2018

The National Economic Impact from Agriculture: Gwagwalada Case Study.

Ejiro U. Osiobe

Ane Osiobe International Foundation

5/13/2018

The National Economic Impact from Agriculture: Gwagwalada Case Study.

May 2018

Prepared for public use by:

Ejiro U. Osiobe B.sc, M.A
CFO *Ane Osiobe International Foundation*
jiji@aneosiobe.ngo

Ane Osiobe International Foundation

In partnership with

Ane Osiobe Trendsetters Series (TSS)

Abstract:

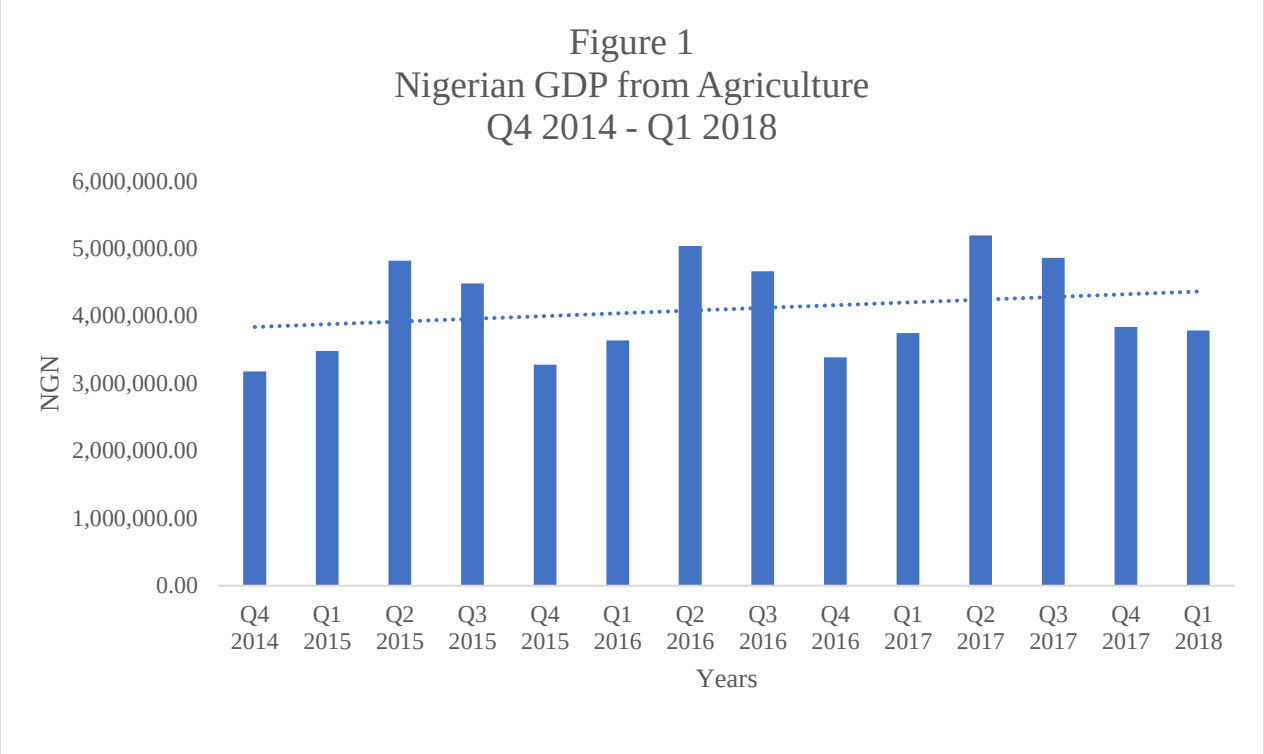
This paper uses the economic impact model IMPLAN to estimate the economic impact(s) from a Cassava and Fish farm development in the city of Gwagwalada, Nigeria. The project-specific impact is estimated at the aggregate level of the Nigerian economy (i.e., the impact(s) of Ane Osiobe Altruism Farm on the Nigerian economy as a whole). The primary economic policy question addressed in this study is how Cassava and Fish farm production in Gwagwalada, Nigeria affects the nation's economy. During the starting phase of the farm, it is estimated that the farm will employ approximately two farmers full-time and five part-time workers for both the Cassava and Fish farm, giving a total of approximately ten to thirteen new jobs that will be created in the city of Gwagwalada. In the running phase of the project, it is expected that Ane Osiobe Altruism Farm will employ approximately thirteen workers on the farm site (both full and part-time workers). The total economic activity to the nation would be substantial, equating to approximately ₦ 4,122,761.90k as the net impact in the first year and ₦ 6,159,243.10k as the net impact in the subsequent years. Given the current level of impact(s) observed by other farms in Nigeria and the potential for increased impact(s) due to optimal utilization of mechanized farming equipment's and trained industry-specific labors, Gwagwalada appears to be well positioned and equipped to see increasing impact(s) from the Ane Osiobe Altruism Farm.

Keywords:

Economic impact study, Ane Osiobe Altruism Farm, Federal Capital Territory, Gwagwalada

Introduction:

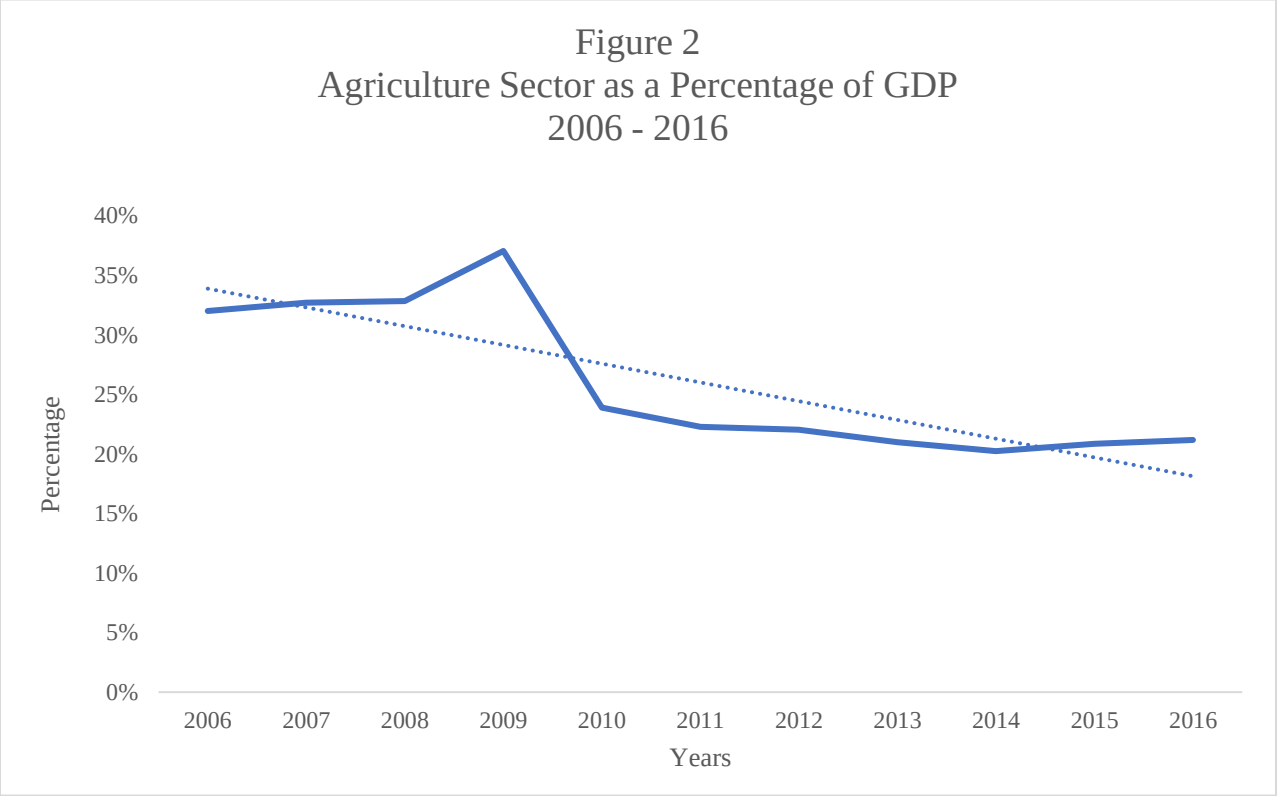
Agriculture is recognized as an essential sector of the Nigerian economy, accounting for 21.18% contribution to Nigeria's Gross Domestic Product (GDP) (Central Bank of Nigeria, 2016). On average, the GDP from the agricultural sector is ₦ 3,771,185.70k, with a high of ₦ 5,189,365.99k and low of ₦ 2,594,759.86k.



Source: Trading-Economic | National Bureau of Statistic, Nigeria.

Social and political support for agriculture has been growing stronger, as some states in Nigeria (Adamawa, Borno, and Yobe) were declared to be in famine as of Feb. 2017 by the United Nations (UN) (The Guardian News Paper, 2017). Agricultural farms are part of the social and political environment, and movement that influences how agricultural farms operate and supply produce to different parts of Nigeria. If food production in Nigeria is to be sustainable, it

is critical to understand the net contribution of the agriculture sector to the total GDP of the economy. Figure 2 shows the participation of the agricultural sector to the entire GDP of Nigeria.



Source: National Bureau of Statistic, Nigeria.

Many of the impact(s) from agriculture are recognized as predominantly local (e.g., rural to urban farm production transitions). While in Nigeria, the public supports the agriculture industry, starting a new farm in any community, especially by non-indigenes, is a trend that has frequently raised concerns in local rural communities. Among these concerns are question(s) about community reinvestment, as most of the farms don't reinvest in the local communities they operate in. Advocates often argue that these agricultural operation(s) are beneficial to most rural small towns and have zero social or private cost on the communities. On the other hand, critics in these communities have asserted that the agricultural project(s) have little lasting local economic impacts in their communities. Economic development today emphasizes favorable and

sustainable economic climate, where job creation is paramount and such questions carry greater weight. In the past, studies of economic impact from starting and running a Cassava and Fish farm in Nigeria suggest that the economic implications to the local government area, state, and country are substantial. However, few studies have sought to quantify these impacts.

This paper uses the data from (Enyinnaya and Osiobe, 2017) and the optimization results from (Enyinnaya, 2018) to analyze the economic impact(s) of starting and running the Ane Osiobe Altruism Farm in Gwagwalada, Nigeria. The IMPLAN model was used to assess and analyze the economic impact(s) from the farm. The project-specific impacts are estimated at the national level. The primary economic policy question addressed in this study is how this investment affects the Nigerian economy, and where the Cassava and Fish farm will be located (Gwagwalada). The results presented in the study will include total jobs created, labor income, value-added, benefits, overall economic output (activity) in the community, direct, indirect, induced, and total effect. This analysis also discusses agriculture trends that are likely to influence economic impacts of continued farming in Gwagwalada and the nation.

About Ane Osiobe Altruism Farm:

Ane Osiobe Altruism Farm will be located at Gwagwalada, CKC district, FCT, Nigeria. Gwagwalada is one of the six local government area councils of the Federal Capital Territory of Nigeria. Gwagwalada land mass is about 1,043 km2 and has a population size of 157,770 at the 2006 census.

The Federal Capital Territory is one of the fastest growing areas in Nigeria due to its political status as the nation's capital city as well as its geographical location (Enyinnaya and Osiobe, 2017). The FCT grand-master plan of (2000), illustrates the location of FCT. The study shows that the FCT lies between latitude 8º 25' and 9º 25' North of the equator and longitude 6º

45’ and 7º 45’ East of the Greenwich meridian (Aondoakaa, 2012). The FCT is located in an area known as the middle belt region of Nigeria. The size of the capital is about point eight percent (0.008) of Nigeria. FCT shares borders with four states: Kaduna in the North; Nassarawa in the West; Kogi in the South; and Niger in the East. The capital has a land mass of 8,000 square kilometers (Km2). The Ane Osiobe Altruism Farm was established to support the feeding of students at the Special Needs School (Abuja School for the Blind) located in Jabi, FCT, Nigeria.

Why Impact Analysis is Important:

Recently, policymakers have placed a significant amount of attention on fiscal and economic policies at the federal, state, and local level; however, many urban and rural communities have faced various economic challenges over the past few decades, varying from the great depression of the 1930s to the great recession of 2007 – 2010.

The scaling of agricultural produce led to the creation of more jobs, lease for landlords, better opportunities, the opportunity for construction, manufacturing, maintenance, and increases in tax revenues for the government. The economic impact is multi-faceted, or, to put it another way, a chicken and egg dilemma. A project’s overall impact(s) depends on the availability of resources and the ability of local businesses to participate in agricultural production in the city of Gwagwalada, as well as the preference and participation of individual independent contractors. In most extreme cases in Nigeria, agricultural production can begin with little capital, which in turn results in little or zero economic impact or value for the locality or host community where the project or farm is sited. Tracing the distribution of effects within the federal, state, and local economy is essential to understanding the value of agriculture for the localities where the project(s) are sited. The information from an impact study can help and guide policymakers

when creating new policies, to ensure that the federal, state, and local communities are capturing the impact they desire or wish to see in their communities.

Literature Review:

The Crompton (2001) study presented a generalized model for understanding how to write, analyze, and interpret an economic impact study. The paper offered a conceptual rationale for undertaking an impact study regardless of the software one is using either IMPLAN, JEDI, RIMS II, REMI, or a Dynamic System Model (DSM). The author presented four principles to guide our research process and how to carefully interpret the input-output result(s).

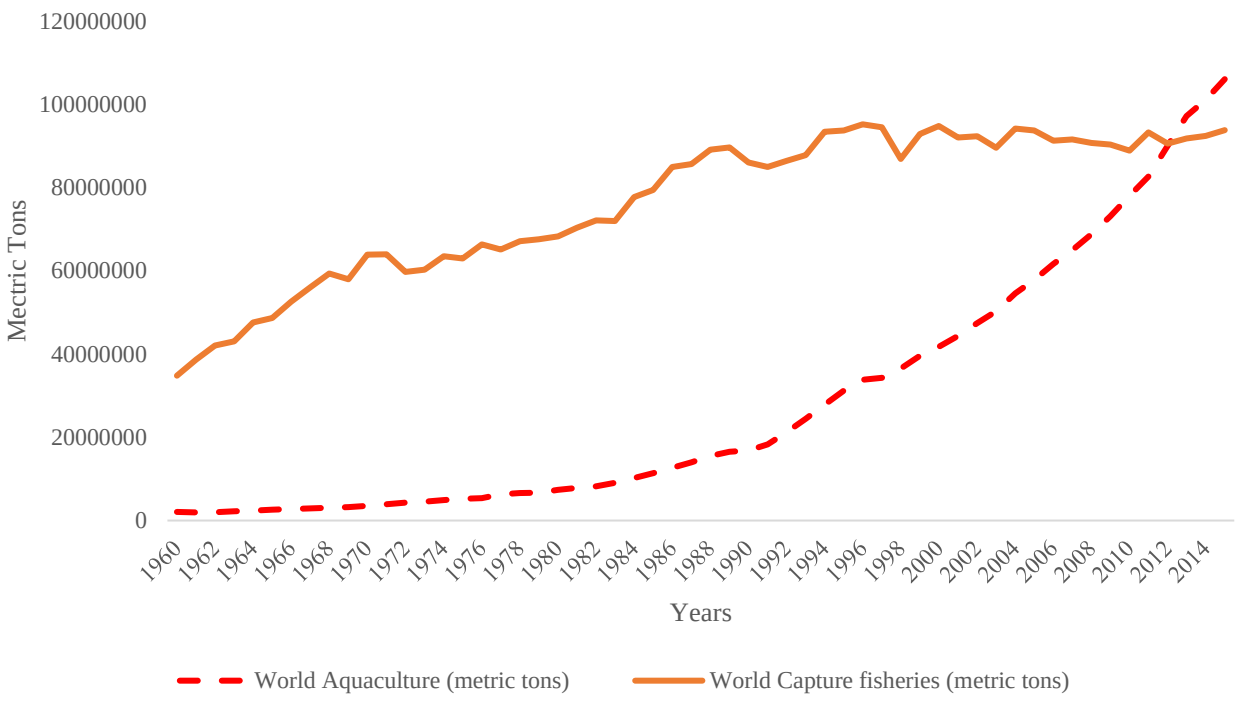
Cassava Production:

The cassava plant is also known as Yuca, Manihot esculenta, Manico, Mandioca, or the Brazilian arrowroot. It is a perennial shrub from the family *Euphorbiaceae*. This crop is grown in the tropic areas of the world—such as Nigeria, Ghana, Brazil, and Paraguay—and some other countries, such as Thailand and Indonesia, because of its starchy tuberous root, which is consumed by man and fed to animals. Cassava is a famous staple food crop in West-Africa and a significant source of income to rural communities. As a ground rooted crop, Cassava has excellent resistance to many pests and diseases, making it an essential food crop to enhance food security; this is why most rural communities support its growth. Cassava value-added products include, but are not limited to, garri and fufu, as they are easy to prepare. Cassava is used as an industrial raw material to produce alcohol, gums, pharmaceuticals, and confectionaries. Presently, Nigeria is among the most significant producer of cassava in the world, with an annual production of 38.6 million tons. This is because of the development of high yielding cultivars followed by improved production technologies. (Toluwase S.O et al. 2013).

Fish Production:

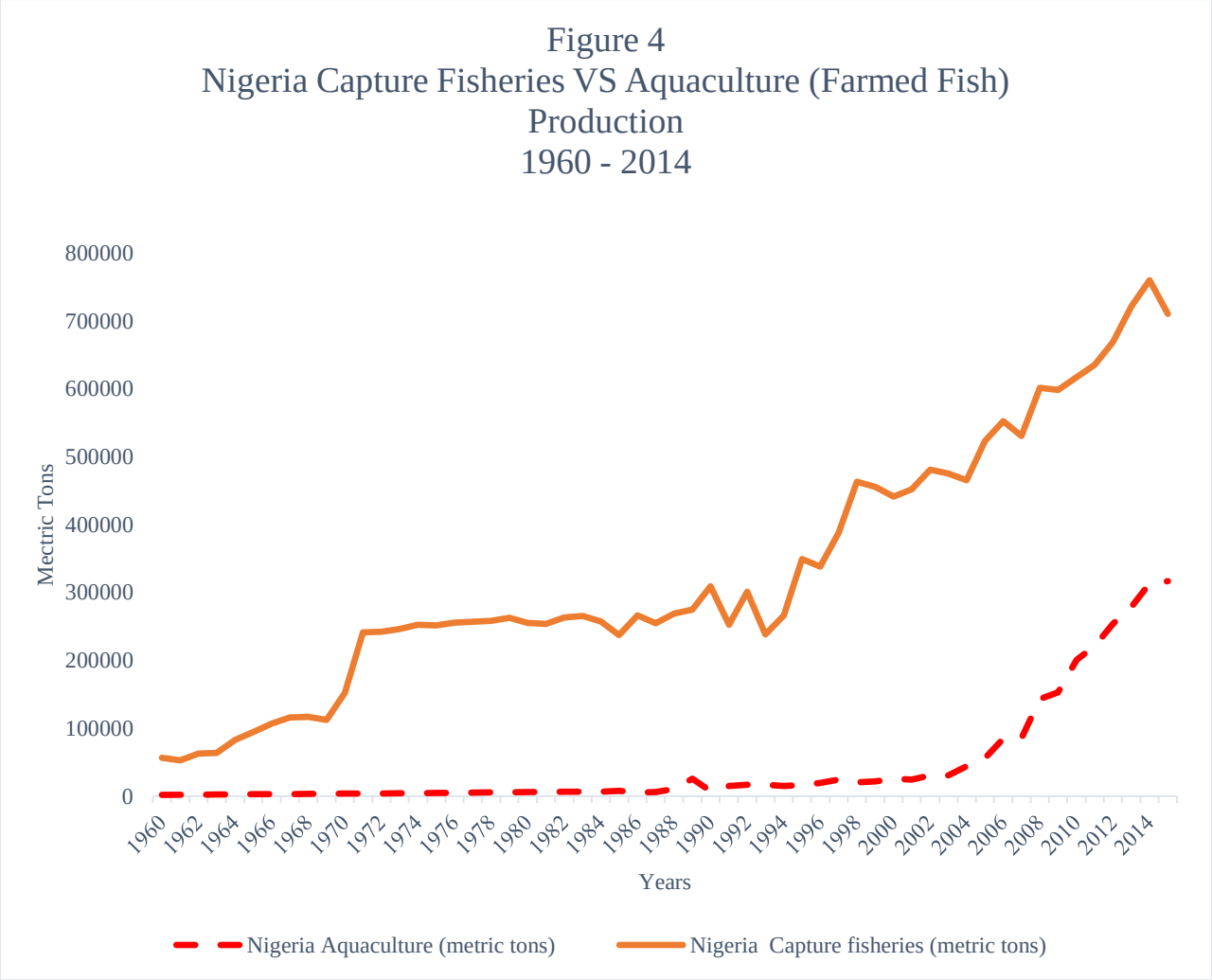
Fish production makes up a high percentage of the total world supply of animal protein. In West-Africa, fish production has helped significantly reduce the epidemic of anemia, kwashiorkor, and other ailments resulting from protein deficiency (Enyinnaya and Osiobe, 2017). There are several economic importance of fish production, including but not limited to improvement in nutrition, job creation, agro-industrial development, foreign exchange/trade and overall development of rural areas (Toulwase S.O et al., 2013).

Figure 3
World Capture Fisheries VS Aquacture (Farmed Fish) production
1960 - 2014



Source: World Bank – World Development Indicators

The annual production of seafood from wild-catch fisheries and aquaculture (farmed seafood) practices are measured in metric tons per year. Figures 3 and 4 show the yearly figures of fish caught, as reported by the UN Food and Agricultural Organization (FAO).

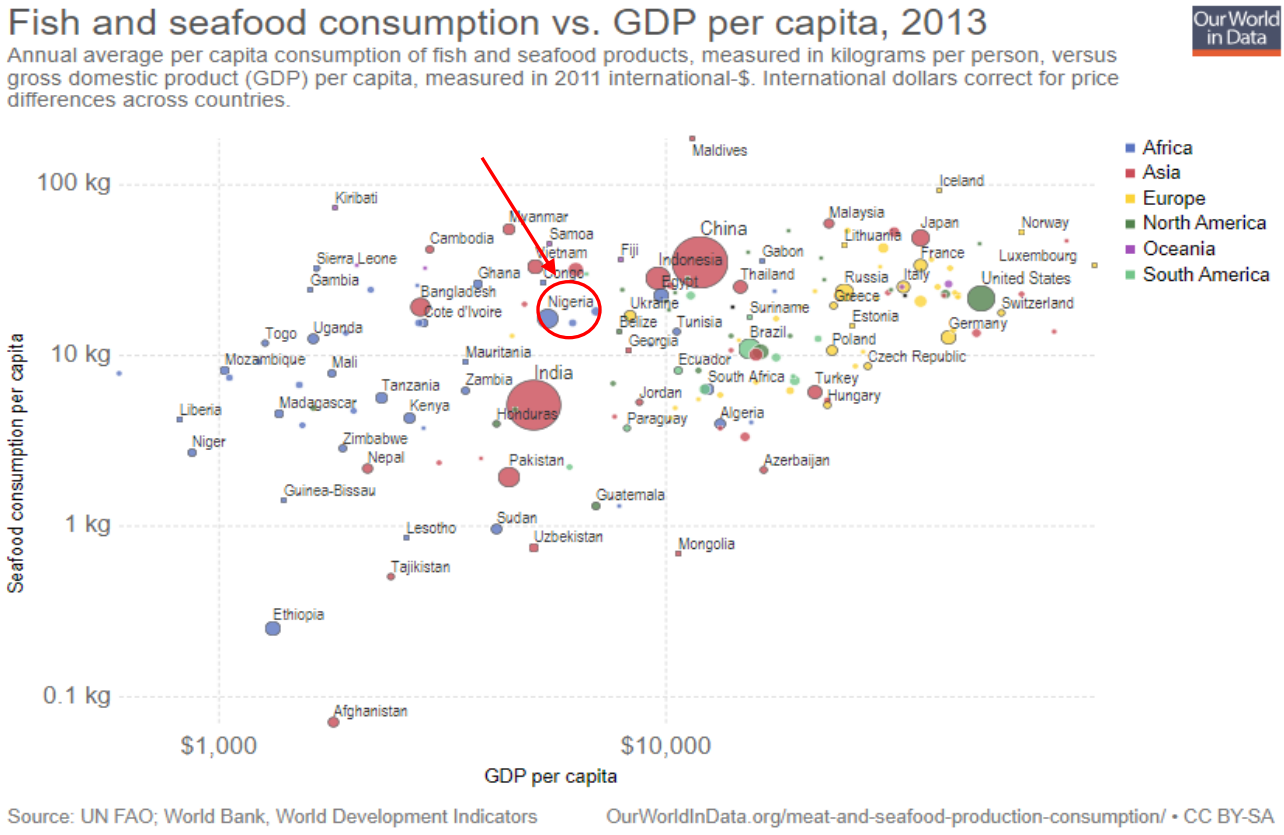


Source: World Bank – World Development Indicators

Figures 3 and 4 shows the total production from wild fisheries, and aquaculture (fish farming) across all seafood types (including fish, crustaceans, and sea plants). Figure 3 shows that global catch from wild fisheries has had little or no change, while that of Nigeria in Figure 4 has been increasing over the years. While aquaculture worldwide has grown rapidly, particularly

over the last 20 years, that of Nigeria has only begun to grow over the last ten years. Global aquaculture production is greater than the wild fishery caught, but not so for Nigeria.

Figure 5



Methodology:

To analyze the economic impact of the farm project in Gwagwalada, Nigeria, this study utilized the IMPLAN software. The appropriateness of this model for this study was determined as a result that IMPLAN is the only Input-Output data company that has the aggregate labor force data for Nigeria.

About IMPLAN Software:

IMPLAN is wholly an input-output model. It is non-survey based, and its structure typifies that of input-output models found in the regional science literature. Like REMI, IMPLAN assumes a uniform national production technology and uses the regional purchase coefficient approach to regionalize the technical coefficients (Lynch 2000). The IMPLAN model generates two types of multipliers: Type I multipliers and Type III multipliers. The difference between the two IMPLAN multipliers is as follows:

1. Type I and Type III multipliers both have an induced consumption affect. IMPLAN's Type III multiplier differs from the standard Type I multiplier in the following ways:
    a. The consumption function is nonlinear; that is, the marginal propensity to consume is not constant, decreasing as income in the region rises.
    b. Population thoroughly responds to employment changes and drives consumer spending. Multipliers are generated for employment, output, value-added, personal income, and total income.

The IMPLAN Input-Output Model

The IMPLAN model software is a regional input-output modeling system created by the Minnesota IMPLAN Group. The modeling system is an interactive, computer-based modeling system capable of producing input-output accounts and input-output models for any region(s) in the United States as small as a single county and the national level for other countries across the globe.

The system consists of regional databases and software that allows users to develop these models to describe the structure of local economies and predictive analyses, especially those

associated with estimating the economic impacts of a quantifiable change in regional production. The data regarding inter-sector relationships used for this analysis are from 2011.

National Industry Data

The IMPLAN model uses national production functions for nearly 500 industries to estimate how an industry spends its operating receipts to produce its goods and services. The model also uses a national matrix to determine the byproducts that each industry generates. To analyze the impacts of household spending, the model treats households as an "industry" to determine their expenditure patterns. IMPLAN couples the national production functions with a variety of National-level (in the case of Nigeria) economic data to assess the impacts of every case analyzed with the software.

County-Level Economic Data

To estimate the national-level impacts, IMPLAN combines national industry production functions with state and local government areas economic data. IMPLAN collects its data from a spectrum of economic, industrial, and financial sources to generate average output, employment, and productivity for each industry. IMPLAN also receives data on average prices for all the goods and services sold in the local, state, and national economy.

Multipliers:

The IMPLAN software integrates these data collected from their various sources to create a variety of Type I and III multipliers for the national economy of Nigeria. The multiplier analyzes the total economic activity that results from industry (or household) spending an additional dollar in the local, state, and national economy. Based on these multipliers, IMPLAN

generates a series of tables to show the economic effects: the direct, indirect, and induced impacts.

The Direct Effect (DE):

The DE refers to the dollar value of economic activity instigated in the economy due to the start of that project. In the case of a farm in the city of Gwagwalada, the direct impacts are equal to the original farm equipment and tools needed to start that is the farm and the farmers discretionary spending. The DE does not include household savings and payments to federal, state, and local taxes, as these payments do not circulate through the economy (Richmond, 2018). The direct effect is the immediate consequences of a change in economic activity or policy.

Indirect Effect (IE):

The IE refers to the inter-industry impacts of the input-output analysis. In the case of the new farm in Gwagwalada, indirect impacts result from spending by the local and regional companies that the new farm and farmers buy their tools and equipment from. More examples include but are not limited to retail establishments, farm service providers, and other firms use the payments they receive from new farm and farmers to purchase equipment and supplies, rent space, pay their employees, etc. The indirect effect is the second-round consequence of a change in economic activity or policy. It occurs when one industry purchases input-materials from another industry.

Induced Effect (INE):

The INE refers to the impacts of household spending by the employees generated by the DE and ID. In other words, INE results from the farm spending of employees of business

establishments that the new farm and farmers patronize (direct) and their suppliers (indirect). The IMPLAN model accounts for local commute patterns in the geography. The INE is a result of the employees of the new farm project (farmers) spending their wages in the local economy of Gwagwalada.

Other terms used in the study include: employment, which is the amount of labor required for the job; labor income, which consists of the employees' wages; value added, which refers to the change in the values of a good or service during each stage of production; total effect, or the total of the direct, indirect, and induced effects; and output, which refers to the gross industry expenditure.

Results:

The economic impact results are reported for full-time job(s) equivalent, earnings, total value added, and total output. The results are divided into two main groups, the starting phase and the operating phase. The Enyinnaya (2018) optimization study on Ane Osiobe Altruism Farm provides our study with the base, first, and second iteration assumptions used to carry out our impact analysis. A summary of the optimization result can be seen in the appendix section of the study Table 11 – 12 and Figure 10.

Table 1
Analytical Categories

Meaning	**Acronym**
Starting the Cassava Farm	SCF
Starting the Fish Farm	SFF
Base Iteration Operating both the Cassava and Fish Farm	BOCFF
First Iteration Operating both the Cassava and Fish Farm	FOCFF
Initial Farmer Operating a Mazie farm	OMF
Base Iteration Net Operating Impact (BOCFF – OMF)	BNOI
First Iteration Net Operating Impact (FOCFF – OMF)	FNOI
Nigerian Naira	NGN

The estimated annual impact of Ane Osiobe Altruism Farm to the city of Gwagwalada from starting and operating the Cassava and Fish Farm project is shown in Figures 6 – 9. Specific numbers can be seen in the appendix section or the report. See Tables 2 – 10.

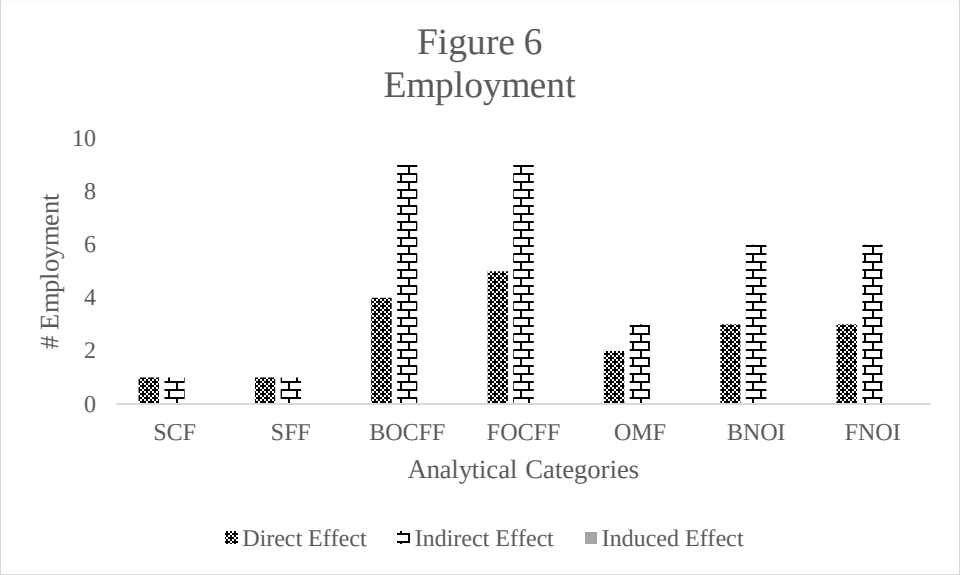


Figure 6 shows the total employment per capita of each analytical category.

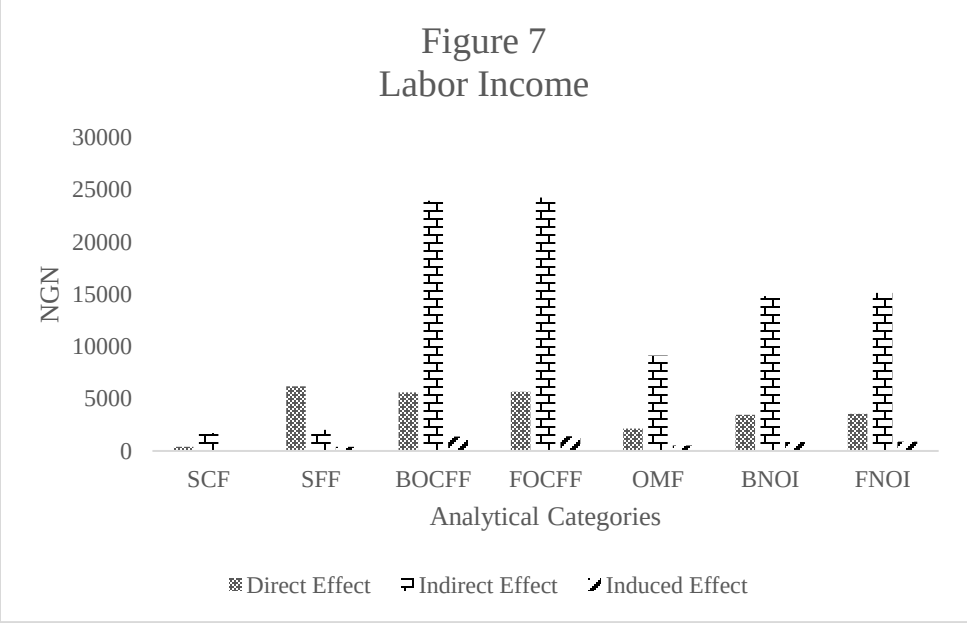


Figure 7 shows the labor income per capita of each category.

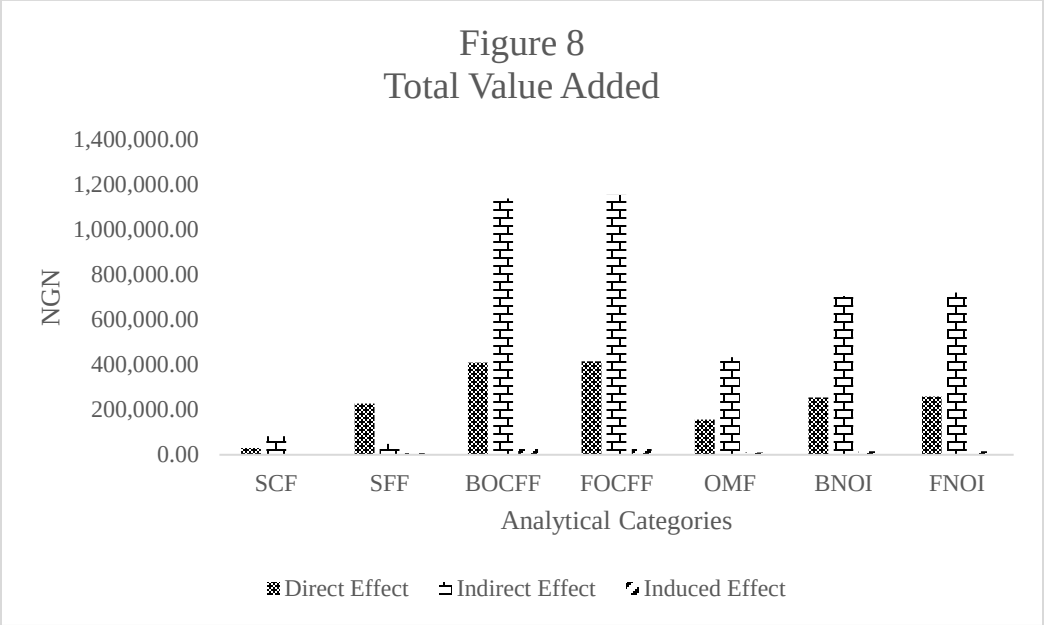


Figure 8 shows the total value added for each category.

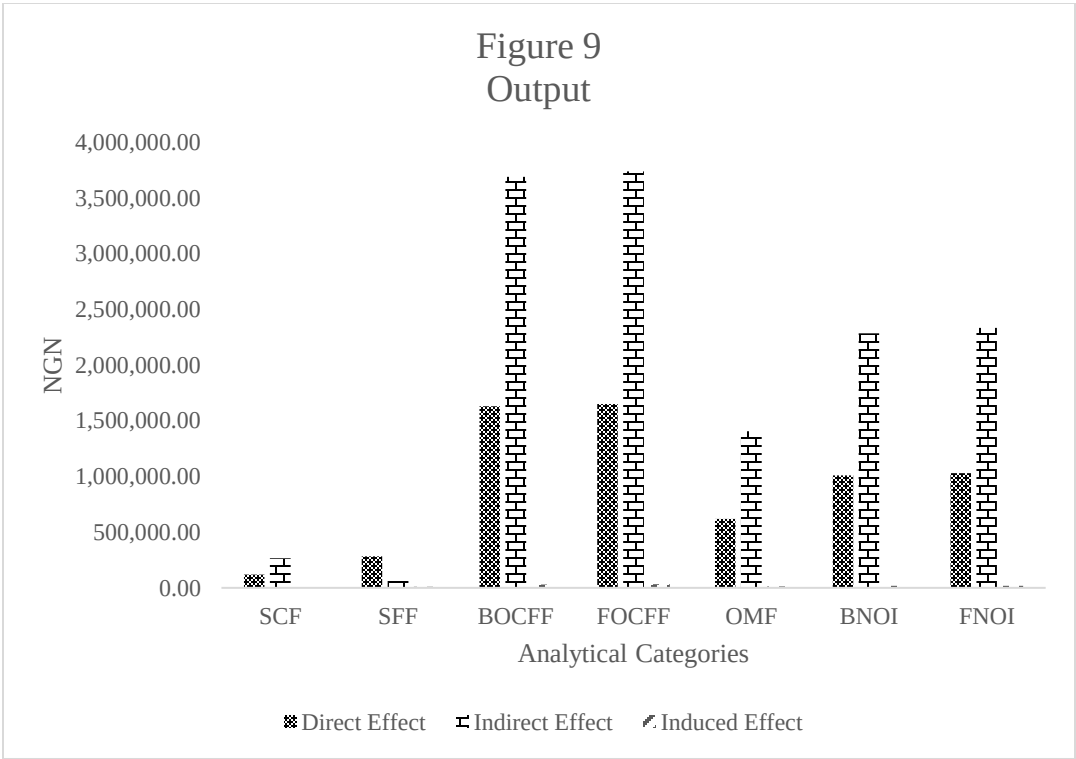


Figure 9 shows the total value added for each category.

Discussion and Policy Implication:

Economic development considerations in studies of agricultural produce impacts typically focus on the state and local level jobs because of the low capital cost for starting a small farm in a rural community. The starting and operating of a Cassava and Fish Farm can present a long-term, significant, infusion of money into the local economy of Gwagwalada.

Ultimately, the level of impacts and their distribution depends on the extent to which the local economy can directly participate in the construction, starting phases, operating phase, and ownership of a project. Because community farm project is common in Gwagwalada, and they constitute to about 70% of total farm capacity in FCT, the impacts are more often a function of the ability of the local societies to supply goods and services, labor force both for the construction and operations phase. Likewise, the ability of local businesses to participate in a project is a function of local economic development, developer preferences, and whether or not the industries affected by farm projects are situated in the community.

The Gwagwalada focus of this study provides a unique perspective on the question(s) of the economic impact of agricultural produce. Over time, a variety of factors are likely to influence the total economic development activities captured by the nation of Nigeria as a whole as the distribution of those economic impact within a given country. Workforce development and technical training programs may increase the number of skilled agricultural workers in Gwagwalada and in specific localities where larger ongoing aggie organizations are sited. On the other hand, if such programs are not accessible to individuals living in localities where agricultural projects are sited, the development and training of skilled construction and operating

workers may not boost economic growth and development at the level of the project host community.

Economic development impacts the nation, state, and a few specific localities (Gwagwalada) where there is a skilled agricultural industry labor force will grow. Impacts to rural communities and local government may not grow and may even be reduced, because other highly trained and specialized workers are available in neighboring local government areas or region. In today's agricultural industry, workers often live in the communities where the project are sited; however, the development of remote monitoring and operations capabilities could reduce the demand for local skilled labor.

Conclusion:

This study shows the economic impact of the construction and running the Ane Osiobe Altruism Farm at Gwagwalada, Nigeria. The project has a positive impact on Gwagwalada and Nigerian economy. Our results were generated from the IMPLAN software, and the study observed the direct, indirect, and induced effect of starting and operating the Cassava and Fish Farm. Other results provided by IMPLAN include top ten industries affected (see appendix). Based on our results, it is agreeable to say it will be in the best interest of Gwagwalda if the project is carried out.

Acknowledgments:

Dr. S.A. Osiobe funded this work and the contribution of Ane Osiobe International Foundation in this project. As specified under the ethics statement of Ane Osiobe International Foundation, Ane Osiobe Trendsetters series is dedicated to providing the public with transparent, unbiased information to help foster growth and development in Africa.

References

Abdu-Raheem, S.O. Toluwase and K.A. "Cost and Returns Analysis of Cassava Production in Ekiti State." *Scholarly Journal of Agricultural Science*, 2013: Vol. 3 (10) pp. 454 - 457.

David W. Archer, Julie Dawson, Urs P. Kreuter, Mary Hendrickson, and John M. Halloran. "Social and Political Influences on Agriculture Systems." *Renewable Agriculture and Food System*, 2008: 23(4); 272-284.

Eninnaya, Joy C. "Economic Optimization of Agricultural Production in Abuja." 2018.

Enyinnaya, Joy and Ejiro Osiobe. "Cost-Benefit Analysis: The Ane Osiobe Altruism Farm of the Edison 3.0 Project 2017 Price Value." 2017.

Guide, IMPLAN Pro User's. *IMPLAN*. 2000. http://www.ci.richmond.ca.us/DocumentCenter/View/6474/Appendix_E (accessed May 12, 2018).

John L. Crompton, Seokho Lee, and Thomas J. Shuster. "A Guide for Understanding Economic Impact Studies: The Springfest Example." *Journal of Travel Research*, 2001: Vol. 40, 79 - 87.

Lynch, Dr. Tim. "Analyzing the Economic Impact of Transportation Projects Using RIMS II, IMPLAN, and REMI." 2000.

Richmond. "An Overview of IMPLAN." 2018.

S.C., Aondoakaa. "Effects of Climate Change on Agricultural Productivity in the Federal Capital Territory (FCT), Abuja, Nigeria." *Ethiopian Journal of Environmental Studies and Management*, 2012: EJESM Vol.5 no.4.

Appendix:

Table 2 Impact Summary SCF				
Impact Type	Employment	Labor Income ₦	Total Value-Added ₦	Output ₦
Direct Effect	0.3	404.0	29,571.3	117,640.0
Indirect Effect	0.6	1,728.8	82,145.8	266,516.0
Induced Effect	0.0	100.6	1,811.6	2,249.8
Total Effect	1.0	2,233.4	113,528.7	386,405.9

Table 3 Impact Summary SFF				
Impact Type	Employment	Labor Income ₦	Total Value-Added ₦	Output ₦
Direct Effect	0.4	6,191.2	227,678.7	284,073.0
Indirect Effect	0.1	2,026.7	47,739.3	60,838.6
Induced Effect	0.0	387.6	6,980.3	8,668.9
Total Effect	0.5	8,605.5	282,398.3	353,580.5

Table 4 Impact Summary BOCFF				
Impact Type	Employment	Labor Income ₦	Total Value-Added ₦	Output ₦
Direct Effect	4.2	5,593.9	409,470.8	1,628,947.9
Indirect Effect	8.9	23,938.8	1,137,463.4	3,690,417.6
Induced Effect	0.0	1,392.7	25,085.0	31,153.3
Total Effect	13.2	30,925.4	1,572,019.1	5,350,518.9

Table 6 Impact Summary FOCFF				
Impact Type	Employment	Labor Income ₦	Total Value-Added ₦	Output ₦
Direct Effect	4.3	5,665.7	414,731.2	1,649,874.9
Indirect Effect	9.0	24,246.4	1,152,076.3	3,737,828.2
Induced Effect	0.0	1,410.6	25,407.2	31,553.6
Total Effect	13.4	31,322.7	1,592,214.8	5,419,256.7

Table 7 Impact Summary OMF				
Impact Type	Employment	Labor Income ₦	Total Value-Added ₦	Output ₦
Direct Effect	1.6	2,129.1	155,850.2	620,000.0
Indirect Effect	3.4	9,111.4	432,934.2	1,404,623.7
Induced Effect	0.0	530.1	9,547.7	11,857.3
Total Effect	5.0	11,770.6	598,332.1	2,036,481.1

Table 8 Impact Summary BNOI				
Impact Type	Employment	Labor Income ₦	Total Value-Added ₦	Output ₦
Direct Effect	2.6	3,464.8	253,620.6	1,008,947.9
Indirect Effect	5.5	14,827.4	704,529.2	2,285,793.9
Induced Effect	0.0	862.6	15,537.2	19,295.9
Total Effect	8.2	19,154.8	973,687.0	3,314,037.7

Table 9 Impact Summary FNOI				
Impact Type	Employment	Labor Income ₦	Total Value-Added ₦	Output ₦
Direct Effect	2.7	3,536.6	258,881.0	1,029,874.9
Indirect Effect	5.6	15,134.9	719,142.1	2,333,204.4
Induced Effect	0.0	880.5	15,859.5	19,696.1
Total Effect	8.3	19,552.1	993,882.6	3,382,775.5

Table 10 Top Ten Industries for Employment						
#	Sector	Description	Total Employment	Total Labor-Income ₦	Total Value-Added ₦	Total Output ₦
1	1	Agriculture	8.2	10,826.7	792,519.2	3,152,783.1
2	21	Financial intermediation and business services	0.0	3,062.8	112,384.9	116,627.1
3	16	Wholesale Trade	0.0	1,517.4	18,617.2	22,591.7
4	13	Electricity, gas and water	0.0	245.0	4,643.9	5,596.0
5	7	Petroleum, Chemical and Non-metal mfg.	0.0	986.5	23,770.7	28,373.6
6	6	Wood and paper	0.0	447.5	7,096.4	8,328.6
7	4	Food and beverages	0.0	353.7	10,467.9	15,654.3
8	17	Retail Trade	0.0	149.0	1,624.1	2,589.8
9	9	Electrical and machinery	0.0	215.9	2,758.7	3,537.3
10	8	Metal products	0.0	185.8	2,170.2	2,650.1

Table 11 Comparison of First and Second Iteration:		
	First Iteration	Second Iteration
Total Gross Profit	₦ 1, 649, 874.92	₦ 1, 667, 893.73
Additional Cost	₦ 11, 250	₦ 37, 369.82
The difference from Base Iteration	₦ 20, 926.99	₦ 38, 945.82
Actual Benefit	₦ 9,676.99	₦ 1, 575.98
Percentage Increase of Benefit compared to Base Iteration	↑ 46%	↑ 4%

Table 12 **Break-Down Structure of Ane Osiobe Altruism Farm:**	
Base Iteration	
Total Land Size {Office Space} [Cassava] (Fish)	4 Hectares {0.9} Hectares [1.9] Hectares (1.2) Hectares
Total Labor Hours Total Cost (Per-Hour)	100 Hours ₦ 1, 462, 630.18 ₦ 500
First Iteration	
Total Land Size {Office Space} [Cassava] (Fish) "Cost Per – 0.5 Hectare"	5.11 Hectares {0.9} Hectares [2.14] Hectares (1.8) Hectares "₦ 1, 250"
Total Labor Hours Total Cost (Per-Hour)	100 Hours ₦ 1, 462, 630.18 ₦ 500
Second Iteration	
Total Land Size {Office Space} [Cassava] (Fish)	4 Hectares {0.9} Hectares [1.9] Hectares (1.2) Hectares
Total Labor Hours Total Cost (Per-Hour)	120 Hours ₦ 1, 500, 000.00 ₦ 500

Figure 10
Sensitivity Analysis