Causal Effect of Potato Production on Export in Nigeria

Chigozirim Ndubuisi ONWUSIRIBE

Department of Agribusiness and Management,

Michael Okpara University of Agriculture Umudike, Abia State, Nigeria

Onwusiribe.chigozirim@mouau.edu.ng

Philips Okore NTO

Department of Agribusiness and Management,

Michael Okpara University of Agriculture Umudike, Abia State, Nigeria

Nto.philips@mouau.edu.ng

Abstract

The quest to increase the export earnings of Nigeria is on with emphasis on diversification from the oil sector. Agriculture is the solution to this quest considering the favourable geographic and demographic status of Nigeria. Potato is one of the staple crops produced in most regions in Nigeria. Potato forms part of international best dishes and this strategically positions it as an export crop. To maximize the export potentials of potato, the increase in production is inevitable. This study reveals that potato production causes potato export ceteris paribus. The study made use of Nigeria potato production and export data made available by Food and Agriculture Organization (FAO). Trend analysis and granger causality tests were used for the data analysis. The trend forecast indicates that exports may continue to grow despite decline in the production level, which implies that potato value chain actors will continue to export potato produced for local consumption. Sustainable potato production guidelines should be implemented by the farmers to ensure increase in production to meet the export demand.

Introduction

In terms of farm land for potato farming, Africa and the America plant about 10% of the world total potato respectively. In terms of output, Africa produces only about 30% of the Americas' output or slightly more than 5% of world production. Potato yields vary in sub-Saharan Africa due to the various ecological zones. The largest producers of potato measured in hectares are Nigeria, Malawi, Tanzania, Kenya and Rwanda, whereas the largest quantities are produced in South Africa, Rwanda, Nigeria, Angola and Tanzania (FAOSTAT 2010). Potato farmers soil enjoy all year round yield., high and increasing market demand for the crop locally and internationally, as potato farming requires a temperate climate with a mid- to high altitudes—roughly 1,000– 3,000 meters above sea level (masl)—to form tubers. In addition, potato farming is important in Nigeria, where the crop is an export commodity to Europe (Nteranya, 2015).

Potato is complex as a staple crop that addresses food security and serves as a means of income at the farm level and at the macro level. Potato has a short cropping cycle of three or four months and it is suitable for the Nigeria farming pattern which is basically rain-fed. Mature potato tubers are ready for harvest 60-100 days after the rainy season began—a major advantage potato has over crops like cassava (FAO, 2005). Potato is an affordable and nutritionally rich staple food for the timing Nigerian population, contributing significantly to the protein, vitamin C, zinc, and iron needs of the peoples diet(FAO, 2003).

Demand for potato is increasing in Nigeria, but the right questions are not been asked but stakeholders have focused on the increase and availability of farm land as the only challenge to increase production. But the question of best and sustainable potato farming practices has not been answered. The viability and profitability of the potato value chain in Nigeria is another grey area seeking attention, this is because for Nigeria to be competitive in the world potatoes export market the local potato value chain has to be well developed to meet international standards.

Potatoes have become a basic part of much of the international best dish and are the world's largest food crop, following rice, wheat and maize. Hence, there potato can become a major export crop for Nigeria. One basic reason for low potato export form Nigeria might be over-reliance on export of crude oil, poor quality of potatoes harvested, weak value chain etc. (Ajetemobi, 2013).

In the study of causal relationship between avocado, apple, mango and orange and the South African economy Bulagi, Hlongwane and Belete (2014) adopted the granger causality test, where the authors found that agricultural exports does not granger cause productivity. Memon, *et al.* (2008) reported a bi-directional granger causality between the total exports and agricultural GDP. A unidirectional causal relationship was found to exist between agricultural export and agricultural output in India (Suresh and Kumar, 2017). Megbowon (2016) and Gutema, Lagat, Daba and Mebata (2015) adopted the granger causality test in testing agricultural exports and economic growth in South Africa and Ethiopia respectively. The causality between productivity and exports in agriculture was studied using granger causality test (Arnade and Vasavade, 1995). Alam and Myovella (2016) in the study of agricultural exports and production adopted the granger causality test. Granger causality test and correlation analysis were used in this study to address agricultural exports, productivity and economic growth.

Data and Research Methodology

Nigeria has a land area of about 923,769km^2 (Federal Office of Statistics 1989). Nigeria water bodies consist of an area of about 13,000 sq. km while the remaining land is about 910,769sq km (Boomie 1998; Cleaver and Schreiber 1994). This article adopted principally secondary data obtained from Food and Agriculture Organization (FAO) database for a period of 1961-2017. The choice of 1961 – 2016 is for a more detailed interpretation of the trends in potato production and exports.

Data Source and Collection Procedure

This study adopted principally secondary data obtained from the Food and Agriculture Organization database, for a period of 1961-2016. Unit Root Test using the ADF test, and Philip-Perron technique to test if the time series data is stationary, the tests were done one by one for confirmation of the presence of constant means. Descriptive statistics was used to describe the nature of data as well as granger casualty test was used

The ADF test consist of estimating the following regression

$$\Delta Y_t = \propto + \beta_t + \gamma Y_{t-1} + \delta_1 \Delta Y_{t-1} + \cdots + \delta_{P-1} \Delta Y_{t-P+1} + \varepsilon_t \qquad \ldots 1$$

Where

Δ, δ, γ = Difference operators

$\propto$ = constant

Y = dependent variables

β = coefficient

$\sum$ = summation sign

e = error terms

t = time

It is an one tail test whose null hypotheses is $\delta=0$ versus $\delta<o$ (thus expansive negative estimations of the test measurements prompts the dismissal of the invalid) and Δ is the difference operator. Under the alternative, Yt must be differenced to accomplish stationarity; under the option, Yt is as of now stationary and no differencing is required (Dickey and Fuller,1981), Consider a model

$$Y_t = \theta_0 + \delta Y_{t-1} + a_t \qquad \ldots 2$$

Where

δ = Difference operators

θ = constant

Y = dependent variables

$\sum$ = summation sign

e = error terms

t = time

However, for measuring the acceleration or deceleration in the growth rate, log quadratic trend equation was fitted and stated thus.

$$lnY = a + b_t + f_t^2 + e_t \qquad \ldots 3$$
$$lnq = a + b_t + f_t^2 + e_t \qquad \ldots 4$$

Where

y = potato production in tonnes

q= Potato export in tonnes

a=constant

b, f= coefficients

u= error terms

t= time

A positive significant value of *f* indicates acceleration while a negative significant value implies a deceleration. A nonsignificant value shows stagnation in the growth process. This is in line with Mbanasor, Nwachukwu, Agwu and Onwusiribe (2015) and Onyenweaku (2004). The model for the causality test is as shown below:

$$Y_t = b_0 + b_1 Y_{t-1} + b_2 Y_{t-2} + \cdots + b_n Y_{t-n} + b_1 Q_{t-1} + \cdots + b_n Q_{t-n} + e_i \qquad \ldots 5$$

Where

Y = potato production in tonnes

Q= Potato export in tonnes

b= coefficient

e= error term

n= data size

e= error ter

Results and Discussion

Since all the variables are not integrated in the same order, there is a need for a co-integration test. This implies that some linear combinations of the series must be co-integrated, such that even though the individual series may be integrated in the order I(0) and I (1) the series may drift apart in the short-run, and then follow a common trend which permits stable long-run relationship between them.

Table .1 Unit root test of the variables

| | ADF test | | Philips-perron | | |
| | | 1st | | 1st | |
	Level	difference	Level	difference	decision
potato area harvested	-1.11952	-5.6245	-1.05391	-7.46316	I(1)
potato yield	-2.38093	-3.95479	-2.62834	-6.18835	I(1)
potato production	-0.80524	-6.7858	-0.92345	-10.9917	I(1)
potato export	-0.08535	-6.12107	-0.31121	-9.75577	I(1)

-3.7498, -2.5005 & -1.6793 are Mackinnon critical value for rejection of hypothesis of unit root applied at 1%, 5% & 10% respectively. I(0), & I(1) indicates that the variable has a constant mean at the level, first difference & second difference respectively. Source: FAO database, computed using Eviews 9.5

Since all the variables are not integrated in the same order, there is a need for a co-integration test. This implies that some linear combinations of the series must be co-integrated, such that even though the individual series may be integrated in the order I(0) and I (1) the series may drift apart in the short-run, and then follow a common trend which permits stable long-run relationship between them.

The Trend of in the Production and Export Of Potato

After the independence of Nigeria, the production of potato was at 9500 tonnes. The high levels of production from 1961 to 1969 were due to the existing colonial agricultural policies that emphasized more production for the purpose of exports (Iwuagwu, 2008). From 1970 the production of potato started to drop significant, this drop could be attributed to the agricultural policy shift anchored on the National Accelerated Food Production Program (NAFPP) of 1972 and the Integrated Agricultural Development Program (IADP) of 1974 that focused on the production of rice, maize, cassava and wheat. The Operation Feed the Nation (OFN) of 1976 and other subsequent agricultural policies did not lead to increase in the production of potato in Nigeria. The policies were flawed by poor implementation and corruption.
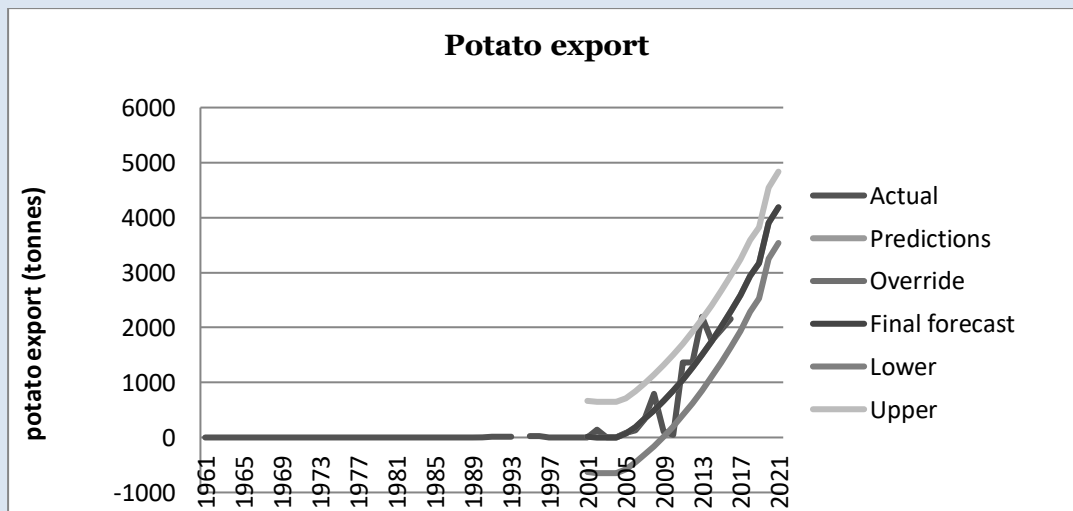
Figure 1: Trend of potato production in Nigeria
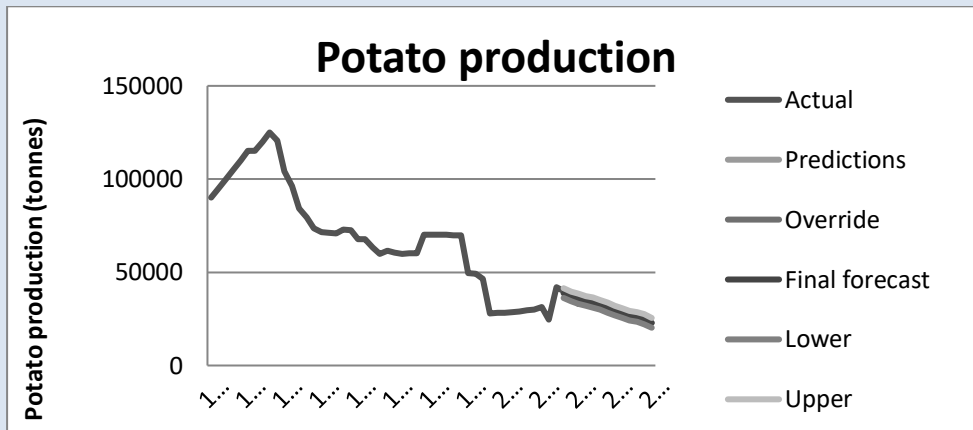
Source: FAO database. Computed by the authors using Ms Excel

Nigeria recorded significant potatoes export from 2005, the potatoes output has continue to gain some growth and the forecast data revealed that the potato exports may continue to grow.

Figure 1: Trend of potato export in Nigeria

Source: FAO database. Computed by the authors using Ms Excel

The growth rate in production and export of potato was analyzed using a log-quadratic trend. The model revealed the presence of stagnation, acceleration or deceleration in the production and export of potatoes within the study period. The results of the analysis are presented in Table 2.

The result presented in Table 2 showed that potato production, and export recorded positive and significant growth during the period, with compound growth rates of 0.94and 0.65 in production and export of potatoes. It implies that the output of potato in tonnes has been growing over the years. The obvious enabling environment which fosters the country's comparative advantage coupled with the multiplicity of expansion programmess such as the presidential initiatives has played contributory roles to the increase in the production and export of potato. Given that the estimated time terms had significant and positive coefficients, there is an indication of marked acceleration in the growth trend in production and export of potato in the study area.

Table 2 Estimated growth equation in production, import, and exports of potato

Variables	B_0	b_1	b_2	R^2	R^{-2}	F
potato						449.441***
production	1.67E+05	-27379	869.962	0.94432	0.94222	
	(3.891)***	(-7.904)***	(14.77)***			
potato export	391.859	-57.798	1.37812	0.66716	0.65436	52.1148***
	(2.762)**	(-5.000)***	(7.017)****			

Values in parenthesis are t-values; *,**& *** indicates that the values are significant at 10%, 5% & 1% respectively.

Source: FAO database computed using Eviews 9.5

Causal Relationship Between Potato Production and Export

From Table 3 there is a one-way causation running between potato production and potato export with an F- statistics of 6.834 which was statistically significant at 1%. This implies that we reject the null hypothesis that potato production does not granger-cause potato export. We, therefore, conclude that potato productivity causes/ lead to potato exports.

Ugonna et al., (2013) while explaining the linkages of the potatoes value chain, linked potatoes production to the value chain and the eventual export. Ayuba, Kitsche and Oguntola (2014) reported that Nigerian potato wholesalers are basically agents in the potatoes value chain that ensure the potatoes produced by smallholder farmers are aggregated for the purpose of exports and retail.

Table 3 causal relationship between potato export and production

Null Hypothesis:	Obs	F-Statistic	Prob.
POTATO PRODUCTION does not Granger Cause POTATOEXPORT	54	6.83363	***
POTATO EXPORT does not Granger Cause POTATO PRODUCTION		0.12293	

Source: FAO database.computed using Eviews 9.　　　*** indicate that the value is significant at 1%.

Conclusion

Potato production is the primary cause of potato export. This implies that the production of potatoes results in the export of potatoes. Globally the demand for potatoes is on the increase this is because it forms part of the world best cuisine. The Nigerian potatoes export is expected to increase despite non commensurate increase in the expected production rate. This implies that local producers and value chain actors may focus on the international market more than the local market in order to earn more. The declining trend of potato production is worrisome and the need to increase production through a specific potato famers policy action, since some of agricultural policies in the past focus on staple crops like rice, wheat, cassava and maize. A production for export-focused policy that will entail value chain development and farmers should follow the sustainable potato production guideline for developing countries by Food and Agriculture Organization (FAO) (Lutaladio et al., 2009).

References

Alam, F. & Myovella, G. (2016). Causality between Agricultural Exports and GDP and its Implications for Tanzanian Economy. *Journal of Economics, Finance and Accounting*, Volume: 3 Issue: 1: 1- 18.

Arnade C., & Vasavada U. (1995). Causality between Productivity and Exports in Agriculture: Evidence from Asia and Latin America. *Journal of Agricultural Economics*, 46: 174–186.

Ayuba, S. M; Kitsche, M. & Oguntola, R.F (2014). Economic Development for Peace and Stability in Plateau State, Nigeria: Promotion of Potato Value Chains in Nigeria. Funded by the European Union. https://daserste.ndr.de/panorama/media/potato102.pdf accessed 02/04/2020

Boomie, O. (1998). Motherland Nigeria: Geography. http://www.motherland nigeria.com/geography.html.

Bulagi, M. B; Hlongwane, J. J & Belete, A. (2014). 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. *African Journal of Agricultural Research,* Vol. 10(9): 990-994.

Cleaver, K. & Schreiber, G. (1994). Reversing the Spiral: The Population, Agriculture and Environment Nexus in sub-Saharan Africa, Washington: World Bank.

Dickey, D.A., and D.W., Fuller,(1981), "The Likelihood Ratio Statistics for Autoregressive Time-series with a Unit Root," *Econometrica*, 49: 1057-1072

FAO (2005), Food and Agriculture Organization: *Production Yearbook*, Rome Italy: FAO.

FAOSTAT (2010), Food and Agricultural Organization: Agricultural Statistics, Rome, Italy.

Gutema, T.Y; Lagat, J. K; Daba, D. & Mabeta, J. (2015). Causality Relationship between Agricultural Exports and Economic Growth in Ethiopia: A Case of Coffee,Oilseed and Pulses. *Journal of Economics and Sustainable Development,* Vol.6, No.17: 1- 6.

Iwuagwu, O. (2008). Colonial and Post-Independence Agricultural Policies in Eastern Nigeria, 1946 – 1980. Lagos Historical Review Vol. 8 2008: pp. 64-78

Lutaladio, N., Ortiz, O., Harvekort, A. & Caldiz, D. (2009). Sustainable Potato Production: Guidelines for Developing Countries. Food and Agriculture Organization of the United Nations. http://www.fao.org/3/a-i1127e.pdf accessed 04/04/20

Mbanasor, J. A., Nwachukwu, I, N., Agwu, N.M. & Onwusiribe, N. C. (2015). Impact of Climate Change on the Productivity of Cassava in Nigeria. *Journal of Agriculture and Environmental Sciences* June 2015, Vol. 4, No. 1: 138-147

Megbowon, E. T. (2016). Causality Relationship between Agricultural Exports and Economic Growth: Evidence from South Africa. *Journal of Social Science*, 48(1,2): 129-136.

Memon, M. H; Baig, W. S; & Ali, M. (2008). Causal Relationship Between Exports and Agricultural GDP in Pakistan. *Applied Economics Research Center, University of Karachi*. Munich Personal RePEc Archive

Nteranya, S. (2015) Root and Tuber Crops (Cassava, Yam, Potato and Sweet Potato). Background Paper: An Action Plan for African Agricultural Transformation. *United Nations Commission for Africa.* Feeding Africa held at Abdou Diouf International Conference Centre, Dahar Senegal.

Onyenweaku.C.E. (2004). Stagnation, Acceleration and Deceleration in Agricultural Production in Nigeria. 1970-2000. *Journal of Agriculture and Food Science, 2(2): 131-140.*

Suresh, A.& Kumar, P. S. (2017). The Causal Relationship between Agriculture Exports and Agriculture Growth in India. *Bodhi International Journal of Research in Humanities, Arts and Science*, Vol.1 No. 3: 28 – 33.

Ugonna C.U, Jolaoso M. O, Onwualu A. P. (2013) A technical appraisal of potato value chain in Nigeria. *International Research Journal of Agricultural Science and Soil Science* Vol. 3(8) :291-301