.6852
F-statistic	2.4696 P.Value=0.0000	2.4696 P.Value=0.0000
Log likelihood	-38.1856	-41.5283
Durbin-Watson stat	1.6131	1.5746

Note: (d=differenced once) Adjustment coefficients (standard error in parentheses) [P-value in brackets]

* Significant at 5 % level of significance ** significant at 1% level of significance.

The speed of adjustment coefficient is significant at 1% critical value with the correct (negative) sign. This means with the adjustment speed, the rate of variation of the volume and value of sesame seed export in the ECM system is adjusted towards the dynamic equilibrium long run cointegrating relationship. According to this estimate, short run value and volume of sesame seed export disequilibrium is corrected at speed of 59.48%and 49.25% per year respectively.

Totally, both value and volume of sesame seed exports from Ethiopia are noted to decrease with increasing real effective exchange rate in the long run. But in the short run the increase in REER leads to increase in value and volume of sesame seed export but the effect is insignificant. The change in world sesame seed price level has a positive and significant impact on value of sesame seed export in the long run but positive; and its impact is insignificant in the short run. With this in hand, productions of sesame seed have positive and significant impact on both value and volume of sesame seed export in the short run and long run. The direction of the relationship TOT with both values and volumes of sesame seed export is opposite to the long run relationship and its impact is insignificant in the short run. The direction of net inflow of FDI with export value and volume of sesame seed is the same with the long run relationship.

3.3.3 Granger Causality Test

The other two are the issues of causality and simultaneity. In order to tackle the simultaneity problem, previous studies either performed causality test or employed a simultaneous equation model. Simultaneous equation model is estimated in order to take into account the idea that there is simultaneity or feedback relationship between value or volume of export sesame seed and its covariate and to examine the indirect impact.

The causality test is conducted by taking into account the cointegration and error-correction formulation of the variables. It has already been shown that both output and exports are I (1) variables. What remains is to check whether these two variables are cointegrated in the Engle-Granger sense. The result of the cointegration test based on the Engle-Granger two-step procedure is reported in Table 13 and Table 14 in the appendix.

The error-correction term opens up an additional channel of Granger causality so far ignored by the standard Granger (1969) and Sims (1972) tests. The Granger causality can be evidenced through the statistical significance of the t-test of the lagged error correction term (s) or the F-test applied to the joint significance of the sum of the lags of each explanatory variable (Masih and Masih, 1996). Here, the Granger-causality conducted by the F-statistic of the lagged error-correction coefficient suggests statistically significant long-term bidirectional causation between two variables, i.e. export value and volume of sesame seed causes real effective exchange rate devaluation and real effective exchange rate also causes export of sesame seed at 10% level of significance. But at 5% level of significance only REER causes export values and volumes of sesame seed.

Therefore, the result of Granger causality test from the error correction model indicates a different channel through which real effective exchange rate could cause change in export value of sesame and export volume. Export value or volumes of sesame seed causes domestic production of sesame seed at 5 % level of significance. But the remaining variables have no causal relationship with export volume of sesame at 5% level of significance.

4. Conclusion and Policy Implications

4.1. Conclusion

In identifying the key determinants of Sesame exports of Ethiopia, effort was made to estimate separate regressions with value of exports and volume of exports being the explained variables in the respective regressions. The study reveals that, the results found in the short run and long run equations for both values and volumes of sesame seed are different.

In the long run, domestic productions of sesame seed, real effective exchange rate, terms of trade and FDI have a significant impact on both value and volume of sesame seed export. Except real effective exchange rate all have a positive relationship with both value and volume of sesame seed export. But in the short run, only domestic sesame production have a significant positive effect on export values and volumes of sesame seed export.

Export price of sesame seed have a significant and positive effect on export values of sesame seed in the long run; its effect is statistically insignificant in the short run. But export price of sesame seed have negative and statistically insignificant relationship with export volume of sesame seed in the long run.

The direction of the short run relationship between values and volumes of sesame seed export, terms of FDI is the same to the long run relationship; it is positive. The long run coefficients of terms of trade and real effective exchange rate sign different from the short run relationship.

From Granger causality test we conclude that real effective exchange rate unidirectional causes export volume or values of sesame seed. Export volumes and values of sesame seed causes domestic production of sesame seed but domestic production could not causes sesame seed export. But the other variables have no causal relationship with sesame seed export.

Moreover, we conclude that both values and volumes of sesame seed export and covariates are related to past deviations (error-correction terms) from the empirical long-run relationship. It implies that both variables in the system have a tendency to quickly revert back to their equilibrium relationship.

Totally, as expected from the theory high sesame production, a fall in real effective exchange rate, a rise in export price, improvement of direct investment in the country, and trade liberty increase gain from sesame seed export (export value). But rise in export price could not increase volume (amount) of sesame seed export from Ethiopia. Keeping this, except export price others listed above conditions should increase export volume of sesame seed from Ethiopia.

4.2. Policy Implications

The implication of these outcomes is that the focus of future Ethiopia's sesame as well as agricultural products export trade should be strategized along the following guidelines from a marketing perspective:

- Like other developing countries both values and volumes of sesame export from Ethiopia is highly elastic with world price of sesame seed. From the finding we see that Ethiopia's export gain (value) increased during the raise in export price of sesame seed in the international market but its volume is unaffected. This may be due to quality of the product, international competition and outside demand for Ethiopian sesame seed. In order to stimulate the sesame seed export when price rise policy actions like more promotion about Ethiopia's sesame seed in the international market, promoting quality of the product internally, increasing export destinations of sesame seed should have to be taken.
- From the findings devaluation of currency or appreciation of real effective exchange rate boosts up values and volumes of sesame export in the long run. Therefore, as expected devaluation of currency and lowering domestic price of sesame seed is one of the policy implications for future trade enhancement of sesame seed.
- As our findings revealed domestic production of sesame seed favor both short run and long run values and volumes of sesame seed. Thus, a mechanism which enables to increase production of sesame should have to be facilitated.
- The impact of FDI on sesame export is significant in the long run, the sign is positive but the size is small. This indicates that the investment activity in sesame production is very small, but if there are encouraging activities and more investment in the sector it will have a significant impact on promotion of value and volume of sesame seed export.
- Here this study only focus on few determinants of sesame seed export but the other important demand and supply factors side factors were not included in the study. Demand side factors like world sesame

production, destination countries propensity to import and capacity, distance of destination countries and supply side factors like road presence of infrastructure, agricultural inputs, land and yield of sesame and area of cultivated land expected to have a significant impact on sesame export trade of Ethiopia. So, we recommend future researcher who need to conduct further researches to deal with this factors. In addition, also we recommend seeing the impact of sesame seed export on Ethiopian economic growth.

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