*Full Length Research Paper*

# Causality relationship between agricultural exports and agriculture's share of gross domestic product in South Africa: A case of avocado, apple, mango and orange from 1994 to 2011

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The study analysed causality between agricultural exports and its share of gross domestic product in South Africa from 1994 to 2011. Apple, avocado, mango and orange exports in tonnes were used to Granger analyse agricultural exports versa agricultural GDP contribution. The results of the Granger causality test showed a unidirectional causality between exports and GDP. Policies and programmes can help farmers with employees wage to enter the export markets which are ineffectual. Policies can be aimed at redress, such as the Employment Equity Act; which is size dependent on other sectors outside agriculture which discourage growth and export participation.

**Key words:** Agricultural economic growth, agricultural exports, agricultural trade policies, export-led growth, Granger Causality test.

## INTRODUCTION

According to Ukpolo (1998) the notable relationship between exports and growth in developing countries has attracted exhibiting interest because of its policy implications. The establishment of the agricultural sector by the marketing of Agricultural Products Act of 1996 has placed South Africa among the world's exporters of agro-food products not limited to wine, fresh fruit and sugar. South Africa is also an important trader of agricultural exports in Africa and competes for international market with those exports destined for EU and US markets. The

debate on the relationship between agricultural export and agricultural Gross Domestic Product (AgGDP) has exhibited considerable interest in the field of development economics due to the nature of the contribution of the agricultural sector. Several empirical studies were conducted to assess the role of exports towards the economic growth of developing countries from various aspects. While the true measure of these nation's development needs to be expressed through improvements in the standard of living , their economic

growth plays a significant part in this process by providing increased per capita income, increased revenue for government sponsored social services, leading to export led-growth.

Many researchers (Haleem et al., 2005; Stiglitz, 2007; Shirazi and Manap, 2004; Raza et al., 2012; Jatuporn et al., 2011) believe that agriculture can salvage the declining economy under unstable global economic conditions. Avocado, apple, mango and orange production in South Africa over the decade has shown good growth trends. In South Africa recently, empirical studies carried out (Dlamini and Fraser, 2010; Rangasamy, 2009; Pearson et al., 2010) to appraise the impact of export growth in comparison to economic growth, comparatively yet little has been done to analyse the impact of a single or few produce within the agricultural sector. The issue of how South Africa's agricultural sector can greatly contribute to economic growth is one of the fundamental economic questions which need proper considerations. An export-led growth hypothesis, which states that agricultural exports and other exports in general are keys to promoting economic growth, provides one of the answers to these fundamental questions. According to Abou-Stait (2005), an export-led growth strategy aims to provide producers with incentives to export their produce through various governmental policies.

Chambers (1984) showed that the restriction on the openness of the economy depresses the agricultural sector, which later affects its trade, agricultural prices relative to non-agricultural prices and income. The South African agricultural industry has become less dependent on state support and internationally more competitive, although many sectors within the industry experienced a difficult period of adjustment and distress relating to segmented level of farming groups. The country's key and rising agricultural exports generally face relatively low levels of border protection, in part, due to bilateral and general tariff concessions to South Africa following the marketing of the Agricultural Products Act of 1996. However, these preferences do not exclude the country from the seasonal elevation of tariff barriers, export quotas and the implicit constraints of the entry prices built into the European Union (EU) regime for fresh fruits. This needs utmost attention since issues of seasonal elevation of tariffs affects South African's possibility of exporting fruits from provinces which have similar harvesting seasons to those in Europe and competing countries.

On average, South African avocado, apple, mango and orange production, in both commercial and subsistence sectors, has experienced increases on a yearly basis. This growth in production results in surplus quantities in the market. Drawn from a neo classical economic notion, the direct link between agricultural exports and its share of GDP can contribute to the export-led economic growth. This export-led growth can create profit allowing the agricultural economy to balance its finances, surpassing

the debts and lowering returns which are challenges in South Africa's agricultural economy. The increased agricultural exports growth can trigger more avocado, apple, mango and orange production, which would create more exports opportunities. Farmers producing avocado, apple, mango and orange for exports purposes can receive export tariff subsidies and better access to the local and international markets. Exports of avocado, apple, mango and orange from South Africa to the African continent have been declining during the past three years, moving from 866 tons in 2007 to 396 tons in 2009. As a result, avocado, apple, mango and orange exports to the Americans have been consistent over the last decade, remaining below 100 tons for most of the decade and only peaking to 160 tons in 2001 (DAFF, 2011).

Avocado, apple, mango and orange exports are chosen because their productions have a higher value adding processing potential and are scattered around the republic. These agricultural produce must be clustered based on their comparative advantage and exports potential. The argument concerning the role of the exportation of these fruits as one of the main determinants of economic growth is not new. Haleem et al. (2005) investigated export supply response of citrus and mangoes in Pakistan. The study reviewed performance of citrus and mango exports for the years 1975 - 2004. The fluctuating performance of citrus and mango exports can be attributed to highly fluctuating domestic production, inconsistent export policies, currency devaluation, export duties, non-competitiveness of exports and uncertain situation in the international markets (Ghafoor et al., 2010).

Agricultural exports can play a significant role in analysing the impact of agriculture's share of GDP in South Africa. This can lead to the change in the quantity of produce exported to overseas market hence it can contest an economic decision within the local market for those products. Over the years the world agricultural exports and South African agricultural exports grew per annum. This is due to the export oriented agricultural sector and an instant demand of agricultural produce due to climate change and higher competition which improved the quality produced. The contribution of agriculture's share of GDP in South Africa has been declining while the aggregated agricultural exports are increasing.

The figures show the exports of agricultural products considered for this study. In comparison from the figures, tonnes of mango and avocado exports were lagging behind those of apple and orange exports. The tonnes of avocadoes and mangoes remained at a value less than 100 000 tonnes and fluctuated throughout compared to tonnes of apple and oranges in Figure 1, a factor which economists' debate on based on the fair competition that these produce face in the global market. The favourite climatic conditions that favours both apple and orange production in the country and its value chain analysis that
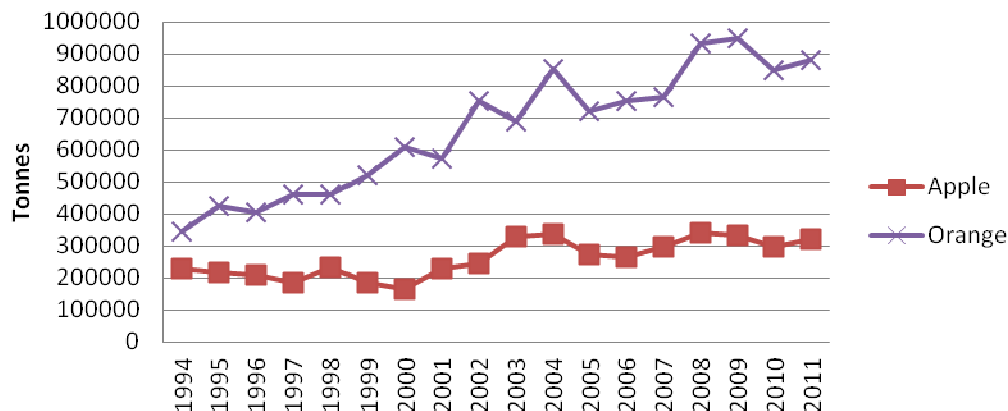
**Figure 1.** Apple and orange exports from 1994 to 2011 in South Africa.
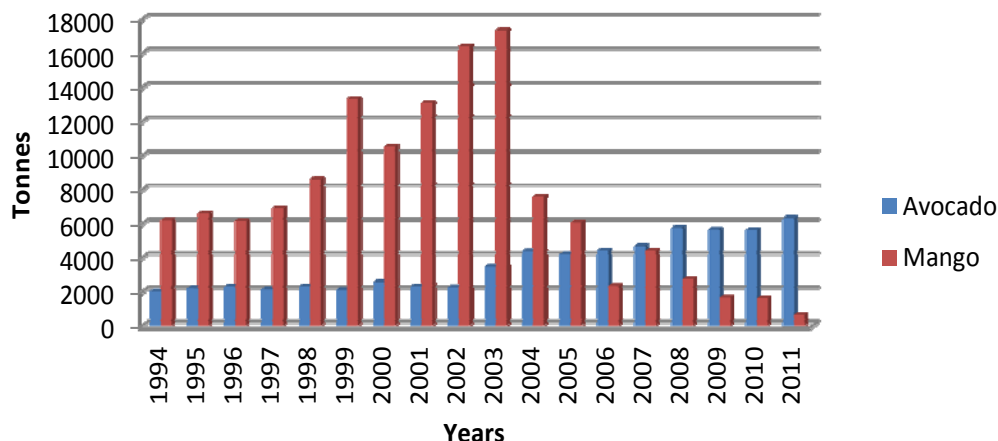


**Figure 2.** Avocado and mango exports from 1994 to 2011 in South Africa.

help process them contribute to this higher volume of exports. Throughout in Figure 1, the tonnes of oranges exported were far higher than that for apple and other produce in Figure 2, which shows that other produce may be improved if they can be given the necessary support.

The study analysed the causality between agricultural exports and its share of Gross Domestic Product in South Africa. Apple, avocado, mango and orange exports were used to Granger analyse agricultural exports and agricultural GDP contribution percentages.

## RESEARCH METHODOLOGY

### Study area and sampling procedure

The study covers the entire South Africa and used secondary time series data that was obtained from National Department of Agriculture, Fishery and Forestry Statistical Directorate. The study covered a sample size of 17 years (1994-2011) of avocado, apple, mango and orange exports in South Africa and the agriculture's share of GDP for the same period.

### Analytical technique

The Granger causality test was used for empirical analysis. The export-led hypothesis was specified by a bivariate linear model. The model is described below:

### Granger causality test

According to Konya (2004) the concept of Granger causality is centred on the idea that a cause come before its effect. In the case of two variable namely X and Y, X is said to Granger-cause Y, if the current value of Y ($y_t$) is conditional on the past values of $X$ ($x_{t-1}$, $x_{t-2}$,..., $x_0$) and thus the history of $X$ is likely to help predict Y. Granger causality test is a better approach to a correlation analysis as it is more efficient than other methods such as Johansson co-integration analysis. Unlike Johansen co-integration analysis which is able to estimate whether the long-run equilibrium exists between two variables, the Granger causality test helps determine the direction of causation. The test however, does not imply causation between correlated variables in any significant way as the name would imply.

Furthermore the Granger test seeks to find out whether the current value of variable $y - y_t$ can be explained by past values of

**Table 1.** Unit root test for agricultural exports

| Parameters | | t-statistics | Probabilities |
|---|---|---|---|
| | | 1% Critical value* | -2.7275 |
| ADF Test Statistic | 1.468174 | 5% Critical value | -1.9642 |
| | | 10% Critical value | -1.6269 |
| *MacKinnon critical values for rejection of hypothesis of a unit root. | | | |

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| EXPORTS(-1) | 0.100402 | 0.068385 | 1.468174 | 0.1642 |
| D(EXPORTS(-1)) | -0.330970 | 0.285063 | -1.161041 | 0.2650 |
| R-squared | 0.051093 | Mean dependent var. | | 18268.75 |
| Adjusted R-squared | -0.016686 | S.D. dependent var. | | 53585.57 |
| S.E. of regression | 54030.79 | Akaike info criterion | | 24.74896 |
| Sum squared resid | 4.09E+10 | Schwarz criterion | | 24.84554 |
| Log likelihood | -195.9917 | Durbin-Watson stat | | 2.119193 |

*represent significance at 1%, respectively.

another variable can give more insight. In that way, the variable *y is* said to be "Granger caused" by *x* if *x* helps predict *y*, which is determined by an F-test (Gilmore and McManus, 2002; Granger, 1969). The most common way to test the causal relationship between two variables is the Granger causality proposed by Granger (1969). The test involves estimating the following simple Vector Auto Regressions (VAR):

$$X_t = \sum_{i=1}^{n} \alpha_i Y_{t-i} + \sum_{j=1}^{n} \beta_j X_{t-j} + \mu_{1t} \tag{1}$$

$$Y_t = \sum_{i=1}^{m} \lambda_i Y_{t-i} + \sum_{j=1}^{m} \delta_j X_{t-j} + \mu_{2t} \tag{2}$$

Where it is assumed that the disturbances $\mu_{1t}$ and $\mu_{2t}$ are uncorrelated. Equation (1) represents that variable $Y$ is decided by lagged variable $Y$ and $Y$, so does Equation (2) except that its dependent variable is $Y$ instead of $X$. It should be noted though that the term Granger causality is somewhat of a misnomer since finding "causality" does not mean that movements in one variable causes a movement in the other, but rather causality implies a chronological ordering of movements of the series (Brooks, 2002).

**Agricultural exports equation**

$$\log AGEXP_t = \alpha + \sum_{i=1}^{k} \varphi_i \log AGEXP_{t-i} + \sum_{i=1}^{l} \beta_i \log AGGDP_{t-i} + \mu_t$$

Agriculture's share of GDP equation

$$\log AGGDP_t = \beta + \sum_{i=1}^{k} y_i \log AGGDP_{t-i} + \sum_{i=1}^{l} \alpha_i \log AGEXP_{t-i} + \mu_t$$

Where, AGEXP represent avocado, apple, mango and orange exports and AGGDP represent agriculture's share of GDP.

**Unit root tests agricultural exports and agriculture's share of GDP**

The constant and coefficient of EXPORTS are significant; t ratios

are less than 2 in absolute values and P-values is less than t ratios. Here the P-value gives the probability that the hypothesis (unit root test of EXPORTS) is not true. It is conventional to reject the hypothesis if the P-value is less than 0.05. The ADF statistic value is 1.468174 and associated one-sided probability value is 0.1642. The constant and the coefficient of GDP are significant, t ratios are less than 2 in absolute values and P-values are less than t ratios. Here the P-value gives the probability that the hypothesis (unit root test in GDP) is not true. It is conventional to reject the hypothesis if the P-value is less than 0.05. The more the ADF statistic test negative, the stronger the rejection of the hypothesis that there is a unit roots at some level of confidence. The ADF statistic value was negative at 1.361641 and above the associated one-sided probability value of 0.1948. This implies that 1% increase in agricultural exports would results in a 19.4% contribution on the share of GDP. ADF was lagged at 3 to minimise bias and avoid suffering the power of the model, which happens when the lag value is too small or large respectively (Tables 1 to 3).

## RESULTS AND DISCUSSION

### Pairwise Granger Causality Test

From the observation we reject the null hypothesis that agricultural exports does not granger cause agricultural share of GDP because the probability that agricultural exports does not granger cause agriculture's share of GDP was significant at 5%. This probability is less at 3% which helps us reject the hypothesis based on its findings. We accept the null hypothesis that agriculture's share of GDP does not cause agricultural exports with the probability value higher at 20.82%. Based on this observation we accept the null hypothesis that agriculture's share of GDP does not granger cause agricultural exports. Therefore, it is known that if hypothesis $H_0^1$ is not rejected but Hypothesis $H_0^2$ is rejected, their linear causality runs unidirectional from $Y_1$ to $X_1$.

## Conclusion

The study attempted to analyse empirically the causality between agricultural exports and its share on GDP over a period of 1994 to 2011. The result derived from the Granger causality test played an important role in complementing agricultural exports in South Africa. In conclusion, the study outlined a unidirectional causality from agricultural exports to agriculture's share of GDP. Gross Domestic Product in the agricultural sector matters in the direction of exports in the agricultural scope of the republic. Thus, an increase in agricultural exports is expected to yield an increase in its share of the GDP.

There are three direct implications for policy that can arise out of this export potential. Firstly, policies and programmes that can be planned to help farmers with employees wage to help enter the export market are ineffectual, since these farms are struggling to finance production in South Africa, which in the long-run affect agricultural exports. Secondly, creating more exporters requires creating a larger pool of potential exporters of the requisite size. This means supporting the entry of emerging farmers but also encouraging the expansion of existing exporting farmers. Encouraging new investment (particularly foreign investment) requires competitive returns and guarantees of the security of this investment. These competitive returns should result from, for example, particular market characteristics (access to the Southern African region), competitive labour costs, or tax breaks. Encouraging existing farms to grow requires addressing issues that farmers cite as constraints, such as policy uncertainty, labour regulations, infrastructure investment and anticompetitive behaviour. Thirdly, policies aimed at redress, such as the Employment Equity Act, which is size dependent may discourage growth, increase costs and discourage export participation.

## Conflict of Interest

The authors have not declared any conflict of interests.

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