

# Seaweed exports and economic growth of Zanzibar

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## ABSTRACT

The aim of this paper was to examine the contribution of seaweed export and economic growth in Zanzibar. The study used time series quarterly data from 2000 to 2018 and applied Ordinary Least Square (OLS) method to estimate the results. The estimated results showed that seaweed export has a positive but insignificant effect with economic growth of Zanzibar. The results also showed that labour had a positive but insignificant effect while capital had a negative and insignificant effect with economic growth of Zanzibar. Furthermore, the results showed a positive significant effect on the exchange rate to economic growth of Zanzibar. The study then recommends that the Zanzibar government should increase the price of seaweed products to local farmers so as to encourage them to engage in seaweed farming and this would ultimately increase the seaweed production and consequently increase seaweed export.

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## 1. INTRODUCTION

Economic growth is one of the most important indicators of a healthy economy. One of the biggest impacts of long-term growth of a country is that it has a positive impact on national income and the level of employment, which increases the standard of living (Economic Growth by Prateek Agarwal). Economic growth leads to extra tax income for government spending, which the government can use to develop the economy, this expansion can also be used to reduce the budget deficit. Additionally, as the population of a country grows, it requires growth to keep up its standard of living and wealth and also helps to improve the standards of living and reduce poverty. Traditionally, aggregate economic growth is measured in terms of gross national product (GNP) or gross domestic product (GDP). Export growth, therefore, is often considered to be a main determinant of the production and employment growth of an economy which is shown in Gross Domestic Product (GDP) growth (Ramos, 2001). Agriculture is a main source of growth for the national economy, a provider of investment opportunities for the private sector, a prime driver of agriculture related industries and the rural non-farm activities. According to the World Development Report (WDR 2008) in the agriculture-based countries (mostly Africa) agriculture contributes significant more than 20% share of overall growth, agriculture is essential to growth, which is in turn necessary to reduce poverty and food insecurity, new markets have dramatically changed the world of agriculture in the 21st century and created new opportunities for faster growth. In low-income countries at an early stage of transformation, the large share of agriculture in GDP (Gross Domestic Product) suggests that strong growth in agriculture is necessary for overall economic growth. Indeed, agriculture accounted for about one-third of growth in Sub-Saharan Africa over the past 15 years. The potential for agriculture to tackling greatest economic challenges including high levels of poverty and food insecurity is enormous but has not been realized as the sector is still confronted with dismal performance of low growth rates induced by inadequate and inefficient utilization of its resources (Zanzibar Agricultural Transformation for Sustainable Development, 2010-2020 For Agricultural Productivity, Food Security and Sustainable Livelihood).

This implies that the sector has a high potential for dealing with the socioeconomic challenges such as high levels of income poverty and food insecurity. Given the importance of the sector for the majority of the population, and as a base for foreign exchange earnings, the sector deserves adequate public and private sector investment for attaining and maintaining the anticipated growth rate. (Zanzibar Research Agenda 2015 – 2020). Seaweed farming is one of Zanzibar's largest export businesses, employing more than 25,000 people, 90 percent of whom are women. International buyers predict increased demand for seaweed since it is a raw material used in a wide range of increasingly popular products as diverse as confectionery, yogurts, and cosmetics. According to reports by allied market research, the global seaweed market size was valued at US\$4 billion

in 2017 and is projected to reach US\$180 billion by 2024 registering a CAGR of 12.0% from 2018 to 2024. Seaweed export earnings rose from \$3.7m in March 2018, to \$3.9m in March 2019, according to the Bank of Tanzania, demand for seaweed is largely being driven by the global skincare market (BOT- Bank of Tanzania). Zanzibar exports earnings increased by 21.6% to 489.9bn/- in 2018 compared to 403.04bn/- of corresponding period 2017. According to Bank of Tanzania (BoT) economic review the major commodities that contributed to the positive exports are as cloves and seaweed. This is what; bring out the point of interest of this research which is to examine the contributions made by agricultural exports to economic growth in Zanzibar, taking seaweed as a case. The layout of the rest of the paper is as follows: Section 2 provides a brief review of the existing literature on the relationship between agricultural export and economic growth. Section 3 introduces the methodology and estimation techniques employed in this paper. Section 4 presents the findings and its discussions and finally in section 5 the authors present the conclusion and recommendations with respect to findings.

## 2. LITERATURE REVIEW

Johnston and Mellor (1961) agreed that expanding agricultural exports are one of the most promising ways to increase revenue. For any government to boost its economy, it must put effort into the agricultural sector. In a global environment where attention to the agricultural sector is reduced, it is important to measure the impact of agricultural exports on economic growth in a developing country. Ohlan (2013) indicated the positive relationship between the variables in the long-run and explained how agricultural exports play an important role in the increase of India's GDP. Meanwhile Awe et al. (2014) examined the relationship between agricultural exports and economic growth using Johansen's multivariate cointegration analysis for the period 1980 to 2012 and the results showed that agricultural exports are long-term determinants of economic expansion. On the other hand Ijirshar (2015) using the cointegration test analyzed the effects of exports on economic growth in Nigeria with statistical information from 1970 to 2012. His empirical results indicated that there is a positive relationship between exports and economic growth in the long run equilibrium. Rotich et al (2018), on their study on factors affecting export earnings: a case study of the flower industry in Kenya. The study used secondary data to achieve the stated research objective, for the period January 2011 to December 2015. Findings from the analyzed data showed that foreign capital flows affected the export earnings of the Kenya flowers. The study further identified that export volumes affected the export earnings of the Kenya flowers. Findings showed that export volumes factors notably demand for flowers and production capacity affected the export earnings of the Kenya flowers to a large extent. The study drew conclusions that the major factors affecting the flower export earnings in Kenya included; exchange rate volatility, inflation rate, foreign capital flows and export volumes.

Furthermore, AbdulKadir (2018), analyzes the factors of Turkey's Export Performance. The study used data for the period of 1980-2010 to examine the determinants of Turkey's export performance. Results of the analysis reveal that demand for export increases when domestic currency remains depreciated. According to estimations results, export supply is positively related to the domestic relative price of exports whereas domestic demand affects export supply negatively. Foreign direct investment and external income level turned out insignificant. Also Rwenyagila (2014) studied the determinants of export performance in Tanzania; using a time series data for the period between 1990 and 2009. Empirical results indicated that real exchange rate and foreign direct investment were significant to export performance in all sectors that is total export, traditional and non-traditional exports. Gross Domestic Product was also found significant in all sectors except traditional sector. However, Inflation Rate and Terms of Trade were found significant determinants to total export and traditional exports. The same variables were found insignificant to non-traditional exports. Farayibi et al., (2016), examines the exchange rate trends and agricultural products export performance in Nigeria between 1970-2015 using a descriptive approach. Particularly, the study emphasizes the impacts of exchange rate volatility on export demand in the country. Findings from descriptive analysis show that despite the policy pronouncements in the period covered, exchange rate volatility greatly affected export performance in Nigeria, in particular, the volume of export demand. The study recommends a deliberate exchange rate policy action that will have good implication for export growth in Nigeria.

### 3. METHODOLOGY

#### 3.1 Model Specification

The theoretical framework of this study has adopted the model proposed by Solow (1956) that all firms in the economy produce output using the same production technology that takes in capital and labor as inputs. Therefore, the level of output (represented by Y), the level of capital (represented by K), and the level of labor (represented by L) are all linked through the production function equation  $Y = F(K, L)$ . The Solow Growth Model assumes that the production function exhibits constant-returns-to-scale (CRS). Under such an assumption, if the level of capital stock doubled and the level of labor doubled, automatically the level of output doubled. As a result, much of the mathematical analysis of the Solow model focuses on output per worker and capital per worker instead of aggregate output and aggregate capital stock. The basic model of this study for growth was designed as follows: - The model for estimation was developed by using the simple production function of Cobb-Douglas using the Solow (1956) ideology which it follows the neoclassical growth theory as follows:

$$Y_t = A_t K_t^{\beta_1} L_t^{\beta_2} \dots \dots \dots 1$$

By applying the logarithm in the equation 1, then we get the following:

$$\log Y_t = \log A_t + \beta_1 \log K_t + \beta_2 \log L_t \dots \dots \dots 2$$

While  $\log A_t$  are the other factors that promote economic growth and assumed to have a linear relationship with growth. To examine the contribution of agricultural exports on economic growth, we extend the equation by including agricultural exports of the commodities selected.

$$\log A_t = \beta_0 + \beta_3 \log SEAW_t + \beta_4 \log EXR_t + \varepsilon_t \dots \dots \dots 3$$

Therefore, the general model used in this study is:

$$\log Y_t = \beta_0 + \beta_1 \log K_t + \beta_2 \log L_t + \beta_3 \log SEAW_t + \beta_4 \log EXR_t + \varepsilon_t \dots \dots \dots 4$$

Whereby the parameter  $\beta_1, \beta_2, \beta_3$  and  $\beta_4$  explain the coefficient values of independent variables,  $\beta_0$  shows the constant term,  $\varepsilon_t$  is the stochastic error term which explain other factors that influence the economy but are not included in the model and  $t = 1, 2, \dots$  is the time index for the years from 2000 to 2018 quarterly. Y represents economic growth, K represents agricultural capital formation, L represents agricultural labour forces in an economy, SEAW represents Seaweed Exports, and EXR represents Exchange rate.

#### 3.2 Variables and their measures

Data of all variables in table 1 extracted from the Office of Chief Government Statistician, all dependent variables are expected to have positive signs implying the positive influence of these variables on economic growth Zanzibar.

**Table 1:** Variables description and their measures

Variable Name	Variable Type	Measures (Proxies)	Expected sign
Economic Growth	Dependent	Gross Domestic Product	
Seaweed Capital Formation	Independent	Earning income	+ve
Labor Force	Independent	Consumption	+ve
Exchange rate	Independent	Productivity	+ve
	Independent	Tsh against USD	+ve

Source: Author's construction (2020)

### 3.3 Estimation Techniques

The descriptive study with the time series data for the period from 2000 to 2018 were used to examine the contribution of seaweed exports on economic growth of Zanzibar.

#### 3.3.1 Unit Root Test

Due to macroeconomic data to have the feature of random walk (Nelson & Plosser, 1982), the unit root problem for each individual series was checked to avoid the spurious results. The ADF test developed by Dickey & Fuller (1981) was used with the assumption (null hypothesis) that each individual series has unit root problem.

#### 3.3.2 Co-integration test

The idea of co-integration is for investigating the existence of long run relationship in the stochastic trends in the examined variable. Therefore, this study applied the Johansen test of co-integration in  $EDP_t$  model with multivariable. The following model is tested to ascertain whether the variables are co-integrated or not.

$$Y_t = \theta + \sum_{i=1}^{T-1} w_i Y_{t-i} + \pi Y_{T-t} + \varepsilon_t$$

Whereby,  $\theta$  is a constant,  $w$  as coefficient matrix and  $\pi$  is the number of independent co-integrating vectors, if  $(\pi = 0)$  means no co-integration between series of variables used. Following the study of Johansen and Juselius (1990), if one series co-integrates this means that error in the regression model is stationary although the dependent and independents variables are nonstationary it is concluded the existence of long run relationship.

#### 3.3.3 Ordinary Least Square method

To examine the contribution of seaweed exports on economic growth of Zanzibar, Ordinary Least Square (OLS) technique used to estimate the variables used in equation (iv). This is because under the Gauss-Markov theorem, OLS is the Best Linear Unbiased Estimator (BLUE). Moreover, OLS is mathematically simple. To avoid spurious results, normality tests was conducted like Unit Root test, this was tested using Augmented Dickey-Fuller to test stationarity since the data are time series. Multicollinearity test to test whether there is high correlation between predictor variables and Autocorrelation test using Durbin-Watson test to test whether the error term in one time period is correlated with the error term in any other time period. Applying Unit Root test, the null hypothesis rejected when p-value is less than a significance level of 5%.

## 4. FINDINGS AND DISCUSSIONS

### 4.1 Descriptive Statistics

Usually, before estimating any regression model, it has to check whether the series of variables used has followed the normal distribution curve. Therefore, the traditional way to confirm the normality is to conduct the descriptive analysis for variables used.

Table 2 provides the estimation of mean, median, skewness, kurtosis and probability values. Since, mean over median ratio for each series is seen to be approximately one, the Jarque-Bera test statistics fails to reject the null hypothesis of normal distribution of each variable ( $P > 0.05$ ) and the numeric of kurtosis for each variable found to be close to 3, these results indicate the series had the feature of normal distribution. Therefore, the study has been confirmed the normality of distribution.

### 4.2 Correlation Analysis

multicollinearity test conducted based on Pearson's correlation analysis. The test was conducted on the sample data based on one of the basic assumptions underlying OLS estimation that regressors should not be mutually correlated. If more than one of them is correlated with others, multicollinearity is said to exist. The logic behind this assumption of no multicollinearity and the need to carry out the test is that, if two or more independent variables are linearly dependent on each other, one of them

should be included instead of both, otherwise, it will increase standard error thereby making the results biased. The table 3 shows that, value of Centered VIF for the variables used in the study and found that, there is no existence of serial multicollinearity problem for the variables their centered VIF less than 10.

**Table 2:** Descriptive Statistics of Variables

	LOGNGDP	LOGLAB	LOGEXR	LOGCWE	LOGCAP
Mean	12.87	10.61	7.25	0.90	15.61
Median	12.71	10.62	7.21	0.97	15.82
Maximum	13.87	10.69	7.73	1.79	16.84
Minimum	12.09	10.48	6.68	-0.25	13.89
Std. Dev.	0.53	0.047	0.32	0.53	0.97
Skewness	0.41	-0.87	0.06	-0.25	-0.38
Kurtosis	2.75	4.13	2.95	2.99	2.78
Jarque-Bera	1.15	3.64	0.91	0.43	1.71
Probability	0.56	0.16	0.63	0.80	0.42
Sum	257.43	212.34	145.02	18.16	312.37
Sum Sq. Dev.	5.38	0.043	1.99	5.45	18.03
Observations	80	80	80	80	80

**Table 3:** Variance Inflation Factors

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
LOGLAB	2.12E-11	524.5573	1.690469
LOGEXR	0.016544	12674.50	3.840606
LOGCWEXP	0.000299	18.18334	1.493243
LOGCAP	0.000501	2269.339	2.885020

Source: Author computation from collected Data (2020)

### 4.3 Unit Root Test

ADF was done by comparing the t-statistics calculated and Mackinnon critical values at the 5% level of significance. With the 3 lag interval, the results in Table 4 show that all series were stationary at level at 5% level of significant. Then it is appropriate to use OLS method.

**Table 4:** Results for ADF Unit Root Tests at Level

Variable	T-Statistics	P-Value	Result
LOGCWE	-6.130048	0.0000	Stationary
LOGNGDP	-4.464822	0.0015	Stationary
LOGLAB	-3.173203	0.0356	Stationary
LOGCAP	-3.837286	0.0385	Stationary
LOGEXR	-3.331686	0.0256	Stationary

Note: significant at 5% significance level.

Source: Author computation from collected Data (2020)

### 4.4 Ordinary Least Square Method

The results from the estimated equation (4) showed that, the coefficient of the constant term is 1.34 implying that at zero performance of the various explanatory variables used, economic growth stands at 1.34 units. According to regression findings as presented in Table 5, the adjusted R squared from the estimated equation (4) is 0.94, indicating a model is a good and can explain the explanatory variables by 94%. Moreover, the result indicates a Durbin Watson of 1.826 that meet requirement of Rule of thumb. A rule of thumb shows that normal value should range from 1.5 to 2.5. Therefore, since in our case the value of Durbin Watson is 1.826, serial correlation is not of our concern. Below are the detailed elaborations of the independent variables factors that affect the economic growth of Zanzibar as estimated regression result has revealed.

**Table 5:** Results of Regression Analysis

Variable	Coefficients	Std. errors	T-Statistic	P  t
C	1.335889	3.138282	0.425675	0.6716
Labour forces	0.015976	0.291526	0.054801	0.9564
Exchange rate	1.661648	0.156916	10.58941	0.0000
Seaweed Exports	0.039927	0.028550	1.398517	0.1661
Capital formation	-0.036997	0.037306	-0.991716	0.3245
R-squared	0.939336	F-statistic)	716.6616	
Adjusted R-squared	0.936101	Prob (F-statistic)	0.000000	

S.E. of regression	0.074188	Durbin-Watson stat.	1.826355
Sum Squared Residuals	0.407283		

Source: Author's computations

Moreover, from the table 5 results revealed that, there is a positive and insignificant contribution of seaweed export on economic growth of Zanzibar. The coefficient was 0.039927 and p-value was 0.1661 which was greater than 0.05 (at 5% level of significance) cause seaweed export to be insignificant in the study. With this results if seaweed export is going to be increased by one unit, there will be increase in GDP by 3.9%. The results found to be insignificant but positive due the reason of the price of the seaweed is still not good such that the level of production of the seaweed is low resulting in lower amount of seaweed exportation, there this leads for seaweed to have lower contribution to Zanzibar economic growth. This finding is similar with that of Msuya, Flower (2011) who studied the impact of seaweed farming on the socioeconomic status of coastal communities in Zanzibar.

The results also showed that, Tanzanian shilling exchange rate have positive and also significance contribution to the Zanzibar GDP, having the coefficient of 1.661648 and its p-value of 0.0000 which is significance at 5% level of significance. The findings imply that a unit increase in exchange rate would lead to increase in Zanzibar GDP by a factor of 1.66%. Therefore, from these results, increasing in Tanzanian shilling exchange rate gain is associated with an increasing in Zanzibar GDP. More specifically, an increase of Tanzanian shilling exchange rate gain by one percentage is associated with increasing in Zanzibar GDP. From the empirical results in the estimated model above, show that the capital formation have negative and insignificant effect on Zanzibar GDP such that it coefficient was -0.036997 with the p-value of 0.3245 which is greater than 0.05 level of the significance. From the above regression equation, it was revealed that, a unit increase in capital would lead to decrease in Zanzibar GDP by a factor of 3.69 percent. The negative coefficient of capital was due to the fact that would effects on the aggregate demand and the cost of production the suppliers and producers with fixed cost have a low purchasing power due to the reduced value of money caused by inflation hence reduced demand for products. Equally inflation increases the cost production hence reducing production of goods for export. Labor force had a positive and insignificant contribution to the economic growth of Zanzibar with coefficient values of 0.015976 with it p-value of 0.95 (greater than 5%). The implication of this result is that, if a one percent increase in labor would positive stimulating economic growth in the long run at the 1.59 percent. Thus with that result, it can be concluded that it contributes positively to economic growth of Zanzibar

## 5. CONCLUSION AND RECOMMENDATION

This paper examines the contribution of agricultural export and economic growth in Zanzibar taking seaweeds as a case. The study used time series quarterly data from 2000 to 2018 and applied Ordinary Least Square (OLS) method to estimate the results. The study used descriptive research design, where the secondary data were used for the variables to be analyzed in which the researcher extracted from the Office of Chief Government Statistician through several statistical abstracts. The estimated results showed that seaweed export has a positive but insignificant effect with economic growth of Zanzibar. The results also showed that labour has a positive but insignificant effect while capital had a negative and insignificant effect with economic growth of Zanzibar. Furthermore the results showed a positive significant effect on exchange rate to economic growth of Zanzibar. The study then recommends that Zanzibar government should increase the price of seaweed product to local farmers so as to encourage them to engage in seaweed farming and this would ultimately increase the seaweed production and consequently increases seaweed export.

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