Export performance of the horticultural sub-sector in Tanzania

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List of abbreviations

ADF	Augmented Dickey-Fuller
BOT	Bank of Tanzania
COMESA	Common Market for Eastern and Southern Africa
CPI	Consumer Price Index
ECM	Error Correction Model
EPR	Export Performance Ratio
EU	European Union
GDP	Gross Domestic Product
NBS	National Bureau of Statistics
OLS	Ordinary Least Squares
RER	Real Exchange Rate
REPOA	Research on Poverty Alleviation
ISS	Institute of Social Studies
TAHA	Tanzania Horticultural Association
TZS	Tanzanian Shillings
UAE	United Arab Emirates
USA	United States of America
USD	United Sates Dollar
URT	United Republic of Tanzania

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Abstract

Horticultural sub-sector in Tanzania has been characterized by sustained growth over the years. But there has been slow growth rate in horticultural exports over the last decade. In this regard, knowledge of the determinants of the industry's development is very important. Little attempt was made to examine factors influencing the export performance of the sub-sector.

This study was proposed to examine factors that influenced the horticultural exports performance from 1988 – 2018. Secondary data were collected from the Bank of Tanzania, National Bureau of Statistics, and the World Bank. Co-integration technique was employed to examine the long-run relationships among the series. The coefficient values of the long-run relationship among the variables were estimated using Augmented Dickey-Fuller test.

The model results showed that the real exchange rate, agricultural Gross Domestic Products and foreign income had significantly influenced the horticultural export performance in the long-run. Real interest rate was revealed insignificant in the long-run. These significant variables have an important policy implication in improving the horticultural export performance in the country. The model results of the Error Correction Model were revealed as negative and significant, where it confirmed the existence of co-integration among the series. Its coefficient value was 1.0197, which showed 109.7% of the adjustment from short-run to long-run equilibrium per annum. Important policy implications of this study are included: flexibility in the exchange rate movements in line with the fundamentals of the economy; investment in research and agricultural extension as most smallholder farmers have less financial ability to pay for private research; and efficient policies for stabilization of the interest rates should be put in place (e.g., ceiling on lending rates, lowering inflation rate, etc.). These are considered important policy measures to improve the horticultural export performance of Tanzania.

Introduction

1.1 Background

Exports are crucial in the process of growth and the expansion of the exports is an important part of economic growth process. Export promotion has been commercial policy issue that has attracted a lot of devotion both at national and international levels (Orindi, 2011). Many countries in the world are focusing on the export promotion of their products mainly due to the shrinking local markets. The export sector of a given country is very crucial as it is a source of growth which can be attributed to the foreign exchange earned. This is evident in the Tanzanian horticultural sub-sector which has been significant over the last decade in generation of the foreign exchange and in employment creation. Horticultural export sub-sectors in a number of African countries are contributing significantly to economic development (Barrett *et al.*, 1999).

The horticultural sub-sector in the country has received a lot of interest from both international and local researchers, government and also donors due to its high growth rate and sustained exports growth to Europe (Muendo and Tschirley, 2004). The horticultural sector has significantly grown over the last decade to become the second biggest foreign exchange earner (after tea), employer (both directly and indirectly) and contributor to the food requirements in the country. Therefore this sector needs to be studied closely in order to establish ways in which the sector can be further improved to continue to be significant contributor to gross domestic product. The horticultural subsector in Tanzania is the fastest growing agriculture sub-sector. Tanzania's main trading partners for horticultural products are Netherlands and India (Table 1). Exports to these two countries add to more than half (54%) of the total export revenue. Trade with neighboring country Kenya account for 17%. United Arab Emirates and Comoros each contribute six percent to the total export revenues (ITC, 2020).

Table 1: Major Tanzanian trading partners for fruits and vegetables

#	Country	Share in percentage (%)
1	EU (Netherlands)	28
2	India	26
3	Kenya	17
4	United Arab Emirates	6
5	Comoros	6

Source: ITC data retrieved on February 26, 2021

It should be noted that even if the horticultural sector exports are significant, they only constitute a small percentage (less than 10%) of the total horticultural production. Opportunity exists in the large variety and quantity of fruit that Tanzania already produces.

Fruit production includes mangoes, pineapples, mainly oranges among citrus fruit and bananas (Table 2).

Table 2: Average production of major fruits in Tanzania, 2010 - 2018

#	Fruits	Production (in MT)
1	Banana	3,184,832.80
2	Mangoes, guava	422,816.70
3	Pineapple	363,910.80
4	Oranges	335,590.20
5	Fresh fruits	201,566.40
6	Tropical fruits	50,543.30

Source: FAOSTAT, date accessed: 16/8/2021

Several major domestically produced and marketed vegetable crops are potatoes, onions, and sweet potatoes (Table 3).

Table 3: Average production of major vegetables in Tanzania, 2010 - 2020

#	Vegetables	Production (in MT)
1	Sweet potato	3,476.749
2	Vegetables, fresh	1,819.706
3	Irish potatoes	1,572.540
4	Tomato	374.574
5	Onion	140,700
5	Cabbage	67,938
6	Chillis and pappers, green	14,245

Source: FAOSTAT, date accessed: 16/7/2021

Sweet potato production is far vaster than originally anticipated, more than double the volume of Irish potatoes produced over that same period and much larger than the production in Kenya or Uganda (Table 4). Tanzania is reported to be the third largest producer of sweet potatoes in the world.

Table 4: Vegetable and spice production of Tanzania and neighboring countries, 2010 - 2018 (in MT)

	Sweet potatoes	Green beans	Cloves
Kenya	822.362	39.010	2.030
United Republic of Tanzania	3.476.749	4.233	8.539
Mozambique	826.373	-	-
Rwanda	969.330	7.008	-
Uganda	1.837.967	-	-

Source: FAOSTAT, date accessed: 21/7/2021

The horticultural sub-sector in Tanzania comprises of large firms and small-scale farmers who usually sell their produce to these large farms through their marketing associations or individually to brokers. The flower production and marketing chain is dominated by medium sized and large-scale companies. The smallholder horticultural crop producers face many challenges mainly in production, post-harvest handling, and compliance with phytosanitary requirements such as Global Gap regulations. In addition, access to capital by the smallholder producers is difficult. Over 90% of smallholders in Tanzania produce horticultural commodities but only fewer than 2% do so directly for export (Tschirley *et al*., 2004). Smallholders who produce for export face a lot of constraints in their efforts of seeking to remain in the sub-sector. The challenges are mainly from the consumers increased demand for quality and food safety (phytosanitary regulations) in Europe as well as from rising number of supermarkets in this region.

The growth in horticultural sub-sector has been attributed to the increased consumption of horticultural products in Tanzania as compared to the exports and this is the reason why the exports form a smaller percentage of the overall growth in horticultural sector. Even, taking into consideration the high prices in international market, the dominance of the local market is still evident (Tschirley *et al*., 2004). The continued dominance of the local market and slower growth rate in the export sector and constraints that smallholder farmers face in their efforts to gain access to the international markets should be addressed in order to improve horticultural sub-sector.

There are two main channels in horticultural marketing: the wholesale chain and the supermarket chain. The former links small scale and medium scale producers with the international market. This is through various contracts and agreements with producers, representatives, freight agents and exporters. The wholesale chain links producers with the wholesale trade. In this channel of marketing, the produce is exported in large quantities. The exporters export the fresh produce only after they have bulked up sufficient quantity. The supermarket chain is either partially integrated or fully integrated. The wholesale chain of horticultural marketing is mainly used by large-scale growers. These large-scale growers are also exporters. On the other hand, the supermarket chain involves production, exporting,

and cargo handling being done by the same company. High level of technology is adopted by large scale producers in the supermarket chain in order to have high production and high quality as required by food safety regulations (Barrett et al., 1999; Nyange *et al*., 2019). The largest amount of the quantity exported is through supermarket chain. Fruits, vegetables and cut flowers are exported through this channel. According to Tanzania Horticultural Association (TAHA) (2019) the major regions in Tanzania where horticultural crops are grown include Morogoro, Iringa, Mbeya, and Ruvuma in the Southern highlands; Arusha, Kilimanjaro, Tanga and Manyara regions in the Northern corridor and Coast region, Zanzibar in the Coastal zone (usually dominated by small-scale farmers).

1.2 Horticulture and the Tanzanian economy

The Tanzanian horticultural sub-sector is the fastest growing agricultural sub-sector in the country. In addition, the horticultural sub-sector significantly contributes to the economic development and poverty eradication. The Horticultural sub-sector is very important because of creation of job opportunities. Nyange *et al*. (2019) argues that close to 2.5 million people are employed in both formal and informal horticultural setups. In addition, multiplier effects can arise in horticultural production especially in production and packaging of produce. For example, the demand for packaging materials can lead to the development of local plastic and paper manufacturing industries. This is the case in the country. The horticultural industry has helped in reduction of poverty in rural areas as a result of higher incomes as compared to other crops. This is due to forward and backward linkages. Nyairo and Backman (2009) argued that high export growth which is mostly facilitated by the increase in agricultural production is widely considered to be an important pathway to the reduction of poverty. Horticultural production provides the small-scale farmers with an opportunity for earning regular income. Nyairo and Backman (2009) recognized that an increase in production and export of horticultural exports in Tanzania had led to increased incomes.

The analysis of available international trade data through 2018, suggests that comparing export values from fruit, vegetables and spices, the largest group are vegetables with a share of 47%. Spices follow with 37% and fruits only make up 16% of export value. Table 5 shows the distribution of Tanzanian fruit, vegetable, and spices exports by value.

Table 5: Distribution of Tanzanian fruit, vegetable, and spices exports by value

#	Category	Percentage
1	Vegetables	47
2	Spices	37
3	Fruits	16

Source: https://www.trademap.org/ accessed on 16/7/2021

Notable is the high value of spice exports. Cloves make up roughly 87% of all spice exports, with export volume averaging 1,051 MT per year and valued at USD 9.15 million per year

over the most recent three (reporting) years, 2016-2018. Note, however, that clove exports had fallen significantly from the levels of 2011-2014 of USD 35.65 million/year in revenue and 3,795 MT/year (averaged over four years) by the end of the decade. COMTRADE data on black pepper exports appear to be inconsistent, showing 2014 exports of 1,302 MT valued at USD 14.6 million, with India importing 77% of the total exports at a unit price of USD 11,562 per MT. In contrast, the 2013 exports are reported at 919 MT valued at USD 146,100 (hence at a unit price of USD 159/MT). Reported exports in all of the other years of the decade of the 2010s did not exceed 112 MT (2012) and dropped to near zero in 2018. Clearly, there is an issue with the accuracy of data on black pepper. Trade data for other spices is spotty, with reports of some exports for a year or two, but not consistent exports over the decade.

Onions are the leading vegetable export crop at USD 11,915,000 followed by green beans at USD 8,278,000. Revenues for potatoes peaked in 2016 and otherwise remained well below USD 1 million per year. Export revenues for leek increased towards the end of the decade to slightly above USD 2 million per year for 2016, 2017 and 2018 whereas revenues for tomatoes declined from USD 981,000 in 2013 to just USD 74,000 in 2018.

Oranges turn out to be the single most important exported fruit throughout the past decade. Orange exports averaged 13,356 MT per year from 2010 through 2018, with nearly all exports going to Kenya in most years (with Rwanda as a minor secondary destination). The export value and unit values for orange exports to Kenya varied wildly, reported to be as high as USD 24.9 million and USD 2,250/MT in 2012, and as high as USD 22.2 million at USD 2111/MT in 2015, with far lower figures in the intervening years (USD 770,300 at USD 44/MT in 2013 and USD 489,800 at USD 42/MT in 2014).

Besides oranges, exports of avocados rose to greater prominence by 2018. Most other exported fruit also show vast divergence across years between 2010 and 2018. Pineapple export revenue is reported at USD 1.0 million in 2018, a high for the decade, while mango/guava export revenue averaged USD 280,000 and peaked at USD 2.1 million USD in 2016. Export data show modest export volumes for bananas, shipped mainly to neighboring countries (Malawi, Zambia), that reached 1,868 MT in 2016 (valued at USD 2.2 million) and 2,552 MT in 2018 (valued at USD 2.35 million). However, the vast majority of banana consumption is domestic. Exports of melons reached USD 293,300 in 2017, with 75% of that trade value coming from shipments of orange-fleshed melons to the UAE. Export volumes and values were far lower during the two surrounding years, 2016 and 2018, with markedly lower figures for exports to the UAE.

According to a household survey in Tanzania by Nyange *et al*. (2019), the households that engaged in the production of horticultural crops were better off than the household which didn't. In addition, a simulation exercise in the same survey showed that facilitating more households in venturing into the horticultural sector could help in reducing poverty considerably, in rural and urban areas. Therefore, it can be concluded that horticultural sub-

sector is very important to the Tanzanian economy due to the foreign exchange earned by the country from horticultural exports.

1.3 The statement of the problem

Horticultural production in Tanzania can be viewed as a success story but looking generally at the percentage of the horticultural exports in comparison with the total production, it is evident that the export sector constitutes a small percentage of the total production. Between 1993 and 2016, 98% of the quantity of fruits produced and 91% of the quantity of vegetable produced were marketed locally (Mshindano *et al*., 2016, Pioneer Consulting 2018). Over 80% of smallholders in Tanzania produce horticultural crops but few do so directly for export. According to a competitiveness report by USAID (2017), Tanzania's export performance is below its potential, taking into consideration overall agricultural output, size of economy, population, and arable land. It is indicated in the same report that horticultural exports constituted five percent of the total production. Over reliance on domestic markets has led to low domestic prices for the horticultural produce, hence there is need to exploit the foreign market for the horticultural commodities. Although the horticultural export subsector has achieved a significant growth, it has stagnated in the past decade. There is continued dominance of domestic horticultural production and the export sub-sector has experienced a slower growth rate (Guadagno *et al*., 2019). The slow growth rate in the horticultural sub-sector implies that the country has not been able to maximize on the foreign exchange earned from the exports. Although much research has been carried out on the horticultural sector, few studies have empirically studied the export sector.

Tanzania implemented a number of trade and fiscal policy reforms since the mid-1980s as a way to promote export by providing a number of incentives including abolishing export taxes licenses, subscribing to a number of preferential trade arrangements and treaties that provide a fair access to foreign market opportunities. However, export performance has not been satisfactory. Previous studies have provided a number of insights regarding the export performance which focused on the entire agriculture sector ignoring the fact that disaggregating the sub-sector would have different response on export performance. For example, horticultural sub-sector and cereal sub-sectors demonstrate different export performance in Tanzania (Lipumba and Ndulu, 1990). The present study seeks to examine the factors that influence the horticultural exports in Tanzania.

1.4 Research objectives

1.4.1 Overall objective

The overall objective of the study was to examine the determinants of the quantity of horticultural products exported and establish ways in which the horticultural export sub-sector could be improved so as to increase the contribution of the sector to the Gross Domestic Product (GDP) (in terms of income, employment and foreign exchange).

1.4.2 Specific objectives

The specific objectives are:

(i) To identify the relationship between agricultural GDP and export performance of horticultural sub-sector in Tanzania.
(ii) To examine the influence of real interest rate and real exchange rate on export performance of horticultural sub-sector in Tanzania.
(iii) To analyze the influence of foreign income of the trading partners on export performance of horticultural sub-sector in Tanzania.

1.4.3 Research hypothesis

This study was guided by the following research hypotheses:

(a) Agricultural GDP have positive impact on export performance of horticultural sub-sector.
(b) There is negative relationship between real interest rate and real exchange rate on export performance of horticultural sub-sector.
(c) Foreign income has positive impact on export performance of horticultural sub-sector.

1.5 Significance of the study

This study is important because the Tanzanian economy is dependent on agriculture as a source of economic growth (URT, 2016). The horticultural sector is among the leading subsectors of agriculture in terms of income generation (Epaphra, 2016). The study identified the factors which affect the performance of the horticultural sector either positively or negatively and recommend ways in which the sector could be improved. Also, the study is driven by the fact that the largest quantity of what is produced in the horticultural sector is consumed locally and the country cannot rely entirely on the domestic market because of the need to capture wider markets in order to earn more income. The horticultural export subsector stimulates economic growth in a number of ways e.g., linkages between production and international demand, economies of scale, increased efficiency due to competition etc. In addition, when the horticultural exports increase, national goals such as the increase in GDP, rise in sectorial employment level, reduction in trade deficit and improvement in income distribution can be realized. This study emphasizes on the horticultural sub sector because Tanzania has comparative advantage in the production of horticultural produce due to the agro-climatic conditions enhanced by the location of the country on the equator, which makes it possible for production of horticultural crops throughout the year unlike competitors such as Egypt and Morocco. In addition, high dependence on one or few traditional exports e.g., coffee and tea can leave a country vulnerable to volatile international market conditions and hence the need for diversification.

Literature review

2.1 Theoretical framework

Theoretical underpinnings of exports have evolved from Ricardo's comparative advantage in 1817 to the new trade theories. According to the theory of comparative advantage, there is still basis for trade between two nations even if a nation has absolute disadvantage in the production of both commodities if the nation with absolute disadvantage specializes in the production of the commodity in which its absolute disadvantage is smallest. The commodity in which its absolute advantage is smallest is the commodity of the country's comparative advantage. Hence, the nation will specialize in the production and export of that commodity (Salvatore, 2009).

The Heckscher-Ohlin model made popular in 1933 isolates the differences in resource endowments among nations as the basis for trade. Since nations are endowed differently with natural resources in terms of types and quantity, the theory places emphasis in a nation exporting a commodity whose production uses cheap and abundant inputs and will import the commodity whose production requires the intensive use of a nation's limited and costly inputs. Therefore, according to the Heckscher-Ohlin theory, if a nation is labor abundant, it should specialize in the export of the commodity that is labor intensive. Again, if a nation is classified as capital abundant, it should specialize in the export of the commodity whose production utilizes capital-intensive techniques (Salvatore, 2013).

According to Fungaza (2004), the amount of exports a country makes (supply capacity) depends on the size of the sector that is exporting a given commodity (measured by the varieties of the commodity produced), the prices received by the producer (producer price) and domestic transport costs. Fungaza (2004) also stresses the role of country size in influencing the volume of exports. Country size is measured by the Gross Domestic Product (GDP) as well as the population of a particular country. Country size shows how big the market is of the country that is exporting a given commodity. If the importing country's Gross Domestic Product is large enough, that will have an effect on the total quantity of imports that it will make. The higher the Gross Domestic Product, the more likely it is to import more of a commodity. The size of a country is related to the price of exports. The larger is a country's Gross Domestic Product, the more likely it is to influence the price of a commodity that it exports since the price reflects the costs that go into the production and export of a commodity. These costs are directly linked to institutions or policies that are in place in the exporting country.

Besides country size, foreign market access also influences the supply capacity of a country. If a country has better access to international markets, its expected returns from export activities will be higher hence, it will increase the volume of its exports. Better foreign market access can also increase the volume of exports by attracting resources from abroad through

foreign direct investment or through migration of labor, hence increasing productivity. On the contrary, Redding and Venables (2004) argue that supply capacity and foreign market access are negatively related. If the export sector is to expand, it will demand more of factors of production. With this increase in demand on factors of production such as labor, the price of labor (wage rate) increases. This increase in the cost of production will be reflected in the producer price. The higher is the producer price, the lower will be the demand of a nation's exports hence the negative relationship between foreign market access and supply capacity. An increase in foreign market access will lead to a less than proportionate increase in the volume of exports and subsequently a lower supply capacity. This also implies that supply capacity is inelastic with respect to foreign market access (Redding and Venables, 2004). This study adopts the analytical framework by Fugaza (2004) because it succinctly outlines factors that affect exports within the demand and supply confines.

2.2 Empirical review

The regression results of a study on the determinants of the Kenyan exports by Orindi (2011) indicated that explanatory variables namely, the importer's GDP and population provided most of the explanatory power in the regression. The coefficients of these variables had positive signs and hence they were consistent with theoretical expectations. The positive coefficient for the importer's GDP was due to the positive effects of foreign income on the level of Kenya's exports.

Kenya's GDP and population were found to be insignificant in the model, hence the two variables were dropped out of the regression model. The distance variable was found to be significant at 5% and had negative sign as was expected. In this study, the distance had been factored in as the proxy for the transportation costs. The distance in this case had inverse relationship with exports. This implied that the further away from the Nairobi the importing country is located the higher the transportation costs. High transportation costs have negative effects on the exports. However, the author did not take into consideration of the fact that there are countries which are nearer to Kenya and yet exports to these countries from Kenya are less than countries that are far away from Kenya. This implies that the level of trade between countries that have close proximity will be influenced by other factors such as income, trade agreements, and similar comparative advantages. For example, the exports from Kenya to countries in Europe and United States of America (USA) are more than exports to countries such as Somalia, Southern Sudan, and Ethiopia. Fewer exports to these countries could be as a result of poor infrastructure, similarities in climate and output. Common Market for Eastern and Southern (COMESA) dummy was found to be statistically significant at 1%.

This implied that Kenya's exports were likely to be higher to COMESA member states than non-COMESA members. In addition, The European Union (EU) dummy was also found to be positive and statistically significant at 1%. This suggested that Kenya's exports to EU members were likely to be higher than exports to non-EU members. The coefficient for embassy was also positive and significant thereby implying that presence of an

embassy/consulate in the importing country promoted Kenyan exports to that country. The significance of these three variables implies that economic partnership agreements are important in promoting exports. However, the study by Orindi (2011) focused on all the Kenyan exports (exports from all the sectors) and hence a study specific to horticultural exports is required because different sub-sectors may respond differently to macroeconomic variables. In addition, for a comprehensive and precise analysis, there is a need for disaggregation of the various sub-sectors in the economy.

In a study titled the factors that influence Egyptian agricultural exports, Hatab *et al*. (2010), used the gravity model approach. The authors studied the pattern of Egyptian agricultural exports from 1994 to 2008 so as to identify the factors influencing agricultural exports in Egypt into the major importing markets. In that study, the authors carried out regression in three ways, which included the fixed effect model, random effects model and the common intercepts model. The authors used the fixed effects model in the analysis (based on the Hausman test). According to the results in that study, Egyptian agricultural exports patterns followed the basic gravity model. The Egyptian GDP was positive and significant, implying that an increase in Egyptian GDP would lead to an increase in the Egyptian agricultural exports. However, the importer's GDP was not significant thereby suggesting that the foreign income had no significant effects in influencing the Egyptian agricultural exports. The coefficient of distance was negative and significant. Distance was used as a proxy for the transportation costs. The negative value of the coefficient of the distance variable implied that the transportation cost increases as the distance between two countries increases thereby negatively affecting the exports. The importer's GDP per capita turned out to be insignificant in determining the exports of agricultural commodities.

However, the Egyptian per capita income was negative and significant thereby suggesting that an increase in Egyptian GDP per capita would lead to a decrease in agricultural exports. The authors attributed this to an increase in local consumption as a result of an increase in household income. The exchange rate in that study had been taken as the value of the currency of the trading partner in terms of the Egyptian currency. The regression results showed that a depreciation of the Egyptian currency against the currency of the trading partners stimulated agricultural exports. The co-efficient for speaking a common language was positive and significant. This implied that where the official language was Arabic, exports tended to be promoted. The co-efficient for regional trade agreements was positive but not statistically significant. They attributed this to the constraints within the regional economic groupings such as similar comparative advantages, consumption issues (less consumption), membership to different regional trade blocs, policy harmonization, and poor private sector harmonization.

Salasya (1989), in a study on analysis of factors that influence export of French beans from Kenya used linear regression of total French beans exports on price and air freight charges. The regression results showed that the co-efficient for price was positive but insignificant at

5% level. The air-freight co-efficient was negative and significant at 5% level. She argued that price influenced the quantity of French beans exported by a small margin.
A study by Mold and Prizzon (2008) found that price impacted on agricultural exports by a small margin. The result of pooled regression estimates of unit price elasticity of African exports for the period 1980-2001 had a negative and significant co-efficient for agricultural exports implying that African countries increased agricultural exports as the international prices decreased.

Ndubuto *et al*. (2007) conducted a study on the competitiveness and determinants of cocoa exports in Nigeria. They used a multiple regression analysis. They fitted the four functional forms of the regression models (linear, double log, exponential and semi log) to the data by the method of the ordinary least squares. They took the exponential function as the lead equation (main equation) based on the econometric and statistical criteria (Coefficient of multiple determinations). The authors employed Export Performance Ratio (EPR) in the analysis of the export performance in which the trend was estimated inter-temporally. They estimated the export performance ratio to establish the comparative advantage of Nigeria in cocoa export sector. The regression results for the factors influencing cocoa exports in Nigeria indicated that the coefficients of total world quantity, exchange rate of Nigerian currency (Naira) against the dollar and the Nigerian cocoa production (output) were statistically significant. The coefficients explained 70.3% of the variability in the export of cocoa from Nigeria. This had an implication that these variables are the major factors influencing the Nigeria's cocoa export. The coefficient value of the world volume, exchange rate and the Nigerian cocoa production were significant at both 5% and 1% level of significance. The coefficients of the world volume of cocoa and Nigeria's cocoa production were positive while the coefficient of the exchange rate was negative. The positive coefficients of world volume and Nigeria's cocoa production implied that the two variables positively influenced export of cocoa. The authors attributed the negative coefficient of the exchange rate to the declining productivity in the Nigerian economy during the period under study.

Were *et al*. (2002) in a study on analysis of Kenya's export performance used an error correction model in their estimation. They estimated three models in their analysis: tea exports model, coffee exports model, and model for other exports from Kenya. In the model for coffee, the error correction results showed that all the variables used in the regression had the expected sign. The coefficient for the real exchange rate and investment as a ratio of GDP were positive and significant. However, the price effect was only significant at the 10% significance level. In addition, the authors found that the export supply was responsive to prices in the long run. The income of the trading partners was not significant. Manufactured exports are relatively more sensitive to foreign income than agricultural exports. This was evident from the results of analysis of determinants of other exports (excluding coffee and tea) from Kenya in the same study by Were et al. (2002). Unlike the regression for coffee exports, income of the trading partners was significant in the model for other exports. However, private investment as a proportion of GDP was not significant. The

authors partly attributed the significance of foreign income to exports of processed and manufactured goods to Uganda and Tanzania. The exchange rate was not significant in the regression for tea exports. However, investment as a proportion of GDP was significant and positive. This implied that investment had positive impact on tea exports. In this case, an increase in investment as a proportion of GDP would lead to an increase in tea exports. The exchange rate was not significant in the tea model, but a one period lag was significant but had a negative sign. The authors attributed this to lack of adjustment to price responses in the short-run. To measure the impact of the liberalization on coffee exports the authors introduced a dummy for the liberalization for the period 1993-1999. The liberalization impact as proxied by the dummy had a negative effect on the exports. Therefore, trade liberalization impacted negatively on the exports of coffee. The authors attributed this to the nature of these crops i.e., longtime lags. In addition, they linked this problem to the inefficiencies in the coffee institutions. They argued that these institutions are rigid and exhibit inefficiencies.

In a study about the export of gherkin and cucumber in India, Kumar *et al*. (2008) estimates the factors affecting cucumber and gherkin exports by use of a log linear demand function. The world volume of internationally traded cucumber and gherkin products and the exchange rate were found to be significant. According to that study, the world traded volume of these commodities was used to capture the change in international demand for these products. Therefore, an increase in this variable was expected to lead to an increase in the quantity of exports of cucumber and gherkin products from India. Both coefficients were positive and significant. The regression results indicated that an increase in volume of international trade in cucumber and gherkin products (increase in international demand) would lead to an increase in exports of the same products from India. In addition, the positive coefficient of the real exchange rate had an implication that depreciation of the real exchange would lead to an increase in the exports of these commodities.

2.3 Conceptual framework

International trade models usually incorporates both demand and supply variables. This is because both supply and demand factors influence the level of trade. Thus, factors that affect growth of exports can be placed into two broad categories: demand factors and supply factors.

Supply factors are those push factors within the exporting country that give a country impetus to export goods and services. They directly affect the production ability of a country. For case of this study, they include real Interest Rates (RIR) and agricultural GDP. For instance, higher interest rates would increase the cost of borrowing thereby limiting the production capacity and subsequently volume of exports of the exporting country (imports of the importing country). The exports are function of output (Agricultural GDP). This variable can be explained in terms of the capacity to produce in the agricultural sub-sector. An increase

in the agricultural GDP therefore implies that there is an increase in capacity to produce and hence an increase in exports.

On the other hand, Demand factors are those exogenous factors that pull a foreign country to import goods and services from another country. It consists of the external factors/conditions that influence the flow of exports from the exporting country to the importing country. For case of this study, they include foreign income and real exchange rates. Higher incomes for instance increase the purchasing power of the importing country and this implies that they will increase their imports of goods and services.

Therefore, volume of horticultural products exports as dependent variable is linked with both supply and demand factors. Figure 1 below illustrates the relationship between demand and supply factors and how they affect the volume of horticultural exports.

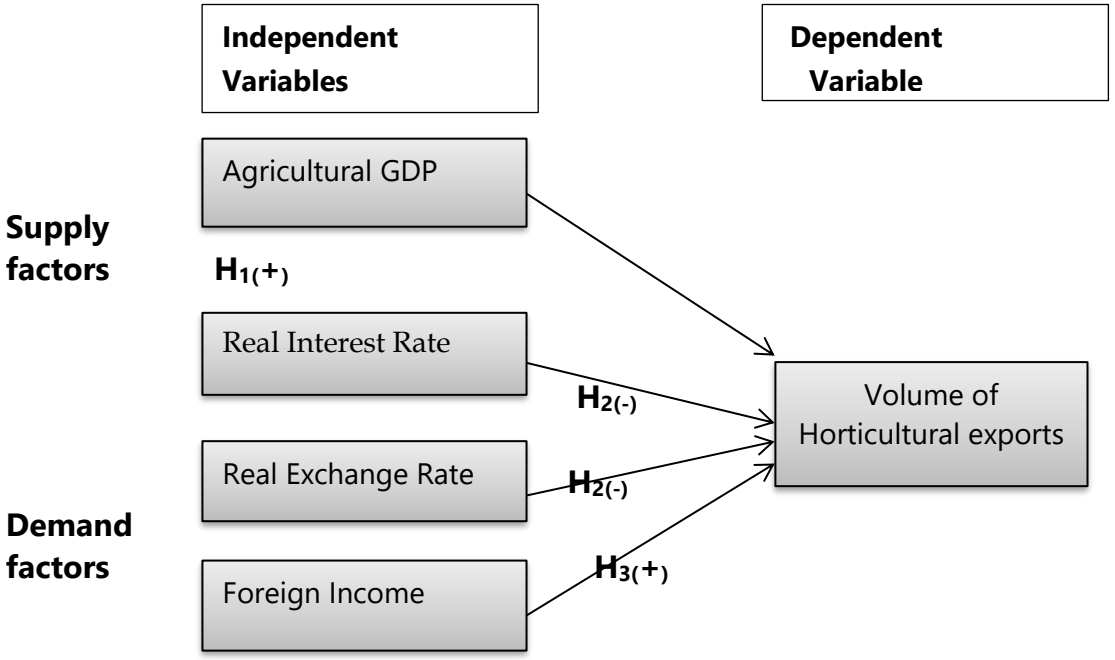

Figure 1: Conceptual framework
Source: Authors' own construction

Methodology

3.1 Research design

The study adopted a statistical research design. This study employs secondary data collected from various sources. Therefore, this study design has found to be suitable for this exercise as it was less costly in-terms of time and fund during data collection.

3.2 Data sources and types

Secondary data was used in this study. The data was time series from year 1988 to 2018. This period is important as it covers the period in which the Tanzanian horticultural sub-sector had achieved a significant growth. Data on the quantity of horticultural products (fresh vegetables, fruits, and flowers) exported from Tanzania was obtained from National Bureau of Statistics (NBS). Also, the data on the Tanzania's Agricultural GDP was obtained from the Economic Survey (various issues) at NBS. Data on foreign income of the major importing countries (trading partners) such as to Netherlands, India, Kenya, United Arab Emirates (UAE) and Comoros was obtained from the World Bank Development Indicators. The data on the exchange rate and real interest rate in Tanzania was obtained from the Bank of Tanzania (BOT).

3.3 Variables and measurements

3.3.1 Volume of horticultural exports

Export is the dependent variable in this study. The unit of measurement is metric tons. This type of measurement had been chosen because country's total export consists of basket of goods and services, therefore it was easily measured in terms of value rather than other measurements.

3.3.2 Real exchange rate

Real exchange rate (RER) is the trade-weighted exchange rate against major trading partners computed as a product of nominal effective exchange rate and domestic consumer price index divided by foreign consumer price index. An increase in the real exchange rate makes the Tanzania's exports cheaper and competitive on the international market thereby increasing the volume of exports. The converse is also true. A decrease in the real exchange rate makes Tanzania's exports relatively expensive and less competitive on the world market. A positive relationship between real exchange rate and volume of exports was therefore envisaged. The real exchange rate was computed as shown in Equation 1.

$$RER = \sum_{i}^{n} \varepsilon_i \omega_i \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots (1)$$

Where; ω_i is the country i's share of trade with Tanzania and is the real exchange rate defined as:

$$\varepsilon_i = \xi_i \times \frac{CPI_D}{CPI_F}$$

Where:
ξ_i is the nominal exchange rate (how much of the trading partner's currency is needed to obtain 1 TZS,
CPI_D is the domestic consumer price index and
CPI_F is the consumer price index of the trade partner.

3.3.3 Foreign income

Changes in national income in foreign countries affect the exports. This is mainly through the income effect. Income effect occurs when there is a change in consumption due to a change in real income. The income effect is clearly described by Engel curve which describes how expenditure by households on a particular good or service varies with household income. Therefore, a rise in the national income in foreign countries captured by GDP per capita will lead to an increase in foreign demand of exports as a result of income effect and a decline in national income in foreign countries will lead to a decrease in exports demand. Therefore, the income of the major trading partners as used in this study measures the absorptive capacity of those countries. An increase in the income of the trading partners will lead to an increase in the exports. Therefore, the co-efficient for the foreign income is expected to be positive.

3.3.4 Agricultural GDP

This is the gross domestic product for the agricultural sector. It is expected that as the agricultural GDP increases so do the exports. Increase in agricultural GDP implies increased productivity in the sector. Therefore, the coefficient for this variable is expected to be positive. The exports are function of output and therefore an increase in the agricultural output will lead to the increase in exports. This variable can also be explained in terms of the capacity to produce in the agricultural sub-sector. An increase in the agricultural GDP therefore implies that there is an increase in capacity to produce and hence an increase in exports.

3.3.5 Real interest rate

Real interest rate is defined as the nominal lending rate adjusted for inflation. The higher the real interest rate, the less resources are invested in the production of horticultural crops and the less the volume of exports. A negative relationship therefore was expected between horticultural exports and the real interest rate. The real interest rates were computed using Fisher's equation as follows:

$$RIR = LR - INF$$

Where:
$RIR =$ real interest rate,
$LR =$ nominal lending rate and
$INF =$ the inflation rate

3.4 Data analysis

3.4.1 Descriptive analysis

The descriptive analysis was used to assess the shape and spread of the dataset distribution of the five variables in the study. For examples, Mean and median: was used to give an indication of the average value of a distribution of figures. If the mean and median of each variable under study are equal, then there is normally distributed data set; Standard deviation: was used to measure the dispersion of a dataset relative to its mean. If the data points are further from the mean, there is a higher deviation within the data set and vice versa; Kurtosis: was used to measure whether the dataset is peaked or flat (heavy-left tailed or right tailed) in relation to a normal distribution. If the kurtosis of the variables fall in the rage of -3 to 3 then the data set is normally distributed; The Skewness: was used to measure of symmetry or lack of symmetry. A distribution, or data set, is symmetric if it looks the same to the left and right of the center point. A normally distributed series falls into the acceptable range of -2 to 2; Maximum and Minimum: was used to measure how the values lie closer in the series. If the difference between maximum and minimum is very low then there are outliers in the data set.

3.4.2 Co-integration analysis

The study adopted the co-integration technique to examine the determinants of horticultural export in Tanzania. This technique is superior compared to other techniques such as panel and gravity modeling. This is because co-integration technique is able to establish the short run and long run relationship amongst variables. Again, this technique is used to estimate the unit root and co-integration test. Granger (1986) cited in Gujarati, (2004) pointed out that testing for co-integration of the regression residual is imperative condition to avoid the possibility of producing spurious regression output. Therefore, this study has taken into consideration the suggestion given by Granger, (1986). Since this study is a time series in nature it also examined the time series characteristics of the variables to be modeled, testing for stationary and co-integration of the variables.

3.3.2.1 Unit root test

Most time series data is usually non-stationary (the data exhibit trending behavior or non-stationarity in the mean). This implies that when estimation by use of Ordinary Least Squares (OLS) is applied directly, spurious regression results are yielded. Spurious regression results are as a result of using time series data that is not stationary. In this case, the values of the time series do not fluctuate around a constant mean or with a constant variance. In spurious regression, a high R^2 is generated even if the explanatory variables have no relationship with the dependent variable. In addition, the t-statistics in spurious regression are likely to be significant even if there is no causal relationship between the dependent and the independent variables. In this case the usual t-ratios do not follow t-distribution. This implies that hypothesis testing for the regression parameters cannot be done because the results derived will be misleading. It is important to test the order of integration of each variable in

a model, to establish whether it is non-stationary and how many times the variable needs to be differenced to derive stationary series. The purpose of the stationary test was to analyze the time-series data stationer (with no unit roots) or no stationer (with unit roots). There are several ways of testing for a unit root. In this study, Phillips-Perron (1988) unit root test was used to check whether variables are stationary or not. The Philip-Perron test makes a correction to the t-statistic of the dependent variables in the autoregressive process to account for the serial correlation in random term. The null hypothesis of a unit root is rejected if the absolute value of the test statistic is greater than the critical values at the significance levels provided.

3.4.2.2 Co-integration test

Co-integration is vital to the analysis of the long run relationships between time series economic variables. Having established that variables are non-stationary at level and stationary at first difference, co-integration tests can be estimated the using Johansen and Juselius (1990) and Engle-Granger test. In this study, co-integration was tested using Engle and Granger (1987) two step approach. The first step involves applying OLS to the non-stationary variables (estimation of the long-run equation). The second step involves testing for the presence of unit root in residuals. The residuals are obtained from the long-run regression. The Augmented Dickey-Fuller (ADF) test was used to test for the unit root in the residuals. In this test the null hypothesis of co-integration is tested against the alternative hypothesis of absence of co-integration. Gujarati, (2004) pointed out that if the computed absolute value of the t-statistic exceeds the Engle-Granger or Augumented Engle-Granger critical tau values, then we reject the null hypothesis of non-stationary and the alternative hypothesis of stationary will be favored.

3.4.3 Econometric model

3.4.3.1 Estimation of long-run relationship

In order to assess the relative impact of various factors on export performance, a multiplicative model was adopted in the following form (Equation 2)

$$X_t = \beta_0 {R_t}^{\beta_1} {Y_t}^{f\beta_2} {Ag_t}^{\beta_3} {I_t}^{\beta_4} \varepsilon_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \quad (2)$$

Where:

X_t = Quantity of horticultural exports in values in United Sates Dollar (USD)
β_0 = Constant
$\beta_1 - \beta_4$ = Regression coefficients
R_t = Real exchange rate in Tanzanian Shillings (TZS)/USD
${Y_t}^f$ = Foreign income in USD captured by GDP per capita of major trading partners
Ag_t = Agricultural GDP in USD over the years under study
I_t = Real interest rate in percentage (%)
ε_t = Stochastic disturbance term

In the estimation process, Equation 2 above was linearized by use of the double-log to minimize the chance of committing specification errors and suit the time series behaviour properly. Hence the transformed model is expressed in Equation 3.

$$LnX = \beta_0 + \beta_1 Ln(R_t) + \beta_2 Ln(Y_t{}^f) + \beta_3 Ln(Ag_t) + \beta_4 Ln(I_t) + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

This study estimated the coefficients of long run relationship amongst the variables using equation (3) above after the regression residual found to be stationary. This was done using Augmented Dickey Fuller (ADF) test. Engle–Granger (1987) and Gujarati, (2004) pointed out that if the regression residuals are stationary in the linear model, then coefficients are not spurious and hence representing long run relationship amongst the variables. But if the regression residuals are non-stationary then regression coefficients obtained in the model are spurious. Thus, the coefficients in the above log linear model were interpreted as elasticity (percentage change in dependent variable due to change in the independent variable). The choice of the above variables is based purely on empirical and theoretical aspects in economics and specifically in international trade.

3.4.3.2 Estimation of an error correction model

When the time series variables are co-integrated, an Error Correction Model (ECT) can be adopted. Following Engle and Granger (1987) approach on co-integration, variables that are co-integrated can be modeled by an error correction model. This involved running regression with first differences of dependent variable on independent variables that have been differenced once as well as one-period lagged equilibrium residuals that have been generated from the long-run (co-integrating) equation. All the variables in the error correction model are stationary. Standard hypothesis testing using t-statistics and diagnostic test for error term are also appropriate when using this model. According to Johansein (2010) since there is co-integration among dependent variables and its fundamentals, an error correction model has to be estimated by incorporating the lagged error correction term in the set of regressors. The error correction term is the residual from the static long run regression, and it joins the set of differenced non-stationary variables to be estimated to capture both short run and long run dynamics. Following the Engel and Granger theorem, the original model (Equation 3) was transformed into an error correction model. An error correction term (ECT_{t-1}) was introduced in the model and hence the final model ready for regression analysis becomes as presented in Equation 4.

$$LnX = \beta_0 + \beta_1 Ln(R_t) + \beta_2 Ln(Y_t{}^f) + \beta_3 Ln(Ag_t) + \beta_4 Ln(I_t) + \beta_5 ECM_{t-1} + \varepsilon_t \ldots\ldots\ldots (4)$$

Thus, an error correction term lagged once (ECT_{t-1}), which is the residual from the long run equation of non-stationary variables, is included as one of the explanatory variables in the general transformed equation for error correction model of determinants of export performance. This term captures the long run relationship by attempt to correct deviations from the long run equilibrium path. The use of error correction term helped to tie the short

run behaviors of variables to its long run. Its coefficient can be interpreted as the speed of adjustment from short run behavior to long run equilibrium.

Results and discussion

4.1 Descriptive statistics of variables

Table 1 shows the descriptive statistics for the five variables used in the study. The logarithm of the quantity of horticultural exported (dependent variable) has a mean of 12.2219 and a median of 12.3404. The mean and the median of the logarithm of exports are almost equal because the difference is very small at 0.1185. This implies that the logarithm of exports is normally distributed. The kurtosis for the logarithm of exports is 1.8741 which falls in the range of -3 to 3 for a normally distributed series. The maximum value of the logarithm of exports is 13.2408 and the minimum value is 10.9571. This implies that there are no outliers because the values lie closely in the series. Presence of outliers in a dataset can give rise to heteroskedasticity. The skewness of the logarithm of exports is 0.5603 which falls into the acceptable range of -2 to 2 for a normally distributed series. This suggests that the series is slightly skewed to the right. Standard deviation of the logarithm of exports is 0.2658. This indicates that the values are not widespread out from the mean and hence there are no outliers in the dataset.

Table 1: Descriptive statistics of the variables

	LogQtsExp	LogR	LogRealexrate	LogFY	LogAgGDP
Mean	12.2219	1.8688	7.1266	9.5561	14.9609
Median	12.3404	1.9002	7.6388	9.5684	14.9616
Maximum	13.2408	4.1592	5.2715	11.7540	15.4163
Minimum	10.9571	-0.1262	-0.4366	11.2301	14.7693
Std Dev	0.2658	0.6171	0.3836	0.2988	1.5808
Skewness	0.5603	-0.7991	-0.1166	-0.1689	-0.2084
Kurtosis	1.8741	2.7499	2.1606	1.5937	2.1173
Observations	22	25	22	31	31

Source: Author's own computation from collected data
Where: LogQtsExp= logarithm of Quantity Exported, LogR= logarithm of real interest rate, LogRealexrate= logarithm of real exchange rate, LogFY=logarithm of foreign income, LogAgGDP= logarithm of agricultural GDP

The mean and the median of the logarithm of the real interest rate is 1.8688 and 1.9002 respectively which implies that the series is normally distributed as the two measures of central tendency are almost equal since the difference is very small at 0.0314. The maximum and the minimum value in this series is 4.1592 and -0.1262 respectively. This implies that there are no outliers as the difference between the maximum and the minimum value is not very large. The skewness of the logarithm of the real interest rate is -0.7991 which falls in the acceptable range -2 to 2 indicating a normally distributed dataset. The kurtosis for the logarithm of exports is 2.7499 which fall in the range of -3 to 3 for a normally distributed

series. The standard deviation of the logarithm of the real interest rate is 0.6171. This implies that the series is not widely spread out from the mean.

The logarithm of the real exchange rate has a mean of 7.1266 and median of 7.6388. The difference between the mean and the median is 0.5122 which is less than one. The maximum and the minimum values are 5.2715 and -0.4366 respectively. This suggests that there is no big difference between the minimum and maximum value, hence there are no outliers. The skewness of this series is -0.1166 while the kurtosis is 2.1606. Both the skewness and the kurtosis lie within the acceptable range for normal distribution (-2 to 2 for skewness and -3 to 3 for kurtosis). The standard deviation for this series is 0.3836.

The logarithm of the foreign income has a mean of 9.5561 and median of 9.5684. The difference between the median and the mean of this series is 0.0123. This is an indication that the two measures of central tendency are almost equal, and the series is normally distributed. The maximum value in this dataset is 11.7540 while the minimum value is 11.2301. This is an indication that there is no outlier in this series as the difference between the highest value and the lowest value is not big. The skewness for this dataset is -0.1689 which lies in the accept range of -2 to 2 for a normally distributed dataset. The kurtosis of this series is 1.5937 which lies in the acceptable range of -3 to 3 for normal distribution. The standard deviation of the logarithm of foreign income is 0.2899. This implies that the data points are close to the mean. Therefore, there are no values that are extremely high or extremely low in the dataset.

The mean and the median of the logarithm of the agricultural GDP is 14.9609 and 14.9616 respectively. The two measures of central tendency are almost equal implying that the series is normally distributed. In addition, the maximum and minimum values in the series are 15.4163 and 14 respectively. This is an indication that there are no outliers in the dataset as the difference between the two values is not big. The skewness for this series is -0.2084 while the kurtosis is 2.1173. Both the skewness and the kurtosis fall in the acceptable range for normal distribution (-2 to 2 for skewness and -3 to 3 for skewness). The standard deviation of this series is 1.5808. This suggests that the data points are close to the mean.

4.2 Stationarity tests

The test results of the Phillips-Perron (PP) tests are presented in Table 2. It shows that there was no stationarity in the level data for Quantity of export, real exchange rate, real interest rate, foreign income, and agricultural GDP. The absolute value of their tests was less than the absolute critical values at 1% and 5% level of significance of 2.960411. The null hypothesis of the presence of a unit root cannot be rejected.

Table 2: Phillips-Perron unit root test at the levels of the variables

Variable	Test statistic	1% Critical value	5% Critical value
LogQtsExp	-0.803	-17.540	-12.660
LogR	-12.375	-17.540	-12.660
LogRealexrate	-2.031	-17.540	-12.660
LogFY	-1.558	-17.540	-12.660
LogAgGDP	-0.003	-17.540	-12.660

Source: Author's own computation from collected data

The variables should be differenced due to non-stationarity of all the variables used in the model. The first differences of the series (Table 3) were stationary, implying that all, the variables have one order of integration i.e. they were all integrated of degree 1 (I(1)). This indicates that PP unit root test is an appropriate method for analyzing the long-run relationship between the series. The absolute value of test statistics for all variables was greater than the absolute critical values at 1% and 5% level of significance of 2.967767. The null hypothesis of the presence of a unit root was accepted.

Table 3: Phillips-Perron (PP) unit root test at the first differences of the variables

Variable	PP Test Statistic	10% Critical value	5% Critical value
LogQtsExp	-38.699	-17.472	-12.628
LogR	-21.374	-17.472	-12.628
LogRealexrate	-40.223	-17.472	-12.628
LogFY	-39.331	-17.472	-12.628
LogAgGDP	-17.506	-17.472	-12.628

Source: Author's own computation from collected data

4.3 Co-integration tests

The presence of co-integration among the series was tested by employing the Augmented Dickey-Fuller (ADF) test approach. The results presented in Table 4 show that the critical values at 1%, 5% and 10% confidence levels are greater than the ADF test statistic. This implies that there is co-integration among the series in the model. The ADF was revealed as the best model for the series. The existence of co-integration among the series aids in analyzing the long-run relationship of the factors that affected the growth of horticultural export in Tanzania.

Table 4: ADF Test results for Co-integration

ADF Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
-4.533	-3.723	-2.989	-2.625

Source: Author's own computation from collected data

The robust standard errors were used to correct for the problem of heteroskedasticity. Table 5 shows the results of Breusch-Pagan test for heteroskedasticity. The results of the Breusch-Pagan test show that there is no heteroskedasticity. This indicates that the model was good

enough for the study of co-integration among the variables. Since the $Prob. > Chi^2$ of 0.3486 is greater than 0.05 (5% significance level), the null hypothesis of constant variance is accepted.

Table 5: Breusch-Pagan test for Heteroskedasticity

Ho: Constant variance
Variables: Fitted values of DLogExp

$Chi^2(1) = 0.88$
$Prob. > Chi^2 = 0.3486$

Source: Author's own computation from collected data

4.4 Factors affecting the growth of horticultural sub-sector

The model results of the long-run estimates of the factors affecting the growth performance of horticultural sub-sector are presented in Table 6. The absolute value of t-statistic determines the level of significance of a variable. From the regression results of the long-run co-integrating equation, the agricultural GDP and the real exchange rate are statistically significant at both 1% and 5% level of significance since the t-statistic of both variables is greater than 1.96 (at 5% level of significance) and 2.57 (at 1% level of significance). The foreign income is significant at 5% level while the real interest rate is not significant.

The agricultural GDP was important variable which had significantly affected the horticultural export performance in Tanzania at both 1% and 5% level of significance. Its partial elasticity was positive as expected at 1.221 in the long run. This shows that a 1% increase in agricultural GDP of the country will increase the export performance of the horticultural sub-sector by 1.221% in the long run. The lag of the variable also had a significant role in explaining the export performance of the sub-sector. This confirmed that as the agricultural DGP of a country grows, more horticultural exports will be produced which will increase the possibilities of increasing horticultural exports. The results of this study are consistent with empirical works of different researchers (Manji, 2010; Anagaw, 2013; Meme, 2015).

Table 6: Long-run Relationship (Co-integrating regression)

Variables	Coefficient	Std Error	t-Statistics	Prob.
LogR	-0.0468552	0.0265934	-1.76	0.090
LogRealexrate	0.2253049	0.0458974	4.91	0.000
LogFY	1.146259	0.4947531	2.32	0.029
LogAgGDP	1.220964	0.3206258	3.81	0.001
Constant	-30.49649	6.163422	-4.95	0.000
R squared	0.9802	Sum of Squared residuals		13.6828
F Statistic	321.1500	Adjusted R squared		0.9771
Prob(F Statistics)	0.0000	Residual sum of squares		0.2714
Durbin-Watson statistic	2.1713	Mean Dependent variable		11.2195

Source: Author's own computation from collected data
Dependent Variable: LogQtsExp

Real exchange rate was another important variable which had significantly affected the horticultural export performance in Tanzania. The partial elasticity of horticulture exports to the change in the real exchange rate was positive as expected and significant at both 1% and 5% level of significance. The long-run coefficient value of 0.225 for the real exchange rate showed that a 1% increase (depreciation in the local currency) in the real exchange rate increased the export of horticultural crops by 0.225%. The lag of the variable also had a significant role in explaining the export performance of the sub-sector. This implies that policy measures regarding the real exchange rate have paramount importance in improving horticulture exports in the long-run. Contrasting to the findings of this study, other researchers have found that the impact of the real exchange rate in explaining the export performance was revealed as insignificant or weak Lakew, 2003; Jongwanich, 2007; Manji, 2010; Mwinuka, 2015). However, the findings of several researchers were consistent with the results of this study (Hausmann *et al*. 2005; allaro, 2011; Anagaw, 2013; Boansi, 2013; Sawore, 2015; Karamuriro, 2015; Mabeta et al., 2015; Abolagba et al., 2016; Epaphra, 2016). They all concluded that depreciation in the value of money had significantly affected export performance of the respective countries.

The income of the importing country was also among the important variables hypothesized to influence the horticultural export performance of Tanzania. It was revealed as positive as expected and significant in the long-run at 5% level of significance. The long-run coefficient indicated a 1% increase in foreign income of the importing countries would increase the export of horticulture by 1.146% in the long run. The findings of many researchers are consistent with the results of this study (Sayeeda and Frank, 2011; Maureen, 2002; Karamuriro, 2015). However, some researchers had obtained a negative impact (Mabeta et al., 2015; Bhavan, 2016), while others obtained an insignificant impact of foreign income on export performance (Manji, 2010; Sawore, 2015).

Real interest rate was revealed insignificant in the long run. The sign of the variable was shown negative in the long run similar to the hypothesis of the study. An increase in the real interest rate by 1% will lead to a decrease in the quantity of horticultural exports by approximately 0.04%. The insignificance of the real interest rate in influencing the horticultural exports can be attributed to the fact that horticultural sub-sector is relatively more capital intensive as compared to other agricultural sub-sectors. For example, a significant amount of capital is required to set up green houses, cooling facilities, pack houses, irrigation system as well as purchase of fertilizers, agrochemicals and other inputs. This is because when the real interest rate increases, the cost of borrowing goes up thereby discouraging investors to borrow to finance their investment activities. In addition, the investors who will be already financing their loans will have less disposable income since they will be spending more on payment of interests. This will lead to a reduction in investment activities thereby resulting to a decline in the aggregate demand thereby leading to a decrease in horticultural exports. This result is inconsistent with the results of Mabeta et al. (2015). However, in the study by Meme (2015), real interest rate had negatively influenced the horticultural export performance of Kenya.

4.5 Error correction model estimation

The model results presented in Table 7, found a greater coefficient of the error-correcting term and it is statistically significant at both 1% and 5% level of significance. In this model, the error correction coefficient found with expected sign which is negative (-1.097314) which showed 109.7% of adjustment per annum. This confirms the existence of co-integration among the variables in the model. It also signifies that the variables in the model are adjusting faster from the short run to the long run equilibrium. This result suggests an existence of a high speed of convergence to long run relationship (equilibrium) amongst the variables. This finding is consistent with the result of the study by Ahmed (2000).

Table 7: Error correction model (Short-run relationship)

Variables	Coefficients	Std Error	t-Statistics	Prob.
DLogR	-0.0421578	0.0213614	-1.97	0.060
DLogRealexrate	0.1721776	0.0559782	3.08	0.005
DLogFY	0 .361853	0.2892747	1.25	0.223
DLogAgGDP	1.207116	0.3749718	3.22	0.004
ECT	-1.097314	0.1281172	-8.56	0.000
Constant	0.0146862	0.0254561	0.58	0.569
R-squared	0.6157	Mean Dependent Variable		0.0696
Adjusted R-squared	0.5356	S.D Dependent Variable		0.1355
Sum of squared residuals	0.53209101	F-statistic		28.8700
Durbin Watson stat	1.749949	Prob. (F-statistic)		0.0000

Source: Author's own computation from collected data

Dependent Variable: LogQtsExp, Letter "D" in front of the variables is the difference operator (shows first difference) and ECT is the error correction term.

Conclusion and policy implications

Over reliance on domestic markets has led to low domestic prices for the horticultural produce and have exposed Tanzania to export earnings instability. To overcome this problem, different policy measures were taken to exploit the foreign market for the horticultural commodities. Incentives have been provided for both foreign and domestic investors engaged in horticultural sub-sector. In addition, different institutions working in the sub-sector like the Tanzania Horticultural Association (TAHA) and Exporters Association have been established to boost the horticultural sub-sector. These institutions represented the sub-sector in the country as well as internationally.

Consequently, this growing sub-sector had recently become the second most important foreign earning sources for the country. However, the performance of the sub-sector is far below its potential given the comparative advantages in the region. This study had attempted to empirically examine the factors that affected the horticultural export performance of Tanzania, using a time series data for the period between 1988 and 2018. It analyzed the influence of macroeconomic factors such as real exchange rate, real interest rate, foreign income, and agricultural GDP. The main proposition of the study was that macroeconomic factors significantly influence horticultural export performance. In testing this proposition, the Augmented Dickey-Fuller test was chosen to analyze the co-integration between horticultural exports and hypothesized variables. Based on the results of the study, real exchange rate, agricultural GDP and foreign income were important factors in influencing horticultural exports from Tanzania. The real interest was revealed insignificant in the long-run. These significant variables have an important policy implication in improving the horticultural export performance of the country. Therefore, policy implications in respect to the variables under the study are discussed:

- With regards to exchange rate movements, there is need to use policy instruments such as capping of interest rates to take care of interest rate differentials that may affect international capital flows. This may reduce volatility of the exchange rate and stabilize foreign exchange earnings derived from the export of cotton and tobacco. In addition, monetary authorities in the country should formulate policies that maintain the real exchange rate at a level that is competitive for the horticultural exports.
- Currently, interest rates in Tanzania are one of the highest. Government therefore needs to establish an agricultural development fund to provide credit at favorable and preferential rates. The interest rate charged by commercial banks and other financial institutions is very high and this discourages investors from borrowing to finance their horticultural farming. This in turn affects the performance of the horticultural sub-sector.
- It should be prioritized in terms of increased budget allocation in the sector, and this will in turn raise agricultural GDP and drive the economy towards export diversification.

- To cushion the impact of changes in the income of the trading partner, government should exploit available markets by increased participation actively in regional integration.

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