

**FISHERY PRODUCTION AND ECONOMIC GROWTH IN NIGERIA:  
PATHWAY FOR SUSTAINABLE ECONOMIC DEVELOPMENT**

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**ABSTRACT**

This research was carried out to examine the relationship between fishery production and economic growth with a view to drawing up relevant implication for sustainable economic development in Nigeria. Time series data on index of fishery production and real gross domestic product covering 1970 to 2011 were utilized in this study. Augmented Dickey Fuller(ADF) test, Vector autoregression(VAR) lag order selection test and granger causality test were employed in the data analysis and the results indicate that fishery production does not granger cause economic growth and this implies that fishery production was not significant in influencing economic growth over the period under study and this was attributed to the low domestic fishery output of Nigeria and the considerable loss of foreign exchange earnings due to the growing fish importation to bridge demand-supply gap. The implication of this finding is that the untapped potential for fishery production must be optimally harnessed to stem down the loss of foreign exchange in importing fish, provide employment for many along the fish value chain, contribute to poverty reduction and ultimately foster sustainable economic development of Nigeria.

**Keywords:** Fishery, Production, Economic growth, Development, Protein.

## INTRODUCTION

Fish is an important source of animal protein for many households. According to FAO (2007), fish contribute more than 60% of the world supply of protein, especially in the developing countries. As a maritime nation with a vast population of over 160 million people and a coastline measuring approximately 853 kilometres, fish production as an enterprise possesses the capacity to contribute significantly to the agricultural sector (Osagie, 2012). With an annual fish demand in the country of about 2.66 million tonnes, and a paltry domestic production of about 780,000 tonnes, the demand-supply gap stands at a staggering 1.8 million tonnes. Despite the popularity of farming in Nigeria, the fish farming industry can best be described as being at the infant stage when compared to the large market potential for its production and marketing (Nwiro, 2012). Fish supply is from four major sources viz., artisanal fisheries, industrial trawlers, aquaculture and imported frozen fish (Akinrotimi, Abu & Aranyo, 2011). The Niger Delta contributes more than 50% of the entire domestic Nigerian fish supply, being blessed with abundance of both fresh, brackish and marine water bodies that are inhabited by a wide array of both fin fish and non-fish fauna that supports artisanal fisheries (Akankali & Jamabo, 2011). The Nigerian fishing industry comprises of three major sub sectors namely the artisanal, industrial and aquaculture of which awareness on the potential of aquaculture to contribute to domestic fish production has continued to increase in the country (Adewuyi, Phillip, Ayinde & Akerele, 2010). A right step towards arresting the demand-supply deficit for fish is aquaculture, which involves raising fish under controlled environment where their feeding, growth, reproduction and health can be closely monitored (Ejiola & Yinka, 2012). Aquaculture practices as a business venture is capable of bringing significant development in the rural and urban areas by improving family income, providing employment opportunities and reducing problems of food supply and security (Akinrotimi Abu, Ibemere, & Opara, 2009). The vast Nigerian aquatic medium of numerous water bodies like rivers, streams, lakes reservoirs, flood plains, irrigation canals, coastal swamps offer great potentials for aquaculture production in Nigeria.

Nigeria spends ₦100 billion on fish importation annually and the current fish demand consumption in Nigeria stands at over 2.66 million tonnes per annum, while the present importation rate is over 750,000 metric tonnes (Oota, 2012). With importation of more than 750,000 MT of fish, more than USD 600 million are spent in hard currency and thousands of jobs are exported (USAID, 2010). The continuous importation of fish portends a colossal loss of foreign exchange earnings to Nigeria. In order to bridge the demand-supply gap, an aquaculture transformation agenda plans to increase annual fish production from the current production of 0.78 million MT to 3.0 million tonnes in order to achieve self-sufficiency in fish production and supply by the year 2015 (Tijani, 2011). This will be achieved through fish farm development program, fish seeds and feed mill development program, fish pen and cage culture development program and fish post-harvest management and marketing program.

Despite the myriads of information on the integral role of the fishery sub-sector to the nation's economy, there exists a dearth of empirical information on the linkage between fishery production and economic growth in Nigeria and its perspective for sustainable economic development which ought to form the basis for policy formulation towards enhancing the fishery sub-sector. Therefore, there is the need to fill the existing gap in literature by providing empirical information on the nature of causal relationship between fishery production and economic growth in Nigeria for the use of all stakeholders in the fishery sub-sector. In view of the foregoing, this study was carried out to achieve the objective of establishing the causal relationship between fishery production and economic growth over the years in Nigeria and

make relevant policy implication in relation to sustainable economic development of Nigeria. The hypotheses put forward in this study are:

$H_o$  = There is no significant relationship between fishery production and economic growth

$H_a$  = There is significant relationship between fishery production and economic growth

## **LITERATURE REVIEW**

### **State of Nigerian fishery Sub- sector**

Fish farming is the least exploited fishery sub-sector with the vast brackish water fishing grounds almost unexploited (Ejiola & Yinka, 2012). Less than 1.0% of the fresh water grounds and about 0.05% of the brackish water grounds are under aquaculture to produce a current average yield of 20,500 tonnes of fish per annum. This represents only 3.12% of the estimated fish culture potential of 656,815 tonnes per annum.

Although the contribution of fisheries to the G.D.P is small (3-4%), it occupies a very significant position in the primary sector providing employment for over five hundred thousand people and contributing to over 40% of the animal protein intake of the people particularly the resources poor (Sanni, Olowosegun, Sule, Muhammed, Yem, & Onimisi 2009).

With an estimated 10 million Nigerians actively engaged in the upstream and downstream areas of fisheries operations in Nigeria, the contribution of the fisheries sub-sector to the nation's economy is significant, ranging from employment creation to the provision of raw materials for the animal feed industry (Osagie, 2012).

### **Constraints of Nigerian Fishery Sub-sector**

Despite the increase of fish production in Nigeria, production level is still very low and this has been attributed to high cost of input, lack of credit to fish farmers at low interest rate, lack of skilled manpower and an ineffective aquaculture extension service system (Oota, 2012). Adewumi & Olaleye, (2011) found out that a number of problems confront the production of catfish; being a major specie in Nigeria. Prominent among these are: Poor management skills, inadequate supply of good quality seed, lack of capital, high cost of feed, faulty data collection, lack of environmental impact consideration and marketing of products. If the associated problems of production, especially the twin issue of feed production and fingerling supply are tackled, Nigeria will soon become a world exporter of catfish

According to George, Olaoye, Akande & Oghobase (2010), the major problem hindering the promotion and development of the aquaculture industry in Nigeria has been the scarcity of fish fingerlings and that the major factors militating against the production of high quantity of fish seed are energy and water quality related problems arising from skills gap in the industry. (Nwiro, 2012) also, reported inadequate supply of fingerlings as a constraints to fishery subsector amongst other factors such as inadequate information and feed supply.

### **Prospects of Nigerian Fishery Sub-sector**

Nigeria has high potentials for aquaculture development and thus potentials can be realized substantially through extension services (Adetunji, 2011). It has been shown that Nigeria can substitute fish importation with domestic production to create jobs, reduce poverty in rural and peri-urban areas where 70% of the population live and ease the balance of payments deficits (Areola, 2007). Many industries also reap from the fishery industry by making use of some commercial by product obtained-from fish and process them into economic and valuable product. These sectors had

made use of fish oil, fishmeal, and fish skin in the manufacture of the following products coal oil, soap, fertilizers, amino supplement feed, and glue e.t.c .

Rondon and Nzeka (2010) reported that Nigeria's fish demand amounted to nearly 2.0 million MT (valued at more than \$1.8 billion) in 2009, leaving approximately 600,000 metric tons of untapped market potential and about 800,000 metric tons valued at approximately \$900 million, were imported fresh and frozen fish (mostly frozen mackerel, herring and croaker). The opportunity of bridging the widening demand-supply gap of fish in Nigeria through domestic production offers a great investment potential to the Nigerian populace and also the inflow of foreign direct investment into the country.

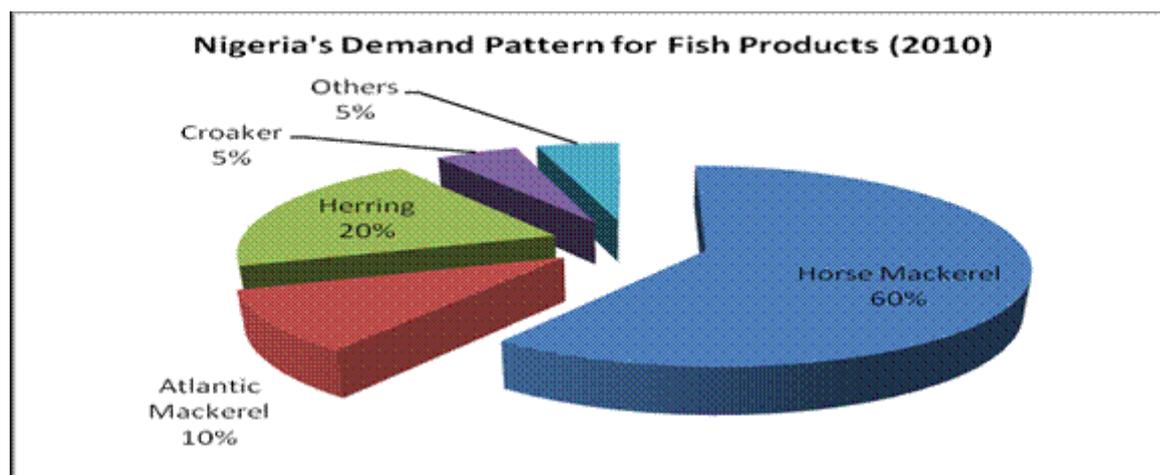


Figure 1: Nigerians Demand Pattern for Fish Products

Source: Rondon & Nzeka(2010)

Obiyai & Ekubo, (2011) posited that noting the benefits that will accrue from the use of improved technologies, fish stock with high growth rate and maturity in production, fish farmers need to be adequately equipped with the necessary skills in breeding and hatching to be able to exploit the immense potentials of fish farming.

## METHODOLOGY

### Description of Study Area

The study area is Nigeria. Nigeria has a total area of 923,800 sq km and occupies about 14% of land area in West Africa. The country lies between 4°N and 14°N, and between 3°E and 15°E. Nigeria is located within the tropics and therefore experiences high temperatures throughout the year. The mean for the country is 27°C. Average maximum temperatures vary from 32°C along the coast to 41°C in the far north, while mean minimum figures range from 21°C in the coast to under 13°C in the north. The climate of the country varies from a very wet coastal area with annual rainfall greater than 3,500 mm to the Sahel region in the north western and north eastern parts, with annual rain fall less than 600mm. The map of the study area is shown in Figure 2.

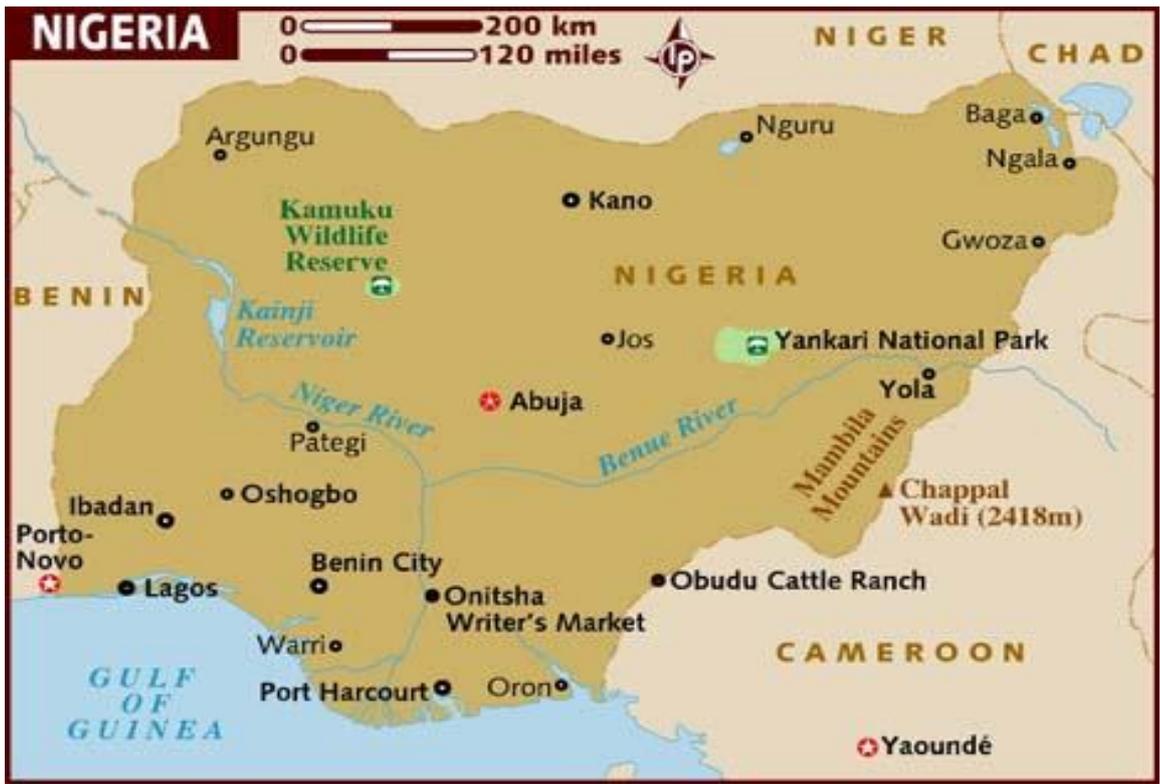


Figure 2: Map of Nigeria

**Description of Data**

This study employed secondary data on fishery production(1970 to 2011), real gross domestic period(1970 to 2011) and fish deficit(2000 to 2015) in Nigeria. The variation in the data periods was based on the period during which reliable data are available. The data were sourced from publications of Central Bank of Nigeria(CBN) statistical bulletin and Federal Department of Fisheries(FDF).

**Analytical Framework**

Pairwise granger causality test was utilized to examine the relationship between fishery production and economic growth in Nigeria. Prior to the granger causality analysis, the stationarity of the variables employed in the model were determined to avoid spurious regression which is a common problem in time series analysis and the optimal lag length chosen for the granger causality analysis was determined using criteria from an unrestricted Vector autoregression(VAR) lag order selection test. Granger & Newbold (1974) had concluded that regression results of non-stationary series may most of the times be spurious to the extent that a relationship would be accepted as existing between two variables as measured by their coefficient of determination, when in actual fact no such relationship exists. This study used the Augmented Dickey-Fuller (ADF) test to examine each of the variables for the presence of a unit root (an indication of non-stationary), since it can handle both first order and higher order auto-regressive processes by including the first difference in lags in the test in such a way that the error term is distributed as white noise. The equation of the Augmented Dickey Fuller test is given below:

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \sum_{i=1}^m a_i \Delta Y_{t-1} + e_t \dots \dots \dots (1)$$

Where:

$\Delta Y_t$  = first difference of  $Y_t$

$Y_{t-1}$  = lagged values of  $Y_t$

$\delta$  = test coefficient

$e_t$  = white noise

$\beta_1$  = constant

$\beta_2$  = coefficient of time variable

The null hypothesis of the Augmented Dickey Fuller unit root test is  $H_0: \delta = 0$  and the alternative hypothesis is  $H_a: \delta < 0$ .

### Model Specification

To examine the relationship between fishery production and economic growth in Nigeria, the pairwise granger causality test was modelled as:

$$lFP_t = \beta_0 + \sum_{i=1}^n \beta_i lFP_{t-i} + \sum_{j=1}^n \alpha_j lEG_{t-j} + \mu_{1t} \dots \dots \dots (2)$$

$$lEG_t = \gamma_0 + \sum_{i=1}^n \gamma_i lEG_{t-i} + \sum_{j=1}^n \delta_j lFP_{t-j} + \mu_{2t} \dots \dots \dots (3)$$

**FP** = Fishery production given by the index of fishery production

**EG** = Economic growth given by real gross domestic product (₦ million)

**l** = Natural logarithm

## RESULTS AND DISCUSSION

### Analyses of Trends

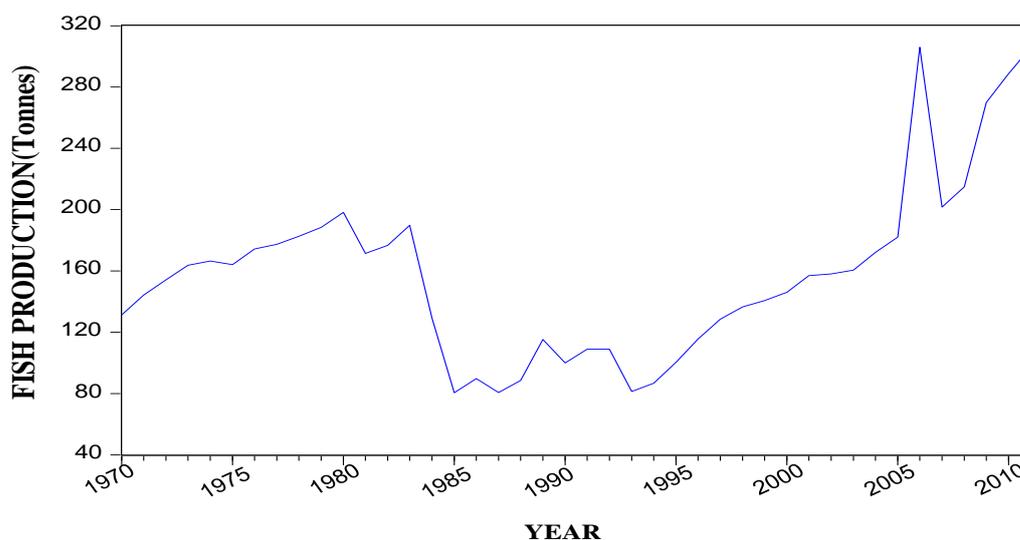


Figure 3: Trend of Fish Production in Nigeria(1970 – 2011)

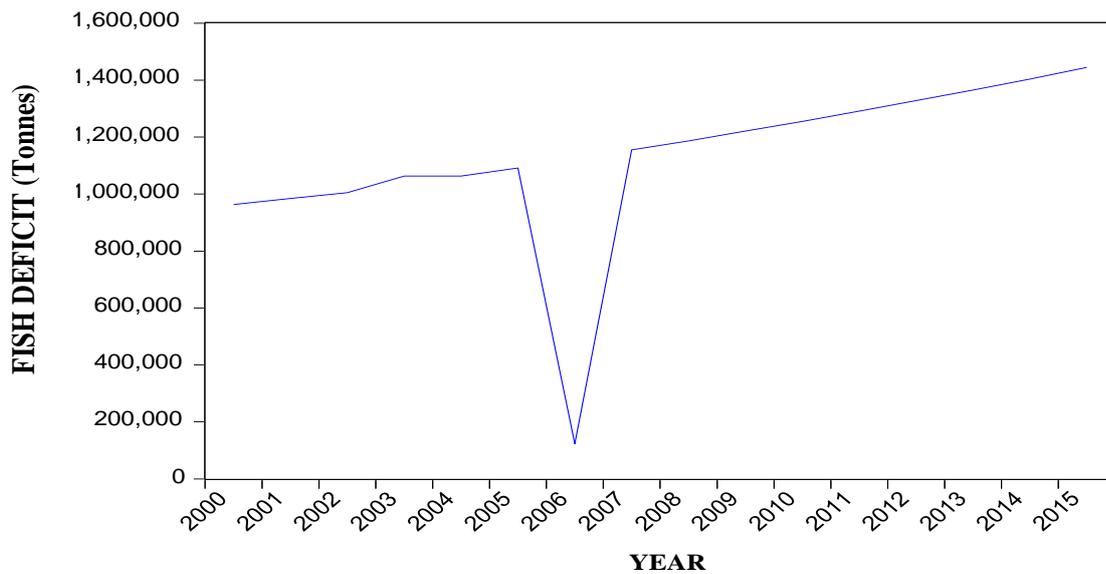


Figure 4: Trend of Fish Deficit in Nigeria(2000 – 2015)

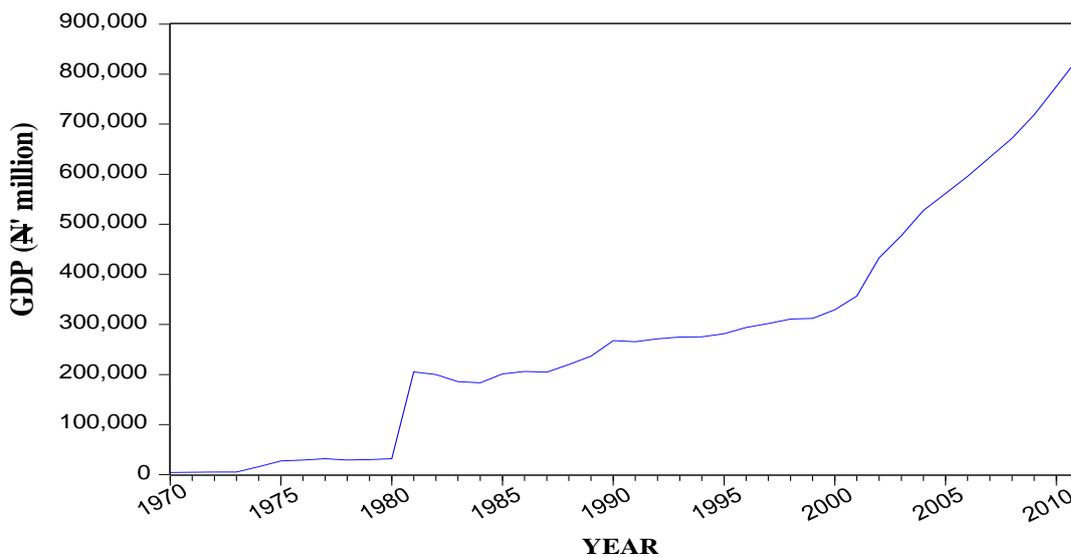


Figure 5: Trend of Gross Domestic Product in Nigeria(1970 – 2011)

The trend in fish production, fish deficit and gross domestic product in Nigeria as shown in figures 2, 3 and 4 respectively indicates that there has been an increase in fish production over the years with fluctuations but the observed increase has not been able to meet up with local demand with the demand – supply gap(fish deficit) rising much faster than the growth in fish production. Despite the rising fish deficit, gross domestic product has been on the increase largely from contributions of other sub – sectors of the agricultural sector and other sectors of the economy.

### Unit Root Test

Augmented Dickey Fuller (ADF) unit root test was used to examine the presence of stationary in the variables of employed in this study. The ADF test was performed at level form as well as first difference form. The outcome of ADF test at level form given in Table 1 indicates that *LFP* and *LEG* are non-stationary which implies that they are integrated of order one and needed to be differenced once to make them stationary leading to the acceptance of the null hypothesis of the ADF test. The ADF test at first difference form indicates that the variables became stationary after differencing them once leading to the acceptance of the alternative hypothesis of the ADF test.

**Table 1: Augmented Dickey Fuller Unit Root Test Result**

Variables	ADF Test Statistics (Level Form)	Inference	ADF Test Statistics (First Difference)	Inference
<i>LFP</i>	-1.150549	NS	-6.787732	S
<i>LEG</i>	-2.108588	NS	-6.203834	S

**NB:** NS means non-stationary, S means stationary

### Causality Test

Estimation of pairwise granger causality test is sensitive to lag length and therefore, the optimal lag length utilized in the granger causality test was determined using three criteria(LR, FPE, AIC and SIC) produced from an unrestricted Vector Autogression(VAR). An optimal lag length of one was selected as shown in Table 2. The result of granger causality as shown in Table 3 indicates that there is no causal relationship(independence) between fishery production and gross domestic product leading to the acceptance of the null hypothesis. This observed empirical result implies that fishery production was not significant in influencing economic growth over the period under study and this suggests that despite the contribution of fishery, it has not achieved much in Nigeria's economy relative to the well documented huge potentials of fishery in Nigeria. This finding agrees with Fagbenro, Akinbulumo, & Ojo (2004), who noted that despite the considerable prospects and potentials of commercial aquaculture, the contribution of aquaculture to the Gross Domestic Product (GDP) has not been encouraging. This anomaly can be attributed to the sharp rising fish deficit in Nigeria as shown in figure 3 leading to the loss of considerable foreign exchange earnings annually due to the growing fish importation to bridge demand-supply gap. This is in consonance with Oota, (2012) who reported that the high volume of fish importation constitutes a huge drain in the nation's foreign exchange reserve while the pressure of demand on limited supply translates to high prices of fish and its products in the country. The result of this study has implication on the pursuit of economic development through agricultural transformation by the present administration in Nigeria.

**Table 2: Result of Vector Autoregression(VAR) Lag Order Selection Criteria**

Lag	LR	FPE	AIC	SIC
0	NA	0.148457	3.768269	3.855345
1	135.3729*	0.003441*	0.002928*	0.264158*
2	0.394409	0.004230	0.206819	0.642202
3	2.325625	0.004888	0.345514	0.955051
4	5.852015	0.004976	0.352730	1.136420
5	8.562701	0.004521	0.239612	1.197455

NB: LR = likelihood ratio

FPE = Final prediction error

AIC = Akaike information criterion

SIC = Schwarz information criterion

**Table 3: Result of Granger Causality between Fishery Production and Economic Growth**

Null Hypothesis	Obs.	F statistic	Prob.
<i>I</i> FP does not granger cause <i>LEG</i>	41	1.46984	0.2329
<i>LEG</i> does not granger cause <i>I</i> FP	41	0.03508	0.8524

### Pathway for Sustainable Economic Development

Sequel to the non-existence of causal relationship between fishery production and economic growth over the period of 1970 to 2011 established by this study despite the huge potentials of the nation for fish farming and the drive for sustainable development of the economy through the agricultural sector in line with the nations transformation agenda, it is expedient for the nation to harness its untapped potentials for fish farming so as to make the fishery sub-sector of the agricultural sector a viable option for sustainable economic development. It is very important for adequate institutional framework to be put in place to enhance fish farming enterprise in a bid to achieve self-sufficiency in fish production, production of surplus for foreign exchange earnings through fish exportation, provision of employment opportunities along the fish value chain, contribution to the alleviation of poverty especially in rural Nigeria and ultimately offer a platform for sustainable economic development of Nigeria. This is feasible because of the favourable agro-climatic conditions, vast water bodies in Nigeria that is yet to be put into use for fishery production and the available local and international market for fish.

### CONCLUSION

This study has been able to provide empirical information on the nature of relationship between fishery production and economic growth in Nigeria and the perspective for sustainable development of the economy. Time series data over the period of 1970 to 2011 data obtained from various publication of the central bank of Nigeria were utilized in this study. The tools of data analysis employed in the study included augmented dickey fuller unit root test, unrestricted vector autoregression lag order selection test and the pairwise granger causality test. The result of the data analysis showed that there was no causality between fishery production and economic growth and this implied that there has been no significant relationship between fishery production and economic growth over the period of the study. This was

attributed to the low domestic production of fish in Nigeria resulting from the non-optimization of the nation's immense potentials in fish farming leading to the loss of foreign exchange earnings in the importation of fish to meet local demand. Therefore, it is recommended that adequate measures should be put in place for Nigeria to harness its huge production and market potential for fishery geared towards ensuring that the fishery sub-sector contributes significantly to the sustainable development of the economy.

## REFERENCES

- Adetunji, A.A.(2011). Fish Production, Poverty Alleviation and Cooperative Success of Eriwe Cooperative Fish Farm at Ijebu-Ode, Ogun State, Nigeria. Unpublished Bachelor of Aquaculture and Fisheries Management Project, University of Agriculture, Abeokuta, Ogun State, Nigeria.
- Adewumi, A. A. & Olaleye, V.F.(2011). Catfish culture in Nigeria: Progress, Prospects and Problems. *African Journal of Agricultural Research*, 6(6): 1281-1285.
- Adewuyi, S. A., Phillip, B. B., Ayinde, I. A. & Akerele, D.(2010) Analysis of Profitability of Fish Farming in Ogun State, Nigeria. *Journal of Human Ecology*, 31(3): 179 -184.
- Akankali, J.A. & Jamabo, N.A.(2011). A Review of Some Factors Militating Against Sustainable Artisanal Fisheries Development in Niger Delta, Nigeria. *Asian Journal of Agricultural Sciences*, 3(5): 369-377.
- Akinrotimi, O.A., Abu, O.M.G. Ibemere, I.F. & Opara C.A. (2009). Economic viability and marketing strategies of periwinkle *Tympanotonus fuscatus* in Rivers State, Nigeria. *International Journal of Tropical Agriculture & Food systems*, 3(3): 238 – 244.
- Akinrotimi, O.A., Abu, O.M.G. & Aranyo, A.A.(2011). Environmental Friendly Aquaculture Key to Sustainable Fish Farming Development in Nigeria. *Continental Journal Fisheries & Aquatic Science*, 5 (2): 17 – 31.
- Areola, F. O. (2007) Fish marketing and export potentials of fish and fisheries products of Nigeria. A lecture delivered at educative and informative aqua-culture workshop and aqua-exhibitions tagged: sustainable fisheries livelihood, management and food security in Nigeria. 23pp.
- Central Bank of Nigeria, (2008). Statistical Bulletin, Golden Jubilee Edition.
- Central Bank of Nigeria, (2011). Annual Report for the Year Ended 31st December 2011.
- Dickey, D.A. & Fuller,W.A.(1979). Testing for Serial Correlation in Least Square Regression. *Econometrica*, 58: 20 – 35.
- Ejiola, M.T, & Yinka, O.F.(2012). Comparative Cost Structure and Yield Performance Analysis of Upland and Mangrove Fish Farms in Southwest, Nigeria. *International Journal of Agricultural Management & Development*, 2(3): 187-198.
- Food and Agriculture Organization, (2007). Food and Agriculture Organization of the United Nations. The state of World Fisheries and Aquaculture 2006. FAO Fisheries Department, Rome Italy, 30pp.
- Federal Department of Fisheries, (2008). Federal Department of Fisheries, Fisheries Statistics of Nigeria Projected human population; fish demand and supply in Nigeria, 2000 – 2015. 56pp.
- Fagbenro, O.A., Akinbulumo, M.O. & Ojo, S.O. (2004). Aquaculture in Nigeria – Past Experience, Present Situation and Future Outlook (history, status and prospects). *World Aquaculture*, 35 (2): 23 – 26.
- George, F.O.A., Olaoye, O. J., Akande, O. P. & Oghobase, R. R.(2010). Determinants of Aquaculture Fish Seed Production and Development in Ogun State, Nigeria. *Journal of Sustainable Development in Africa*,12(8): 22 – 34.
- Granger, C.W. & Newbold, P. (1974) Spurious Regressions in Econometrics. *Journal of Econometrics*, 2: 111 – 120.
- Nwiro, E.(2012) Fish Farming a Lucrative Business. Accessed online 20<sup>th</sup> October 2012 from <http://www.thisdaylive.com/articles/fish-farming-a-lucrative-business/119253/>
- Obiyai, K.K. & Ekubo, N.A.(2011). Development of Entrepreneurship Skills Training Module on Fish Breeding and Hatching Occupation. *Asian Journal of Agricultural Sciences*, 3(2): 111-114.
- Oota, L.(2012). Is Nigeria Committed to Fish Production. Accessed online 20<sup>th</sup> October 2012 from <http://blueprintng.com/2012/07/is-nigeria-committed-to-fish-production/>

Osagie, C.(2012). Aquaculture as Path to Thriving Agriculture. Accessed online 5<sup>th</sup> October 2012 from <http://www.thisdaylive.com/articles/aquaculture-as-path-to-thriving-agriculture/124614/>

Rondon, M. & Nzeka, U.(2010). Strong Demand Continues Expanding Fish Exports to Nigeria. Global Agricultural Information Network(GAIN).

Sanni A. O., Olowosegun, T., Sule, A. M., Muhammed, A., Yem, I.Y. & Onimisi, H. U.(2009) Capacity Building and Training Requirement For Effective Fisheries And Aquaculture Extension In Nigeria - A Review. *Nature & Science*, 7(4): 66 – 71.

Tijani, B.(2011). Federal Ministry of Agriculture and Rural Development Action Plan Towards the Attainment of a Sustainable Agricultural Transformation in Nigeria. Being a Lead Paper Delivered at the World Food Day Seminar, Agricultural Show Ground Keffi Road, Abuja, Nigeria. pp. 1 – 10.

United States Agency for International Development, (2010). Best Management Practices for Fish Farmers in Nigeria. USAID Markets Programme – Nigeria. pp. 1 – 38.

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