AGRICULTURAL ECONOMICS AND EXTENSION RESEARCH STUDIES (AGEERS)

2018, Vol 6, No.2

Promoting Agricultural Research

AGEERS

AGRICULTURAL ECONOMICS AND EXTENSION RESEARCH STUDIES

Promoting Agricultural Research

Vol. 6, No.2

ISSN: 2315-5922

2018

A PUBLICATION OF
THE DEPARTMENT OF AGRICULTURAL ECONOMICS AND EXTENSION,
UNIVERSITY OF PORT HARCOURT, NIGERIA

AGRICULTURAL ECONOMICS AND EXTENSION RESEARCH STUDIES

AGEERS

VOLUME 6 (2), 2018
ISSN: 2315 – 5922

A Publication of the Department of Agricultural Economics and Extension
Faculty of Agriculture, University of Port Harcourt
PMB 5323, Choba, Rivers State, Nigeria

IMPACT OF FADAMA III PROJECT ON IRISH POTATO FARMERS' INCOME IN PLATEAU STATE, NIGERIA

Jirgi A. J., Adebayo, C.O,[1]Fulus, D. F.
Department of Agricultural Economics and Farm Management, School of Agriculture and Agricultural Technology, Federal University of Technology, P.M.B. 65, Minna, Niger State, Nigeria
[1] National Examination Council Head Quarters, Minna, Niger State
E-mail: jirgi.abigail97@gmail.com

ABSTRACT

The study examined the impact of fadama III project on the income of Irish potato farmers in Plateau State, Nigeria. Data were collected from 127 beneficiaries and 118 non-beneficiaries of the project. Structured questionnaire complemented with interview schedule were used to obtain the require information to meet the objectives of the study. The data were analyzed using simple descriptive statistics, farm budgeting technique and Double difference estimator (DD) model. The results show a mean age of 47 years and 49 years for beneficiaries and non- beneficiaries respectively. The mean household size for beneficiaries and non- beneficiaries were six and five persons respectively. The farm budgeting technique result revealed that the Net Farm Incomes per hectare for the project beneficiaries and non-beneficiaries after Fadama III project were ₦ 160,889.27 and ₦ 119,566.28 respectively which is relatively higher than that of the non-beneficiaries. The t-test shows that the difference in the income of the two groups was significant at 5% level of probability. The findings further depict that the mean income difference of the project beneficiary farmers before and after the project intervention was ₦37,029.20 and was significant at 1%, while non-beneficiary farmers was ₦4,371.65. A positive mean double income difference of about ₦32,657.35 was realized between beneficiaries and non-beneficiaries before and after Fadama III project. Considering the fact that the project has positive impact on the income of the beneficiaries it is recommended that agricultural key stake holders in Plateau state ensure sustainability of operations of the beneficiary groups through intensive advisory services. The farmers should also continue to utilize the knowledge obtained on good agronomic practices learnt from the fadama III project.

***Key Words**: Fadama, beneficiaries, non-beneficiaries. income, double difference estimator, irish potato.*

INTRODUCTION

The *Fadama* I and II Projects successfully refined approaches for improved utilization of the *Fadama* lands. *Fadama* II implemented an innovative Local Development Planning (LDP) tool based on a community-driven development mechanism. The *Fadama* III which covered numerous resource users and crops including Irish potato was a follow on *Fadama* II. According to Ike (2012), the objective of the *Fadama* III project is to increase the income of *Fadama* land and water resource users on a sustainable basis. The project will support the financing and implementation of five resources to the beneficiary group, comprising:

i. Institutional and social development;
ii. Physical infrastructure for productive use;
iii. Transfer and adoption of technologies to expand productivity, improve value-added and conserve land quality;
iv. Support for extension and applied research; and

v. Provision of matching grants to access assets for income generation and livelihood improvements.

However, given the challenges affecting the Irish potato farmers in Plateau State, there is the concern as to whether the Irish potato farmers can enhance production and improve their standard of living (Iman, 2009). Though, few studies have been conducted on Irish potato and the general production of Irish potato (Mohammed, 2009; Okonkwo and Afinkwe, 1995; Tewe *et al.*, 2003), there are also few reports from the Plateau Agricultural Development Project (ADP). To the best of the researches knowledge the impact of *Fadama* III on the income of Irish potato farmers in Plateau State have not been investigated. The aim of the study was to examine the impact of *Fadama* III Project on Irish potato farmers' income in Plateau State, Nigeria.

The specific objectives of the study are to: describe the socio-economic characteristics of the irish potato farmers; determine the costs and returns of irish potato farmers and to evaluate the impact of *Fadama* III Project on the incomes of participating Irish potato farmers.

MATERIALS AND METHODS

The study area is Plateau State which derives its name from geographical landscape that pre-dominates this part of the country (Kwon-Ndung, 2012). Barkin Ladi, Bokkos and Mangu LGAs were the areas considered. Plateau highland stands out at an average height of 1,200 meters above sea level. Plateau State is located in the North Central Zone of the Country. It lies between Latitudes 80º 24′ and 100º 38′ North and Longitudes 80º 32′ and 100º38′East. The State covers a total area of 262,241Km^2 and has an estimated population of 3,670,000 (National Population Commission, 2011). It comprises 17 LGAs and is divided into three and agricultural zones: North, Central and South (Blench *et al.*, 2003). According to the Plateau State *Fadama* Coordination Office (2014), The Plateau has an average temperature between 18º and 22º C. The mean annual rainfall varies from 131.75cm (52 in) in the southern part to 146cm (57 in) in the north. The soil and climate favours the cultivation of a wide variety of potatoes both sweet and irish, cereals, legumes, vegetables as tomatoes, cabbage, onions and carrot, and tree crops and livestock such as cattle, sheep, goat, horses and pigs are also kept. The inhabitants of the state are mostly small-scale farmers.

Proportionate sampling was used to select Irish potato farmers who benefited and those who did not benefit from *Fadama* III Project in Barkin Ladi, Bokkos and Mangu LGAs of Plateau State. Twenty percent of the respondents were selected randomly from beneficiaries in Barkin Ladi, Bokkos and Mangu. Thus from the 195, 230 and 210 beneficiaries who were involved in the cultivation of Irish potato, 39, 46, and 42 were randomly chosen from Barkin Ladi, Bokkos and Mangu LGAs respectively. This gave the total number 127 beneficiaries sampled. In all 118 non-beneficiaries were selected from 590 registered Irish potato farmers.

Descriptive statistics such as frequencies, percentages and mean were used to describe the socio economic characteristics of the Irish potato farmers in Plateau State. The budgeting technique was used to determine the profitability of the farmers in the study area. Pandey (2002) defined profitability as the ability to make profit from all the business activities of an organization, company, firm, or an enterprise. It shows how efficiently the management can make profit by using all the resources available in the market. The Net Farm Income was used in determining the profitability of the enterprise. The incomes of *Fadama* III project beneficiary and non-beneficiary farmers was also compared. The model specification for the net farm income is expressed in equation 1:

NFI = GFI – TVC – TFC eqtn 1

Where:
NFI = Net Farm Income
GFI = Gross Farm Income
TVC = Total Variable Cost
TFC = Total Fixed Cost

Double Difference Estimator (DD) was used to determine whether there is a significant difference between the income of the beneficiaries and non-beneficiaries of the project. This is a standard evaluation tool used to measure potential programme impacts (Verner and Verner, 2005). To use this estimator, information on both project participants and non-participants are required, before and after the project.

A positive and significant income difference value implied project intervention impact on beneficiary otherwise no impact (Verner and Verner, 2005). In order to evaluate programme impact, Verner and Verner (2005) in their double difference estimator model version gave a simple model as expressed in equation 2:

$$DDs = [1/p\sum(Y_{1ia}–Y_{1ib})]–[1/c\ \sum(Y_{0ja} – Y_{0jb}) \quad \text{eqtn 2}$$

Where:
P=number of participants
C=number of individuals in a control group (non-participants)
DDs = the estimator i.e. the difference between the average changes in the income for the participant and non-participant groups
Y_{1ia} = outcome variable of participant after the programme
Y_{1ib}= outcome variable of participant before the programme
Y_{oja} = outcome variable of non-participant after the programme
Y_{ojb} = outcome variable of non-participant before the programme.

RESULTS AND DISCUSSION

Socio-economic Characteristics of Irish Potato Farmers

Table1: Socio-economic characteristics of beneficiaries and non-beneficiaries

	BENEFICIARIES			NON-BENEFICIARIES		
Variables	Frequency	Percentage	Mean	Frequency	Percentage	Mean
Gender						
Male	112	88		108	91	
Female	15	12		10	9	
Age						
≤30	4	3		6	5	
31-40	30	24		18	15	
41-50	55	43		41	35	
51-60	24	19		31	26	
≥61	14	11		22	19	
Mean			47			49
Marital status						
Married	121	95		111	94	

Single	5	4		7	6	
Divorced	1	1				
Household size						
1-4	28	22		45	38	
5-8	92	72		71	60	
≥9	7	6		2	2	
Mean			6			5
Education						
Formal	118	93		115	97	
Non-formal	9	7		3	3	
Academic years						
1-9	33	23		9	7	
10-12	42	30		46	37	
13-20	52	40		6.3	53	
Farming experience						
1-10	2	2		0	0	
11-20	27	21		8	7	
21-30	39	31		24	20	
≥31	59	46		80	73	
Mean			30			37
Farming size (ha)						
0.10-2.50	88	69		81	69	
2.51-5.00	39	31		37	31	
Mean		2.2			2.3	
Output (kg)						
1-2500	5	4		12	10	
2501-5000	59	46		87	74	
5001-7500	58	46		18	15	
Above 7500	5	4		1	1	
Mean			5007			3817

Source: Computed from survey data, 2015

The results from Table1 revealed a mean age of 47 years for beneficiaries while that of the non-beneficiaries were 49 years were obtained. This result is in agreement with the findings of Jirgi, (2013) and Tijjani and Bakari, (2014). The mean household size for beneficiaries and non-beneficiaries were six and five persons respectively. The respondents' household sizes has implications for farm labour and food security(Akpa, 2007; Ekong (2003) and Ephraim *et al.* (2008).

Net Farm Income

The Net Farm Income of beneficiaries and non-beneficiaries before (2008) and after (2014) project is shown in Table 2.

Table 2: Net Farm Income of beneficiaries and non-beneficiaries before (2008) and after (2014) project

Input (₦/ha)	Beneficiaries		Non-beneficiaries	
	Before	After	Before	After
A. Variable costs				
Herbicide	2,383.00	2,339.00	2,824.09	2,293.42
Labour	18,104.19	19,733.68	7,026.66	6,346.25
Seed	9,382.85	8,564.00	17,902.57	17,398.73
Insecticide	2,267.00	1,539.44	2,981.27	2,732.65

Fertilizer	31,885.20	35,146.92	30,811.03	34,169.37
Total	64,022.24	67,323.04	61,545.62	62,940.42
B.				
Fixed cost (Depreciation)	2,125.47	2,531.72	2,986.52	2,165.17
C.				
Total cost (A+B)	66,147.71	69,854.76	64,532.14	65,105.59
D.				
Total revenue (estimated price of ₦110/kg	190,007.78	230,744.03	179,726.77	184,671.87
Net farm income (D – C)	123,860.07	160,889.27	115,194.63	119,566.28

Source: Computed from survey data, 2015 and Irish potato farmers record

The average costs incurred and the output in monetary value of Irish potatoes obtained per hectare by the *Fadama* III beneficiaries and non-beneficiaries before and after the project are presented in Table 2.

The Net Farm Incomes per hectare for the project beneficiaries and non-beneficiaries after *Fadama* III project were ₦ 160,889.27 and ₦ 119,566.28 respectively. The results indicated an increase in the Net Farm Income of both groups after *Fadama* III project.

T-test of income for *fadama* III beneficiaries and non-beneficiaries after the project

T-test of income for *fadama* III beneficiaries and non-beneficiaries after the project is shown in Table 3.

Table 3: T-test of income for *fadama* III beneficiaries and non-beneficiaries after the project in the study area.

Variable	Mean	Standard deviation	T-value
Beneficiary	160479.7	134290.00	2.41**
Non-beneficiary	119566.30	99236.63	
Difference	40913.45	184508.10	

** significant at 5% probability level; Source: Computed from survey data, 2015

The difference in income of the beneficiaries and non-beneficiaries after *Fadama* III project which was significant at 5% level of probability.

Impact of *Fadama* III on Beneficiaries' Income

The result of the double difference estimate on the impact of *Fadama* III on beneficiaries' income per hectare is as shown in Table 4.

Table 4: Double difference estimates of impact of *fadama* III project on income

Variable	Mean Difference	Standard Deviation	t-statistics
Beneficiary	37,029.20	70,082.94	5.95***
Non-beneficiary	4,371.65	96,607.56	0.49
Double Difference	32,657.35	120,812.90	3.13***

Source: Field survey, 2015, *** = significant at 1% probability level

As indicated in the table, the mean income difference of the project beneficiary farmers before and after the project intervention was ₦37,029.20 and was significant at 1%, while non-beneficiary farmers was ₦4,371.65. As positive mean double income difference of about ₦32,657.35 was realized between beneficiaries and non-beneficiaries before and after *Fadama* III project. The difference in income was significant at 1% probability level. The finding implied that there was an impact of the project intervention on beneficiary farmers' income in the study area. This result is consistent with the findings of Eze (2014), Nkonya *et al.* (2008) and Simonyan and Omolehin (2012) who reported that *Fadama* project beneficiaries were better off than the non-beneficiaries in terms of income and output.

CONCLUSION

Based on the result of this study, it was concluded that *Fadama* III has a positive impact on the incomes of Irish potato farmers under the project in the study area, given that the incomes of the beneficiaries were significantly greater than that of the non-beneficiaries.

RECOMMENDATIONS

The following recommendations were made based on the findings of the study:

i. Ensuring sustainability of operations of the FUGs and FCAs by the farmers and the agricultural key holders in the State.
ii. It is pertinent for Plateau Agricultural Development Programme (PADP) to ensure sustained agro-input (especially fertilizer) linkage with the view to enhancing the efficiency and profitability of Irish potato farmers under the project.
iii. Intensive advisory services by the PADP and ADPs on resource allocation and utilization and other means of increasing beneficiary farmers' income further are very relevant.

REFERENCES

Akpa, E. C. (2007). A Comparative analysis of the impact and technical efficiency of *Fadama* II and Non *Fadama* II arable crops farmers in Imo State, Nigeria". B. Agriculture Thesis. Department of Agricultural Economics and Extension, Abia State University Uturu.

Blench, R.M., Daniel, P. & Hassan, U. (2003). Access rights and conflict over common resources in three states in Nigeria. Report to Conflict Resolution Unit, World Bank (Extracted Section on Jos Plateau), 36-38.

Ekong, F.E. (2003). An Introduction to rural sociology.Second Edition, Dove Educational Publisher, 80 Wellington Bassey Way, Uyo, Nigeria.P. 209.

Ephraim, N., Dayo, P., Tewodaj, M., John, P.,Muhammed, K.Y.,Gbanga, A., Tunji, A. & Edward, K. (2008).Impact of a pro-poor community-driven development project in Nigeria. IFPRI Discussion Paper 00756 March 2008.

Eze, O.R. (2014). Impact of National Fadama III Development Project Financing on the socio-economic growth of Ebonyi State in Nigeria.*Scholars Journal of Economics, Business and Management*, 1(9), 412-416.

Ike, P.C. (2012) Analysis of impact of Fadama III on poverty alleviation in Delta State Nigeria. Assian.*Journal of Agricultural Science, 4(2)*, 158-164.

Iman, I. (2009). Nigeria:World Bank – Fadama III project to gulp $ 440 million copy (c) right 2009. *This day all Africa Global Media* (allafricacom).

Jirgi, A. J. (2013). Technical efficiency and risk preferences of cropping systems in Kebbi State, Nigeria.Unpublished Ph. D. dissertation, Department of Agricultural Economics, Faculty of Natural and Agricultural Sciences, University of the Free State Bloemfontein, South Africa, pp 421.

Kwon-Ndung, E.H (2012).Report of Mid-Term Impact Study of Fadama III Project on Plateau State Beneficiaries, Submitted to Plateau State Fadama Coordination Office, Jos. 15-23.

Mohammed, A. (2009). Plateau and Irish potatoes. Agriculture: *Daily Trust Online.* Thursday 16th July 2009.Retrieved 10th January 2014 from www.newsdailytrustonline.com/.../index.php.

National Population Commission, (NPC) (2011) Estimated Population Figures. www.npc.org/news/2014&-11-29/visualizing-peak-population.

Nkonya, E., Pender, J., Jagger, P., Sserunkuuma, D., Kaizzi, C. &Ssali, H.,(2003). Strategies for sustainable development in Uganda.Research Report Manuscript (under review).International Food Policy Research Institute(IFPRI), Washington DC.

Okonkwo J.C.& Ifenkwe, O.P (1995).Effect of nitrogen and phosphorus rates and plant population on total and graded yield of potato (Solanum Tubersum) in Jos Plateau.*Nigeria Agriculture Journal,23,* 31-40.

.

Plateau State Fadama Coordination Office (2014). Plateau Agricultural Development Programme. Internal Implementation Report of the 3rd National Fadama Development Project (Fadama III). Credit No. IDA 4494 Uni.

Simonyan, J. B. & Omolehin, R. A. (2012). Analysis of impact of *Fadama*II Project on beneficiary farmers income in Kaduna State, Nigeria: A Double Difference Method Approach. *International Journal of Economics and Management Sciences,* 1(11), 01-08.

Tewe, O.O., Oyenini,F.F. & Abu O.A. (2003). Potato production, utilization and marketing in Nigeria. Social Sciences Department, International Potato Centre (IPC) Lima, Peru. June, 2003. Retrieved from http/www.iita.org, Pp. 46.

Tijjani, A.&Bakari, U.M. (2014). Determinants of allocative efficiency of rain-fed rice production in Taraba State, Nigeria. *EuropeanScientificJournal*, 10(33), 220-229.

Verner, D.& Verner, M. (2005). Economic Impacts of professional training in informal sector: The case of the Labour Force Training Program in cote d'voire. World Bank Policy research working paper 3668, July 2005.

AN ASSESSMENT OF FARMERS' INVOLVEMENT IN BACKYARD LIVESTOCK PRODUCTION AMONG RURAL HOUSEHOLDS IN KWARA STATE. NIGERIA

*Kayode A.O, Omotesho, K.F Adebayo S.A, Awoyemi A.O and Oladele O.S
Department of Agricultural Extension and Rural Development
University of Ilorin, Ilorin, Nigeria
*Corresponding author e-mail: toyinkayode2000@yahoo.com +2348067309397

ABSTRACT

This study analyzed farmers' level of involvement in backyard livestock production. Multistage random sampling technique was used to select 160 respondents on whom a structured questionnaire was administered. Data was analyzed using descriptive and inferential statistical tools. The mean age of the respondents was 43 years with an average monthly income of N24, 708 derived from backyard livestock production. Chickens, goats and Turkey were common livestock reared among the respondents with a percentage of 96.3%, 79.4% and 47.5% respectively. The respondents were more involved in routine activities such as feeding of livestock (Mean=3.05), Sanitation (Mean=2.72) and vaccination (Mean=2.49). The major constraints to backyard livestock production were Poor pricing, theft and lack of adequate finance. The study concluded that the level of involvement of farmers' in the study area in backyard livestock production was low and was influenced by the farmers' household size, years of experience and monthly income . It was recommended that extension agents should encourage the farmers to venture more into other livestock which can be useful in mixed farming.

Key words: Backyard, Livestock, Production, Involvement, Rural-Household

INTRODUCTION

Backyard livestock production is an ancient practice of rearing domesticated animals using backyard facilities in a residential area to ensure that the immediate needs of the rural household members are guaranteed. According to Gueye (2003) almost every village household keeps livestock at an average of 5 to 20 livestock to enhance sustainability and improve their standard of living. Large proportion of rural households in developing countries keep livestock, as part of the farming operations and these animals contributes to the meeting of household consumption needs, social needs and ceremonies and income (Akhilu, Almekinders, Udo & Venderzipp 2007). The livestock sector makes meaningful contribution to food security and poverty reduction. It is estimated that about 70 percent of the world's 1.4 billion extreme poor depends in one way or the other on livestock production (Food and Agricultural Organisation 2009).

Livestock production forms a major capital reserve of the rural households by increasing food provision and consumption, income generation and quick cash when emergencies and external shocks occur, and also have a cultural and spiritual value (International Fund for Agricultural Development 2015). Livestock production serve as living bank for many farmers and have a critical role in the agricultural intensification process through provision of draught power and manure for fertilizer and fuel. Official statistics often underestimate the overall contribution of livestock and especially their multipurpose contributions to food and agricultural production in developing countries (FAO 2005). Livestock production among rural farm families reduce risk through diversification of production and income sources and there is therefore a much greater ability to deal

with seasonal crop failures and other natural calamities. Livestock, particularly sheep, are efficient in controlling weeds and thus help to increase crop production (Moyo and Swanepoel, 2010).

Rural households with different levels of income have incentives to keep livestock because of the wide spectrum of benefits these provide, such as cash income, food, manure, draft power and hauling services, savings and insurance, and social status and social capital (Bebe et al., 2003;; Upton, 2004). Livestock production is also used in traditional rituals, ceremonies and festivities and is given as a gift in worships (for example installation of ancestral spirits, ritual slaughter, and bride wealth) (Moyo and Swanepoel 2010).
However, it should be noted that the success of every livestock production can be determined by the adequate and efficient feed and management given to such livestock. Most farmers in rural area rarely have time for their livestock, leaves them to scavenge for foods themselves. So backyard livestock production is a supplementary enterprise, which does not compete with other activities for scarce resources and therefore involves very few costs. Livestock feed mainly by scavenging, with very little supplementary grain fed and are rarely housed. However, provides a low cost supplement to family nutrition and the incomes (Upton 2004). Considering the enormous significant of backyard livestock production to rural households there is need to access the effectiveness of this practice. The study therefore assessed farmers' engagement in backyard livestock production. The specific objectives are to: describe the socio-economic characteristics of the respondent; examine the types of livestock reared by the respondent; examine the level of Involvement in Backyard livestock production in the study area; identify reasons for involving in backyard livestock production and to assess the constraints militating against backyard livestock production.

HO 1**:** There is no significant relationship between the socio-economic characteristics and level of backyard livestock production.

MATERIALS AND METHODS

Kwara state, with its state capital in Ilorin is one of the six states in the North central zone of Nigeria (LGAs). It is situated between 8° and 10° North latitude and 3° and 6° east longitude. The state has 16 Local Government Areas and covers an area of 74,256sq km. The state has an estimated figure of 203,833 farm families' majority of which live in the rural areas (Nigerian Population Commission, 2006). The Annual pattern across the state extends between the month of April and October with minimum (1000-1,500mm) with peak rains in May to June and September to October. The major crops cultivated in the state includes Yam, cassava, rice, millet, groundnut, maize. Sorghum, okra, cowpea, sweet potatoes, some leafy vegetables and livestock reared includes poultry, goats, sheep and cattle.

The population of the study comprises of all farmers in Asa Local Government Area (LGA) of Kwara state. Multistage sampling techniques were used to select respondent for this study. The first stage is the purposive selection of Asa LGA because the area is predominantly known for farming activities. The second stage was randomly selection of 5% of the total number of towns and villages in Asa LGA (i.e Asa LGA has 139 towns and villages) therefore total number of towns and villages selected was 7 for the purpose of this study.

In the third stage from the number of registered farmers by extension agents in the local government, 5% of the farmers were purposively selected. (Total number of registered farmers in Asa LGA is 32,100 as at 2012 according to KWADP) giving a total of 160 respondents.

Data were collected through the use of a questionnaire. The questionnaire has six (5) sections A to E, section 'A' dealt with the socio economic characteristics of the farmers section B identified the types of livestock reared by the respondents section C assessed the level of involvement of the respondents on livestock production Section D analyzed the constrains of backyard livestock production and Section E examined the perceived benefits of backyard livestock production. The independent variable were the socio-economic characteristics of the respondents, the types of livestock the respondents reared and the constraints faced by the respondents in practicing backyard livestock. The dependents variable for the study was the level of involvement of backyard livestock farming. This was measured with the use of a 4- point Likert scale.

A list of routine management activities were drawn and respondents were asked to indicate the extent to which they practice those activities. The scale was graduated as Very often (4), Often (3) Rarely (2) and Not at all (1). Weighted mean score was used to derive the mean, any variable below the mean score was regarded as low involvement while variables above the mean score was regarded as high involvement, Pearson's Product Moment Correlation was used to test the relationship between the respondents' socio-economic characteristics and the level of involvement on backyard livestock production.

The formula can be written as ;

$$r = \frac{\Sigma X\ Y - (\Sigma X)\left(\frac{\Sigma y}{N}\right)}{\sqrt{\left(\sum X^2 - \frac{(\Sigma X)^2}{N}\right) - \left(\sum Y^2 - \frac{(\Sigma Y)^2}{N}\right)}}$$

Where: X = Independent variables
X^2 = Square of score on independent variables
Y = Dependent variable
Y^2 = Square of score independent variables
XY = Product of X & Y
$\sum$ = summation of sores
N = Total number of raw sores
$\sqrt{}$ = Square root

RESULTS AND DISCUSSION

Table 1 showed that the mean age of the respondents was 43 years. This implies that those involved in backyard livestock production are still in their economic and active age and also fit for the challenges of the practise. Males (76.7%) were more involved in backyard livestock farming than females (23.3%) in the study area.72.5% are married with a mean household size of six (6).

Table 1: Distribution of the respondents by their socio-economic characteristics. (n=160)

Variable	Frequency	Percentage (%)	Mean score
Age			**43**
≤ 30	24	15.0	
31-50	65	40.6	
Above 50	71	44.3	
Sex			
Male	117	73.1	
Female	43	26.9	
Marital status			
Single	36	22.5	
Married	124	77.5	
Years of Schooling			
0 years	39	24.3	
1-6 Years	60	37.5	**8.3**
7-12years	28	17.5	
>12 years	33	20.6	
Household size (Person)			
≤ 5	80	50.0	
6-10	64	40.0	**6.0**
Above 11	16	10.0	
Livestock Backyard Farming Experience			
≤ 10 years	71	44.4	**13.5**
11-20 years	39	24.3	
Above 20 years	50	31.3	
Monthly Income			**N24,708**
≤ 19,000 naira	40	25.0	
20,000-50,000 naira	71	44.4	
Above N50,000	49	30.6	
Total	160	100	

Source: Author's Field Survey 2017

The mean years of schooling was 8.3 years which shows a low level of literacy among the respondents which implies that the farmers are likely to have so much difficulty in understanding and adopting modern agricultural technologies and innovation. Years of backyard livestock farming experience was 13.5 years which in an indication that the respondent have vast knowledge of the practice. Also the mean monthly income derived from backyard livestock farming was found to be N24, 700 which is used to support their other source of income.

Type of livestock they produce

Table 2 shows that the most common livestock kept by backyard livestock producers is chicken with 96.3% involved in it, goat keeping is next with 79.4% respondents , followed by turkey with 47.5% .31.8% reared pig, 23.8% keep sheep, cattle keeping has 17.5% respondents while rabbits has 12.5 respondents who reared it.

Table 2: Distribution of the respondents by the type of livestock they produce

Types of livestock	Frequency	Percentage
Sheep	38	23.8
Chicken	154	96.3
Rabbit	13	8.1
Pigs	51	31.8
Turkey	76	47.5
Goats	127	79.4
Cattle	28	17.5

Source: Field Survey 2017
***Multiple responses**

This results implies that the respondent are involved in keeping various types of livestock their backyards. This findings collaborates with the reports of Adesiji et al. (2017) that chicken production is highly fragmented in Nigeria with most birds raised in backyard facilities with less than 1,000 birds.

Involvement in Routine Management of Back-yard Livestock Production

Table 3: Distribution of the Respondents According to involvement in Routine Management of Back-yard Livestock Production

Management Activities	Very Often	Often	Rarely	Not at all	Mean	Ranking
Feeding of livestock	49(28.1)	91(43.8)	17(20.0)	3(0.6)	3.05	1st
Provision of clean water for livestock	16(10.0)	52(32.5)	41(25.6)	51(31.8)	2.89	3rd
Vaccination	31(19.4)	47(29.4)	23(14.4)	59(36.9)	2.44	5th
De-worming of animals	5(3.1)	17(10.6)	95(59.4)	43(26.8)	1.99	8th
Quarantine	36(22.5)	58(36.3)	29(18.1)	37(23.1)	2.65	4th
Housing	23(14.3)	19(11.9)	58 (36.3)	60 (37.5)	2.01	7th
Sanitation	45(28.1)	55(34.4)	38(23.4)	22(13.8)	2.92	2nd
Dehorning and , Castration	3(1.9)	19(11.9)	7(4.4)	131(81.9)	1.81	10th

Administration of drugs	8(5.0)	31(19.4)	62(38.8)	59(36.9)	2.20	6th
Taking the animals for Grazing occasionally	0(0)	15(9.4)	19 (11.9)	126 (78.8)	1.90	9th

Percentages are in parenthesis Source: Field Survey 2017

Table 3 revealed that the level of involvements in management practices such as adequate feeding of livestock, sanitation, provision of clean water and quarantine were most practiced among backyard livestock producers while the respondents involvement in housing, deworming, grazing, dehorning and castration were low with a mean sore of 2.01, 1.99,1.90 and 1.81 respectively. This results implies that most respondents are involve in few of the practices that can help the hygiene of the livestock, most of the livestock are left without housing and allowed to wander about the compound without given much attention, appropriate treatment are not also given to the livestock when sick. This is consistent with the report of Olafadehan et al. (2010) which state that availability of feed is the most important factor in livestock production. Without optimum feeding, the animals do not produce up to their production potentials and are venerable to various diseases. .

Perceived reasons for involving in backyard livestock production

Table 4 above indicated reasons why respondents were involve in backyard livestock. The most common reason is that backyard livestock production is a source of income (MS=4.40) probably because of majority are low income earner and are agrarian. Followed by consumption (MS= 4.22. Next reason is that it serves as source of food products (MS= 3.88) which include many food item that comes from an animal source such as meat, milk, egg, cheese and yoghurt. Other reasons are efficiency in poverty reduction (3.81), for pleasure (3.81) for manure for planting (3.77), Reduction of input cost of production for farming. (3.48).

Another reason for keeping backyard livestock production are: for social and cultural reason (MS= 3.31).Socio-cultural functions (MS=3.31). Used for grazing (3.30) is fairly one of the reason by the respondents in the study area which could be due to the fact that most respondent practice extensive management. Source of non-food product such as wool, hides etc. (3.13) is the least reason in the study area.

Distribution of respondents according to reason for keeping of livestock is presented in Table 4 below.

Table 4: Distribution of the respondents by their reason for keeping of livestock

Reasons	**SA**	**A**	**U**	**D**	**SD**	**Mean score**	**Rank**
Source of income	79 (49.3)	52(32.5)	17(10.6)	12(7.5)	0(0)	4.40	**1st**
For consumption	69 (43.1)	61(38.1)	16(10.0)	14(8.8)	0(0)	4.22	**2nd**

Production of manure	49 (30.6)	47(29.4)	25(15.6)	26(16.3)	13(8.1)	3.77	**5th**
Serves as source of food products	35 (21.8)	56(35.0)	49(30.6)	20(12.5)	0(0)	3.88	**3rd**
Used for grazing	26(16.5)	48(30.0)	32(20.0)	29(18.1)	25(15.6)	3.30	**8th**
Social and cultural reasons	22(13.8)	39(24.3)	46(28.8)	20(12.5)	33(20.6)	3.31	**7th**
Source of non-food product	23(14.3)	29(18.1)	43(26.9)	31(19.3)	34(21.3)	3.13	**9th**
Efficiency in poverty reduction	51(31.9)	59(36.9)	18(11.3)	20(12.5)	12(7.5)	3.81	**4th**
Reduction of input cost of production for farming	20 (12.5)	49(30.6)	24(15.0)	33(20.6)	34(21.3)	3.48	**6th**
For pleasure	60(37.5)	45(28.1)	22(13.8)	23(14.4)	10(6.3)	3.81	**4th**

Percentages are in parenthesis ***Source: Field Survey 2017***

Constraints in backyard livestock production

It was revealed that poor pricing (3.22) was a severe constraint in backyard livestock production, this was followed by theft of livestock (3.08), next is lack of capital (3.04) other constraints indicated by the respondents are lack of access to extension services (3.02), disease occurrence (2.96) expensive drugs (2.69) and social and cultural barriers (2.59).

Table 5: Distribution of the respondents by the constraints affecting backyard livestock production

Constraint	Very Serious	Serious	Mildly	Not serious	Mean score	Rank
Expensive drugs and vaccine	32(20.0)	45(28.1)	47(29.3)	36(22.5)	2.69	**6th**
Expensive high feed	10(6.3)	3(1.8)	49(30.6)	98(61.2)	2.52	**8th**
Theft of livestock	68(42.5)	44(27.5)	37(23.1)	11(6.9)	3.08	**2nd**
Disease occurrence	46(28.8)	58(36.3)	31(19.4)	25(15.6)	2.96	**5th**
Poor Pricing	65(40.6)	59(36.9)	30(18.8)	6(3.7)	3.22	**1st**
Lack of capital	59(36.8)	65(40.6)	28(17.5)	8(5.0)	3.04	**3rd**
Social and cultural barriers	20(12.5)	28(17.5)	54(33.8)	58(36.3)	2.59	**7th**
Lack of access to extension service	57(35.6)	54(33.8)	29(18.1)	20(12.5)	3.02	**4th**
Inadequate access to clean water	14(8.8)	68(42.5)	48(30.0)	38(23.8)	2.423	**9th**

Source: Field Survey 2017 ***Percentages are in parenthesis***

However the least identified constraint were excessive high feed and inadequate access to clean water with a mean score of 2.52 and 2.43 respectively.

Test of Hypothesis

Socio-economics characteristics of respondents and backyard livestock production

Table 6: Socio-economics characteristics of respondents and backyard livestock production

Variable	r - value	p- value	Remark
Age	0.611	0.542	Not Significant
Education	-0.035	0.972	Not Significant
Household Size	-3.239	0.002	Significant
Years of Backyard livestock Experience	-3.507	0.001	Significant
Monthly Income	0.380	0.004	Significant

N=160, P<0.05 Source: Field survey, 2017

Results presented in Table 6 shows that household size (r=3.239, p= 0.002), years of farming experience (r=3.507, p= 0.001) and monthly income (r=3.380 p= 0.004), were significantly related to the level of involvement in backyard livestock production. This implies that the larger the household size the more the farmers are involved in backyard livestock production which may be due to the fact that there will be more helping hands to take care of the livestock. Also, years of livestock backyard farming experience was significantly related to backyard livestock production, this could be that farmers who have vast knowledge of this practice should know the how, why, and when to be involved in livestock production. Monthly income also influences backyard livestock production. The positive coefficient implies that the level of involvement in backyard livestock production increases with monthly income realized from the sales of the livestock.

CONCLUSION AND RECOMMENDATIONS

The study concluded that the level of involvement of farmers' in the study area in backyard livestock production is low and was influenced by the farmers' household size, years of experience and monthly income. It is therefore recommended that extension agents should encourage the farmers to venture more into other livestock production which can be useful in mixed farming and also credit facilities at minimum interest rate should be made available and accessible to farmers by the government and financial institution to enlarge the production of livestock using backyard facilities.

REFERENCES

Adesiji, G.B, K.F Omotesho. A.O Kayode & K Ahmed (2017): ''Analysis of Poultry farmers' use of pests and disease control strategies in Kwara state Nigeria''. *Pacific Journal of Science and technology* 18(2): 335-345

Akhilu H, Almeikinde A, Udo H.M.I, Venderzippay (2007) ; village poultry consumption and marketing in relation to gender, religious festivals and market access. Journal of Animal Health production 39, 3 page 165-177.

Bebe, B.O., Udo, H.M., Rowlands, G.J., & Thorpe, W. (2003). Smallholder dairy systems in the Kenya highlands: breed preferences and breeding practices. Livestock Production Science, 82(2), 117-127.

FAO (2005); the state of food and agriculture, report of the Environment, Climate Change and Bioenergy Division, Food and Agricultural Organization, Rome. Available at http://www.fao.org/desertification.

FAO. (2009). Livestock keepers – guardians of biodiversity. Paper prepared by the Food and Agriculture Organization of the United Nations Animal Production and Health Division, FAO, Rome.

Gueye, E.F, (2003). Production and consumption trends in Africa. *World Poultry. Sci. J.,* 19: 12-14.

International Fund for Agricultural Development (IFAD). (2015). Smallholders, food security, and the environment, IFAD publishers, Rome.

Moyo .S. and Swanepoel, F.J (2010); The role of livestock in developing communities Enhancing Multi- functionality. Published by the technical centre for Agriculture and Rural cooperative South Africa, pp114-117.

National Population Commission (NPC) (2006): Fact Sheet for Nigeria Population_Retrieved from URL: *www/ npc.org/ population htm* Accessed on 14th April, 2008.

Olafadehan, O.A & Adewumi, M.K (2010); Livestock management and Production system of Agro-pastoralism the derived savannah of south west, Nigeria. Journal of Tropical and subtropical Agro-ecosystems pp 685-689

Upton, M. (2004). The Role of Livestock in Economic Development and Poverty Reduction [Online]. Rome [Italy]. FAO. Accessed 2004 March

ASSESSMENT OF ROLES OF FARMERS COOPERATIVE SOCIETY IN OGBA/EGBEMA/NDONI LOCAL GOVERNMENT AREA OF RIVERS STATE, NIGERIA.

*Ndubueze-Ogaraku, Mercy .E. and Ike, C. C
Department of Agricultural Economics & Extension
University of Port Harcourt, Choba, East-West Road, Port Harcourt, Rivers State, Nigeria
**Corresponding address: mercy.onu@unipoort.edu.ng*

ABSTRACT

The study focused on the roles of farmer's cooperative society in Ogba/ Egbema /Ndoni Local Government Area in Rivers state, Nigeria. A total of 60 respondents were selected through a random sampling technique. Data collected were analysed using descriptive statistics and multiple regression model. Majority 55% of the farmer co-operators were females with a mean age of 50 years and 43.3% of them were illiterates. Mean household size of the farmer was approximately 8 persons, 58.3% of them were full time farmers. Mean farming experience of the co-operators was 20% with average farm size of 1.3 hectares. The regression result indicated that volume of loan received by the co-operators and farm size positively influenced food revenue earned by the farmers while gender and major occupation of the co-operators negatively influenced the volume of revenue realised. Majority 70%, 66.7% and 56.7% of the farmer's co-operators reported that inadequate capital, insufficient farm inputs, lack of skilled personnel were major constraints to increased food production in the study area. Provision of sufficient loan, education and training (skills acquisition) of members, provision of appropriate planting materials should be given to the farmers to enhance production.

Keywords: **Assessment, roles, farmers, cooperative society**

INTRODUCTION

Agriculture is an importance sector in Nigeria because it is a major contributor to economic development in Nigeria especially in the rural areas. Ukeje, (2008) report noted that although appreciable real output growth rates have been achieved in the agricultural sector in the last five years, a significant break-through in productivity to effectively guarantee domestic self-sufficiency is still constrained by several challenges. According to him, these challenges requires effective support for the formation and growth of farmer's cooperatives to assist in accessing credit, training farmer's co-operators and supplying enough inputs etc.

Veerakumaran ,(2005) explained that cooperative society could be used as a fundamental tool for achieving food security at household level. According to Chambo, (2009), developed nations like United States of America, Canada, Australia, almost all European countries and socialist country like China have attained food self-sufficiency through cooperatives societies. Adefila, (2012) conducted a study on the factors influencing the performance of farmer cooperative organizations in Gurara area of Niger State of Nigeria, found that famers' cooperative organizations are involved in various agricultural development and factors influencing their role performance include annual income, experience in farming, leadership training and membership size. The study concluded that cooperatives in whatever form are seriously viewed as catalyst in the process of rural socioeconomic development and the law should empower cooperatives to perform certain functions, such as strengthening their bargaining power as effective agents of socio-economic rural transformation.

In Nigeria "isusu" is popular and people contribute money weekly and give to their members in turn, as a form of credit. Onuoha, (2002) described these forms of joint association as mutual assistance

and not cooperative in the strict sense of the word. Since they are based on reciprocity (you help me today and I help you tomorrow), they may be called "mutual". They are preliterate informal, fragile and temporary activities. On the other hand, modern cooperatives are formal contractual organizations engaged in business undertakings in which men, money and materials are employed on a permanent basis to produce goods and services.

Umeabali & Agu, (2009) stated that farmer cooperative societies are organization of farmers facing common problems and have accepted a joint action in solving the problems by contributing financially and otherwise, bearing all the risks. Farmers' cooperative society can get into production, marketing service, processing, thrift and credit etc. Madu, (2004) defined agricultural cooperative as an association of persons who voluntarily or willingly joined together to achieve a common aim through the formation of democratically controlled organization making equitable fair share of risks and benefits of the undertakings as active participants. Thus, a cooperative society is a self-help project, voluntary and systematic association in which members with common interest pool their resources together to perform functions which they cannot undertake as an individual for the promotion of their common welfare (Nwankwo, 2009).

A cooperative society is an autonomous association of men and women who unite voluntarily to meet their common economic, social, cultural needs and aspirations through a jointly owned and democratically controlled enterprise International Cooperative Alliance (ICA, 2010). It is a business enterprise that seeks to strike a balance between pursuing profit and meeting the needs and interest of members of the communities. Cooperatives not only provide members with economic opportunities, but also offer them a wide range of services and opportunities (Nweze, 2001). The origin of co-operatives in the world may be traced to eighteen century in England. The co-operative was formed as a result of human sufferings and degradation that occurred during the industrial revolution in England. At that time, while employers were reaping high profits, employees were paid subsistent wages which remained very low despite rising cost of living (Ukpere, 2010).

In Nigeria, the first formal co-operative was formed in 1936 with its first co-operative legislation known as cooperative society's ordinance No. 6 of 1935 which was enacted in 1935. According to Madu, (2004) cooperative societies were established in Nigeria in the early 1930's. An Indian cooperation expert named Mr. C.F. Strickland was appointed in 1933 by the Federal Department of Agriculture to study and to report on the desirability and possibility of establishing cooperative societies in the colony and protectorate of Nigeria.

In Nigeria, an agricultural cooperative is a society in which the rural farmers usually participate and is an association of farmers formed and run and is used to enhance agricultural productivity Umebali, (2004). Anyanwu (2004) noted that derivable effects like; economic, social and political. Educational effects which include civic in nature could change the general outlook, attitude and level of enlightenment, understanding and habit of the members. According to him, this may lead to the development of a more progressive and business-like attitude, greater appreciation of value of time and punctuality etc.

Cooperative societies are expected to offer small holders agricultural producers opportunities and a wide range of services, including improved access to markets, natural resources, information, communication, technologies, credit, training and warehouses. They also facilitate smallholder producer's participation in decision making at all levels, support them in securing land-use rights, and negotiate better terms for engagement in contract farming and lower prices for agricultural inputs such as seeds, fertilizers and equipment.

In Rivers State several organization and associations had formed cooperative societies in order to improve members' welfare and provide supports for their businesses and economic

activities. One of which, is the Green River Project of Nigeria Agip oil company which had supported farmers' economic activities through various support programmes.

Farmer's cooperative societies are greatly involved in food production and other economic activities in order to improve the social and economic life of their members in the rural areas in the country (Ebonyi & Jimoh, 2012). In spite of these attributes, farmers' cooperative society still experience low food production owning to some factors such as inadequate capital, lack of farm inputs like implements, high yielding seeds, stems and seedling, agro-chemical disinfectants and fertilizer, problems of marketing of produce and efficient distribution.

However, as food production is not keeping pace with population growth, this scenario is seemly resulting to the upward trend in the prices of food stuff and also created a wide gap between the demand and supply of food. According to (Ajayi, 2008), the resulting effect of the imbalance between demand and supply of food is malnutrition, poverty and deteriorating living conditions. Obinyan, (2000) noted that small holders farm size are small, most of them often had less than two hectares and are characterized by low productivity. This is responsible for low income and low capital investment. Consequently, one of the possible ways of redressing these constraints is to mobilize the desperate small holder farmer for economy of scale and farmer's cooperative society is a veritable platform for this exercise. Therefore, this study was designed to examine the roles of farmer's cooperative society in Ogba / Egbema / Ndoni Local Government Area in Rivers State, Nigeria.

Specifically, the study determined the socio-economic characteristics of farmer co-operators in the study area, identified roles played by co-operative society and services received by members in the study area; identified types and quantity of foods produced by co-operators in the study area and determined the effects of socio-economic characteristics of the farmers on the amount of revenue realised by co-operators in the study area and finally identified various problems faced by farmers' cooperative society in the study area.

MATERIAS AND METHODS

The study was carried out in Ogba/Egbema/Ndoni Local Government Area (ONELGA) of Rivers State. ONELGA is located within latitudes 5^0 23' 26" North and longitudes 6^0 33' 42" East. According to the National Population Census of Nigeria (NPC, 2006), the Local Government Area has a population of 225, 000 persons. It is bound in the north by Adamawa State, in the south by Ahoada, in the east by Egbema in Imo state and in the west by Sagbama in Bayelsa State. Ogba/Egbema/Ndoni Local Government Area is composed of 183 communities. Amongst them are Omoku, Egi, Ebocha, Obirikom, Ndoni, Idu, Okwuzi, Mgbede, Aggah, KreganiP, Utu, Okposi, Egbada, Ubukegi, Egita, Obagi, Ogbogu, Obie, Erema, Ogbidi, Ogbakiri, Akabuka, Umuapu, and many others. They speak Igbo language having farming and fishing as their predominant occupation. The population of the study all members from the 208 registered cooperative societies in the study area (NAOC, GRP 2007).

The random sampling and multi-stage sampling technique were used to select 6 communities from 183 communities in Ogba/Egbema/Ndoni Local Government Area. Six communities were randomly chosen from 6 communities. Then 10 farmers were randomly selected from each six registered cooperative in each community giving a total of 60 farmers.

Primary data were collected using a structured questionnaire and interview schedule. Literature was reviewed from secondary source which included the use of newspaper, journals, previous research projects, internet and other materials which were of importance to the research study. Descriptive statistics such as frequency as well as Ordinary Least Square Regression model.

Multiple regression model

The implicit form of the regression is

$Y = f(X)$…….(eq1)

$Y = f(X_1,X_2,X_3,X_4,X_5,X_6,X_7\ X_8,e)$……(eq2)

The explicit forms of the linear regression is as follows

$Y = b_o + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + \beta_8X_8 + e$ …. (eq3)

Where

Y = Amount of revenue realised from farm produce per annum in Naira

b_o = Intercept

$\beta_1 - \beta_8$ = Regression coefficients

X_1 = age of farmer's (years)

X_2 = education level (non-formal, primary, secondary, tertiary)

X_3 = sex (Dummy;1 = male, 2 = female)

X_4 = household size (in number)

X_5 = farm size (hectares)

X_6 = farming experience (years)

X_7 = occupation types in dummy

X_8 = volume of loan received in naira

e = stochastic error term

The functional forms of the model include the following

Linear function model

$Y = b_o + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + \beta_8X_8 + e$ …….(eq4)

Semi-log model

$\text{Log } Y = b_o + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + \beta_8X_8 + e$……..(eq 5)

Double –log model

$\text{Log } Y = b_o + \beta_1 \log X_1 + \beta_2 \log X_2 + \beta_3 \log X_3 + \beta_4 \log X_4 + \beta_5 \log X_5 + \beta_6 \log X_6 + \beta_7 \log X_7 + \beta_8 \log X_8 + e$……..(eq 6)

RESULTS AND DISCUSSION

Table 1 shows the socio-economic characteristics of members of farmer's cooperative society in Ogba Egbema Ndoni Local Government Area, Rivers State, Nigeria. The socio-economic characteristics of respondents as presented in Table1 include sex, age, marital status, household size, educational status, farm size, farming experience and occupation.

Table 1: Socioeconomic characteristics of farmers co-operators in the study area.

Variables	Frequency	Percentage
Sex		
Male	27	45
Female	33	55
Age in years		
31-40	5	8.3
41-50	22	36.7
51-60	30	50
60 & above	3	5
Marital status		

Married	55	91.7
Widowed	5	8.3
Single	0	0
Household size in persons		
1-5	19	31.7
6-10	38	63.3
11-20	3	5
Level of Education		
Non formal	8	13.3
Primary	26	43.3
Secondary	10	16.7
Tertiary	16	26.7
Years of experience		
11-20	27	45
21 & above	33	55
Farm size in hectares		
0.5-0.9	15	25
1-1.4	29	48.3
1.5 & above	16	26.7
Major Occupation		
Farming	35	58.3
Civil servant	14	23.3
Trading	11	18.4
Total	60	100

Source: Field survey, 2015

Data in Table 1 showed that males were (45%) while (55%) of the farmers were females. This confirms Prakash, (2003) who stated that women are more in food production than men. Most of co-operators 36.7% were in the age range of 41- 50 years and those in the age bracket of 31-40 years constituted 8.3% while majority of them 50% were within the age's bracket of 51-60 years and 91.7 % were married. This is an indication that majority of them could improve their economic ventures if resources are pulled together. The result also showed that 63.3% had family size of 6-10 persons. It is implied that family members could assist them in their various business activities. The result further showed that 43.3% had primary education which implied that they had one form of formal education or the other. This is expected to improve in the management of their respective businesses.

The result further showed that 55% of them had been in the business for at least 20 years and above as member of farmers' cooperative. The long years of involvement in cooperative activities may have helped in proper management of their farm businesses. The result also showed that 48.3% owned between 1.0-1.4 hectares of farmland. The increase in farm size may be due to the access to farm production resources like loan facilities available to members of the cooperative society.

The result on the major occupation was farming showed 58.3% out of the total co-operators in the study area. This implied that farmers in the study area were aware of the benefit of being a member of cooperative society.

Table 2: Roles of played by cooperative society in the study area

S/No	Types of Services	Volume of Services received	Percentage%
1	**Provision of loan (₦)**		
	50,000	13	21.7
	100,000	29	48.3
	200,000	9	15.0
	300,000	2	3.3
	Above 300,000	3	5.0
	Non	3	6.7
2	**Marketing of produce**		
	Sales from produce	53	88.3
	Consumption	7	11.7
3	**Workshops/ seminar**		
	Once	14	23.3
	Twice	34	56.7
	Thrice	9	15.0
	Nil	3	5.0
4	**Provision of Input**		
	Fertilizer	23	38.3
	Nil	37	61.7
	Total	60	100

Source: Field survey, 2015

Result in Table 2 showed roles by farmers' cooperatives in the study area during the period. These include provision of loan, marketing of produce, organising seminar and provision of farm inputs. About 48.3% obtained loan value of about ₦100, 000.00, 5% obtained above ₦300, 000.00 while 6.7% did not obtain loan from the supporting organization. Since 93.3% of the co-operators was able to obtain loan facility from the cooperative society, it means that co-operators can easily embark in their various economic activities. Majority (88.3%) of the co-operators agreed that their products were marketed through the cooperative sales point. This will help save time travelling to the market for sales of their products and facilitates quick selling products.

The result also showed that 95% of the farmers' co-operator acquired new skills and knowledge through participation in the seminar and workshops organized by the cooperative society. This result showed that the cooperative society is performing its roles as expected. One of the principles of cooperative society is education of members on what the society is expected to do. It is also expected that training such as seminar and workshops were organized for members to learn on new ideas, innovations and technology needed to manage their various businesses. It is interesting to note that the cooperative society is carrying out this responsibility according. Inputs like fertilizer and cassava stems was provided once to the farmers to improves their access to quality farm inputs. It is important to note that the cooperative society were able to improve members access to farm inputs by provision of inputs at subsided price. This may have been responsible for high food production recorded among co-operators. About 38.3% of them received inputs such as cassava stems and fertilizer in the study. This finding agrees with Adefila & Makadi, (2014) report which found that farmers' cooperative society performed roles such as to granting of credit facilities to members, enlightening and educating members, introducing new ideas and techniques towards

improving agricultural productivity. They also stated that gave technical advice to members and subsided input prices.

Table 3 Types and Quantity of foods produced by Co-operators in the study Area

Quantity of foods	Frequency	Percentage %
1) Garri per basin (25kg)		
20-40	5	8.3
41-60	14	23.3
61-80	25	41.7
Above 80	11	20
No production	5	8.3
Total	60	100
(2) Fish in number (1 per kg)		
No produce	47	78.3
100-200	4	6.6
201-300	1	1.6
301-400	1	1.6
Above 400	7	11.5
Total	60	100
(3) Yam in barns) (50kg)		
20- 40	5	8.3
41- 60	9	15.0
61-80	8	13.3
Above 80	10	16.7
None produced	28	46.7
Total	60	100
Vegetable in bundles (50kg)		
Non	53	88.3
Less than 30	1	1.7
31-40	3	5.0
41-50	2	3.3
Above 50	1	1.7
Total	60	100.0
Plantain in bunches (12kg)		
No bunches	49	81.7
20-40	6	10.0
41-60	4	6.7
60 and above	1	1.7
Total	60	100

Source: Field survey, 2015

The result in Table 3 showed types and quantity of crops produced by the co-operators in the study area. Major crops produced was cassava which is usually processed into garri. Majority 41.7% of the co-operators produced 61-80 basins of garri. It is not surprise that most farmers produced cassava and processed into garri product. Cassava is a major food staple in Nigeria. There is hardly any household that does not consume cassava and its products. Therefore, it is likely that many co-

operators were involved in cassava production mainly to meet their family food consumption need and a means of generating income for the family. Others are fish, yam, vegetable and plantain. It was reported that 11.5% of them produced more than 400 fishes in the production year. 16.7% of them produced above 80 yams in a cropping season. The result also showed that majority 88.3% did not produce vegetable while 5% produced 31- 40 bundles.

Table 4. Multiple regression estimates of effects of socioeconomic characteristics of co-operators on revenue in the study area.

Variable	**Linear**	**double log**	**Semi-log**
Constant	135639.642	5.412	5.247
	(0.440)	(11.149)	(18.383)
Sex	-0.239	-0.619	-0.082
	(-1.175)*	(-1.497)*	(-0.702)
Age	0.017	-1.603	-0.031
	(0.067)	(-1.917)*	(-0.308)
Educational level	0.036	0.124	0.011
	(0.155)	(0.400)	(0.163)
Household size	0.003	0.337	-0.011
	(0.019)	(1.099)	(-0.116)
Farming experience	0.021	0.169	-0.063
	(0.096)	(0.229)	(0.508)*
Volume of loan received	0.569	0.090	0.540
	(4.113)**	(3.416) **	(3.687) **
Farm size	0.112	0.637	0.014
	(0.544)*	(1.277)*	(-0.169)
Occupation	-0.146	0.111	-0.060
	(-0.741)*	(0.407)	(0.289)
R^2	0.420*	0.284	0.348*
F-ratio	4.250**	2.530**	3.141**

Source: Field survey, 2015 and SPSS **significant at 5% level, *significant at 10%

The result in Table 4 showed the regression result. Three functional forms were used in the analysis (linear, semi-log double log). Linear functional form was chosen as the lead equation because it had the highest R^2 value of 42.0%. This is an indication that 42% of the variation in revenue realised by the cooperators was explained by the explanatory variables in the model. Volume of loan received, and farm size positively influenced the amount of revenue received by the co-operators at a significant level of 5% and 10% respectively. This important in this discussion because volume of loan received showed an expected positive relationship which indicated co-operators received loan facility from their various society. This agrees with the report of Ojiagu & Uchenna (2015) who stated that the coefficient of credit positively influence income of the farmers in Anambra State. However, the report disagreed with finding findings of Ojiagu & Uchenna, 2015 report that level of education attained by the co-operators showed positive correlation with farm income. This is so because the variable did not show significant effect on farm revenue generated by the co-operators.

Gender of the respondents and main occupation of the respondents negatively influenced the revenue at 10% significant value. The negative value of the coefficient sex implies that the more

females were involved in farm economic activities than male cooperators. Since women hardly hold title to land and other factors of production, expansion of the farming businesses will be difficult, therefore, it is most likely that the female dominating the farming business may have accounted for the volume of production in the area. Volume of loan received by the farmers was positive and significant at the 5% level. This suggests a direct relationship between the amount of loan received and revenue realised indicating that the larger the loan received, the higher the revenue realised from food production. Farm size positively contributed to revenue realised and was significant at 10% level. This shows that an increase in the farm size will likely result to increase in the volume of food produced which would increases farmers' revenue all things being equal.

Occupation showed negative sign with the amount of revenue realised from farm business indicating that the co-operators who were full time farmers realized higher output than part time farmers who traded or were also civil servants.

Table 5: Problems of farmer's Cooperative society in the study area

Constraints	Frequency	percentage
Inadequate capital		
Yes	42	70
No	18	30
Total	60	100
Mismanagement of fund & resources		
Yes	4	6.7
No	56	93.3
Total	60	100
Low cooperation among co-operators		
Yes	12	20
No	48	80
Total	60	100
Inadequate skilled personnel		
Yes	34	56.7
No	26	43.3
Total	60	100

Source: Field survey, 2015

The result in Table 4, showed that 70% of the members of farmers' cooperative society had problem of inadequate capital. Access to capital is a serious problem that affect expansion of a business. This finding is supported by Ojiagu & Uchenna, (2015) who identified inadequate funds, poor education, poor farmers' access to farm input. It was also reported that 56.7% of them had problem of inadequate skilled personnel. The study revealed that 6.7% of them accepted that mismanagement of fund and resources was also a problem and low cooperation among the co-operators accounted for 20% of problems faced by the farmers. The findings agrees with report by Debeb & Haile, (2016) who stated that inadequate capital and low participation of members in the cooperative business is affected the success of cooperative society.

CONCLUSION

The study concludes that farmers' cooperative society had contributed immensely to economic activities especially farming in the study area. Age of the farmers, volume of loan received, farm

size and major occupation of the farmers were the major determinants of revenue realised by the co-operators. Factors such as insufficient fund, inadequate skilled personnel and low cooperation among others were major challenges militating against farmers' cooperative society in the study area.

RECOMMENDATIONS

The study therefore, recommends that;

(i) Sufficient loan should be given to the farmer's co-operators to enable them to increase their level of food production in the study area.

(ii) There should be adequate provision of the necessary farm inputs needed by the farmers at reduced cost and at the right time.

(iii) Cooperative societies should encourage members to participate in training workshops and seminars to enable them acquire skills and knowledge that would enhance farm productivity at the same time increase their revenue.

REFERENCES

Adefila, J. O. (2012). Spatial Assessment of Farmers' Cooperatives Organizations in Agricultural Development in Gurara Area of Niger State, Nigeria. *Journal of Ecology and Natural Environment*, 4(2), 51-57.

Adefila, J. O & Madaki , J. (2014). Roles of Farmers' Cooperatives in Agricultural Development In Sabuwa Local Government Area of Katsina State, Nigeria. *Journal of Economics and Sustainable Development,* 5 (12), 80-87.

Ajayi, M. (2008). "Implications of Macro-Economic policy for National Food Security in Nigeria". Paper Presented at the 2008 Annual Conference of the Development Finance Department of Central Bank of Nigeria (CBN), held at Orchid Hotel, Asaba, Delta State, from 15th -18th October.

Anyanwu, C.M. (2004) Micro Finance Institutions in Nigeria, Policy, practice and potential. Paper presented at the G24 workshop on "Constraints to the growth in Sub-saharan African" Pretoris, South Africa.

Chambo, S. (2009) Agricultural cooperatives: Role in Food Security and Rural Development: Paper presented to expert group meeting on cooperatives. New York. December

Debeb, D & Haile, M (2016). Agricultural Cooperatives, Opportunities and Challenges, the Case of Bench Maji Zone, Ethiopia. *Journal of Poverty, Investment and Development.* 22: 57-60.

Ebonyi, V. & Jimoh, O. B. (2002). Cooperative Movements; A way out of Poverty. Lagos, Longman Publishers.

ICA. (2010). International Cooperative Alliance. Retrieved 1, October, 2011 from http://www.ica.coop/.ss

NAOC GRP (2007). Green River Project, Nigerian Agip Oil Company (NAOC) – GRP Farmer's Day Celebration, December 1st 2007, pp 1-6.

National Population Commission (NPC) (2006). Provisional Population Census Report. National Bureau of Statistics, Abuja.

Nweze, N. J (2001). Poverty, Microfinance and Cooperative Promotion in Nigeria. *Nigerian Journal of Cooperative Studies,* (1), 2-5.

Nwankwo, F. (2009). "The Organizational and Management Structure of Cooperative Challenges and Re- poisoning Imperative" Paper Presented on workshop on cooperative formation and Development for Micro Financing. Faculty of Management Sciences Dept of Cooperative Economics and Management. Nnamdi Azikiwe University, Awka. International Cooperative Alliance (ICA, 2010).

Obinyan, E. (2000). "The private sector and Agricultural Transformation. UAC seeds zone" in Nwosu et al (ed), *Agricultural transformation in Nigeria*. Owerri Novelty Industrial Enterprises Ltd.

Ojiagu, N C. & Uchenna, C. O (2015). Effects of membership of cooperative organisations and determinants on farmer -members' income in Anambra State, Nigeria. *International Journal of Scientific & Technology Research,* 4 (8), 28-35.

Onuoha, E (2002). A critique of the drafts of cooperative policy for Nigeria. *Nigeria Journal of Cooperative Studies,* 2 (1),10-17.

Prakash, D. (2003). Rural women food security and agricultural cooperatives. Rural Development and Management Center, New Delhi, India.

Ukeje, M.F. (2008). Agricultural Development Issues, It's sustainability and food security in Nigeria. Paper presented at the 2008 Annual conference of the Development Finance Department of Central Bank of Nigeria (CBN), held at Orchid Hotel, Asaba, Delta State. 15th-8th, October.

Ukpere, W.I. (2010). Demise of a single orthodoxy and the possibility of a co-operative economy. *International Journal of Soc, Econs,* 37(3), 239-253

Umebali, E.E. (2004) Rural Resources Farm Management and Rural Development. Compile Publishers Enugu.

Umebali, E.E. & Agu, F. N (2009). "Understanding the Concept, Strategies and principles of Cooperative Group Formation. Paper presented on workshop on cooperative formation and Development for Micro Financing". Faculty of Management Sciences Dept of Cooperative Economies and Management. Nnamdi Azikiwe University, Awka.

Veerakumaran, S. (2005). Role of cooperatives in food security: A case study of Ethiopia. Department of Cooperative. Faculty of Dry Land, Agriculture and Natural Resources. Makerere University.

ASSESSMENT OF VALUE CHAIN TECHNOLOGIES IN AGRICULTURE: A RURAL SOCIOLOGICAL PERSPECTIVE OF FARMERS IN EMOHUA LOCAL GOVERNMENT AREA.

F. E. Nlerum and M. I. Agorom
Department of Agricultural Extension and Rural Development, Rivers State University
P.M.B 5080, Port Harcourt, Nigeria.
E-mail: frankezi@yahoo.com

ABSTRACT

The study assessed the utilization of value chain technologies in agriculture from the rural sociological perspective of farmers in Emohua Local Government Area of Rivers State, Nigeria. Random sampling technique was used in selecting the sample size of 112 farmers. Data were obtained with copies of the questionnaire. Descriptive statistics of percentage and mean were used in the analysis of the objectives. Inferential statistics of linear multiple regression analysis was used in the test of hypothesis. The major value chain technology utilized by farmers was harvesting of farms as appropriate (93.7%). The rate of value chain technologies used by farmers was 51.2%. The rural sociological perspective of farmers about value chain technology in agriculture was that it is beneficial. The major benefit of value chain was increased farm productivity with the mean of 3.8. The relationship between socio-economic characteristics of farmers and value chain utilized showed a multiple determination of R^2 =0.0618. Age (0.055), educational level (0.048) and extension contact (0.032) had significant relationship with value chain utilization of farmers. The study recommends sustained effort of the rural sociologists in delivery of more value chain technologies in agriculture to farmers in the area.

Keywords: Value chain; Technology; Agriculture; Rural Sociology.

INTRODUCTION

Value chain is defined as the study of full range of activities which are required to bring a product or service from conception, through the different phase of production, delivery to final consumers and find disposal after use (Rathee and Rajain, 2013). Value chain terminology was first brought about and popularized my Michael Porter in a book titled "Competitive advantage: Creating and sustaining superior performance" (Kaplinsky, 2001) and (Onwumere, Onwusibiribe and Iheanatu, 2014). Value chain in agriculture therefore is the full range of process an agricultural product, service or technology passes from the time it was conceptualize through the period of production, processing and delivery to the final consumer who is the farmer. The importance of value chain addition in the agricultural sector include the fact that value added agricultural activity or product attract better demands as opposed to raw and unprocessed ones and shelf life of agricultural products which generally are easily perishable in nature are extended. Also there is increase in the competitiveness of countries with value added technologies and products in the global market.(Onwumere, *et al* 2014). This is true because countries which have added more values to their products compete better than those that trade on products which are raw and natural. Value is the amount buyers are willing to pay for what a firm provides in competitive terms (Achchathan and Kajananthan, 2012).

The value, therefore of agricultural products, services or technologies is their worth to the consumers. There is a relationship between value chain addition and profit margin of firms. The study of Coopers and Lybrand (1996) in Pakistan indicated a correlation coefficient of 0.74 (74%)

between value chain addition and profit margin. This shows that increase in value chain addition brought about 74% increases in profit.

Some key strategies for adding value to a product according to Mmasa (2013) included changing the physical state of the product, producing an enhanced value of a product and differentiation of products. Others are bundling (packaging) of products, production of more products of higher and better efficiency in a given supply chain and acquisition of more assets up a supply chain. Value chain addition is possible and relevant in agricultural technology developments. Generally speaking, the term technology is defined as a body of knowledge, the organization and procedures, the machinery, tools, the necessary materials and inputs and human skills that are combined to produce a socially desired product. Ogunrinde (2006) has however described technology to mean a term which is associated with all ways and manners in which discoveries and inventions in science are put to use to satisfy mans need and desires.

Agricultural technology therefore is the application of scientific techniques which satisfy human needs and desires in control of the development, yield, preservation and processing of agricultural products. Simply put, agricultural technology is an improved skill or input which helps in increasing productivity in all fields of agriculture. The food security status of any nation is to a large extent dependent on the type of agricultural technologies which have been packaged and are reachable to the citizens of that nation. Nigeria has over twenty-two agricultural research institutions. These institutions have developed several value chain technologies in agriculture. These technologies no doubt have added values to the production capacities of the Nigerian farmer. The technologies succinctly can be grouped into production, processing, storage and preservation value chains.

Agricultural production value chain technologies include, but not limited to harvesting of farms as appropriate, weeding farms as appropriate, cassava/ maize/egusi intercropping system, introduction of improved varieties of crops, rearing of sheep and goats, snail rearing, etc .In agricultural processing technology value chain, we have processing of cassava into other food forms, plantain chips processing, soya bean processing and utilization, cocoyam chips processing, etc, Agricultural storage and preservation value chain included shelling and storage of dry maize in air-tight containers, storage pests and diseases protection, storage of maize in cribs, etc. Value chain technologies in agriculture can only be meaningful if they are successfully disseminated from the research institutions where they are developed to the farmers who are the consumers of the technologies. The agricultural extension agent or the rural development practitioner otherwise known as the rural sociologist is the link between research institutions and farmers. The rural sociologist is an expert in rural sociology.

Rural sociology is that branch of sociology concerned with the scientific study of rural development and the agencies through which the development is delivered to the people to bring about the well-being of rural dwellers (Smith, 2011). In as much as rural sociology is interested in the well-being of rural dwellers, its study cannot be complete without a good attention to the study of agriculture which is the main occupation and means of livelihood of many rural people.

The importance of the study of rural sociology cannot be overemphasized and therefore include the fact that it: assist us to understand and appreciate the problems of the rural people as to determine their felt needs, helps rural people to understand themselves, their environment and their role in the development process, helps in providing direct information about rural people to development agencies who are interested in the welfare of rural dwellers, provides sociological knowledge and

capacities such as culture, norms, sanctions, leadership styles, etc to rural development practitioners; provides a feedback link between rural people and development organizations and helps in identifying factors which weaken their ability to work together in groups. Other importance of the study of rural sociology are to discover the basic structure of the rural society and understand the conditions which make positive change in rural area to be possible.

The problem of this study was predicated on the question raised by the study of Kumar et al (2011) which demanded to know the contributions of technology in the development of value chain in agriculture and whether value chain development in the agricultural sector can address the issue of food security and help reduce poverty for those dependent on agriculture as their means of livelihood. In order to provide answers to this research problem, the research questions of the study are, what are the socio-economic characteristics of farmers in the area? What are the value chain technologies in agriculture available to farmers in the area? What are the benefits of value chain technologies in agriculture for farmers in the area? The objectives therefore of the study described the socio-economic characteristics of farmers, analyzed the value chain technologies available to farmers and determined the benefits of value chain technologies to farmers. The hypothesis of the study was that, there is no significant relationship between socio-economic characteristics of farmers and their rate of value chain technologies utilized.

MATERIALS AND METHODS

The study was conducted in Emohua Local Government Area (EMOLGA) of Rivers State. Emohua Local Government Area is located in the north, eastern part of Rivers State within the Ikwerre ethnic nationality. EMOLGA is central to the development of Rivers State. It is bounded on the North by Ahoada East and West Local Government Areas (LGA) on the South by Obio-Akpor Local Government Area on the East by Ikwerre Local Government and in the West by Asari Toru and Degema Local Government Areas. It has an area of 831 km2 (321 square miles) and a population of 201, 901 people at the 2006 census (FGN, 2006*)*. As a result of adequate rainfall and favourable weather conditions, the area has a widespread flora and fauna which supports farming which is the primary occupation of the people. There are varying degrees of economic trees such as palm trees, abura, raffia palm ,iroko, obeche, etc which are exploited for economic use. There are also rivers, streams, and creeks, which makes fishing one of the major occupations of the area. In terms of natural resources, the area is rich in oil and gas reserves, limestone, clay and sharp sand used for building. The L.G.A is made up of five clans namely; Ndele, Rumuji, Elele, Uvuahu and Oduoha and forty-three communities.

The population of the study was made up of all farmers in Emoha Local Government of Rivers State. Multistage and random sampling techniques were adopted for the selection of respondents. In the first stage, three communities were randomly selected from each of the five clans of the L.G.A to have a total of 15. The selected communities were: Omuofo, Ofa, and Agbandele from Ndele clan: Mgbumuoda, Mgbuatata and Mgbuoda from Rumuji clan. Omuadi, Omuse and Omuohia from Elele clan. Omuoda, Omuamah and Omuiba from Uvuahu clan and from Oduoha clan, Rumuogboka, Rumuehio and Rumuokani were selected.

In the second stage, eight farmers were randomly selected from each of the 15 randomly selected communities. This gave rise to 120 farmers. However, 112 copies of the study instrument were retrieved and used as respondents. The tool for data collection was the questionnaire. The questionnaire sought for information on socio-economic characteristics of farmers, agricultural

value chain technologies available to farmers and socio-economic benefits of value chain technologies in agriculture. In order to ensure the appropriateness and correctness of the questionnaire as to be sure that the questions were easy to understand by the respondents, the questionnaire was validated by some experts in rural sociology and agricultural extension in the Department.

Data collected were analyzed using descriptive statistics such as percentage and mean of a four point Likert-type rating scale with a cut-off mean of 2.50. Value chain percentage total score was obtained by summing the results obtained from each of the variable. In the same vein, the value chain mean percentage score for all respondents was obtained by dividing the value of the value chain percentage total score by the number of agricultural value chain technologies (in this case 26) expected to have been utilized by the respondents. Inferential statistics involving the use of linear regression analysis was used for the test of hypothesis.

The model of linear regression analysis used was explicitly expressed as:

$$Y = a+b_1X_1 + b_2X_2 +b_3X_3+b_4X_4 +b_5X_5^-+ ei\ldots.(1)$$

Where :

	=	Value chain index
a	=	Intercept
b_1-b_6	=	Slope of the equation
X_1	=	Age (in years)
X_2	=	Educational Level (years of schooling)
X_3	=	Farming experience (in years)
X_4	=	Extension contact (visits per month)
X_5	=	Household size (number of persons)
e	=	Stochastic error term

RESULTS AND DISCUSSION

Socioeconomic Characteristics of Farmers

The result in Table 1 shows that the means age of the farmers was 46 years. This result is inconsistent with the study of Gwary et al (2014) which indicated a mean age of 26 years among fishers in Bornu State, Nigeria. This indicates that farmers who were exposed to agricultural value chain technologies were in their active age.

Educationally, apart from the 19.6% respondents who had no formal education, majority of them were educated. This finding shows the importance which farmers attach to education. This finding agrees with the opinion of Oluyole (2005) who asserted that high literacy level enabled farmers to understand the intricacies of new production techniques. The finding also agreed with that of Henri-Ukoha*, et. al.* (2011) who posited that education was an important factor to facilitate the adoption of improved technologies in Imo State, Nigeria.

Table 1: Percentage Distribution of Respondents According to their Socio-economic Characteristics.

Characteristics	Frequency	Percentage (%)	Mean ($\bar{x}$)
Age range in years			
20-30	23	20.5	
31-40	31	27.7	
41-50	26	23.2	46.0
51-60	21	18.8	
61-70	11	9.8	
Total	**112**	**100.00**	
Educational level			
No formal education	22	19.6	
Primary School	33	29.5	9.0
Secondary School	30	26.8	
Tertiary education	27	24.1	
Total	**112**	**100.00**	
Household size			
1-4	39	34.8	
5-8	46	41.1	
9-12	27	24.1	7.0
Total	**112**	**100.00**	
Number of years in farming			
1-5 years.	18	16.1	
6-10 years	28	25.0	
11-15 years	23	20.5	
16-20 years	22	19.6	
21-30 years	21	18.8	14.0
Total	**112**	**100.00**	
Number of extension contact per month			
0			
1	81	72.3	
2	13	11.6	
3	15	13.4	0.5
	3	2.7	
Total	**112**	**100.00**	

Source: Field Survey, (2017).

The mean years of farming experience was 14 years. This was inconsistent with the study of Ivande (2014) who found a mean year of farming experience of 36.8 years among farmers in India. The finding indicates that the respondents have acquired some level of experience in agricultural value chain techniques in the area of production, processing, storage and preservation of agricultural products.

Household size of farmers was noted with high tendency ratio with the mean household size as seven (7) persons. This indicates a large household size. The implication of this large household size is that there will be more hands adopting agricultural value chain practices in the area. This will have a positive effect of reducing the cost of hired labour by the farm families. This result agreed with that of Ibekwe and Orebiyi (2012) who asserted that large household size provided most of the labour force for farming household in South East, Nigeria.

The mean number of extension contact was 0.5 times per month. This indicates a very poor contact between the farmers in the study area and extension workers. This result agreed with that of Hussaini (2012) who asserted that 61% of the respondents had no opportunity for coming in contact with the extension agents. This poor extension contact could be as a result of inadequate extension personnels which Omenze (2010) attributed to the lack of sustainability of extension services in rural areas because of the withdrawal of funding by international donors to the Agricultural Development Programmes in Nigeria.

Value Chain Technologies in Agriculture Available to Farmers

Table 2 shows that harvesting of farms as appropriate with 93.7% was the major value chain technology in agriculture available to farmers in the study area. This value chain technological practice involves the harvesting of farms as at when they are matured. The importance of this technology is that harvesting farms when they are due enhances profit maximization. Failing to harvest when the farm is due means extra maintenance cost on the part of the farmer. Example, harvesting product like cassava, maize vegetables, wheat, rice, fish pond and livestock pen as appropriate will yield more income. Failure to harvest as appropriate exposes the outputs to damage by pests, diseases and other natural hazards. When fishes in ponds and livestock in pens are allowed to overstay after they have assumed table size (due for harvest), they consume more feeds and develop predatory habit like cannibalism at the detriment of farm investment.

Weeding of farms as appropriate with 99.1% was the next major value chain technology in agriculture. This technology involves a situation where farmers are thought to keep their farms weed-free especially at critical stages of maturity of the crops. Before the introduction of this technology, farmers were used to carrying out weeding of farms at their convenient time. With this technology in place, weeding of farms is done at appropriate times for optimal performance of the crops. This value chain technology provides that the appropriate time for weeding of farms is three weeks after planting, then six weeks after planted crops and subsequently ensuring that the farm is weed free. The importance of this technology is that farms are saved from suffering the effects of weeds on crops such as competition for available space, water, nutrients, sunlight, air. Besides this, weeds are also known to be host to pest and disease organisms which affect the growth of crops.

The third major value chain technology in agriculture available to farmers was shelling and storage of dry maize in air-tight containers with 87.5%. Before the intervention made by this technology, rural farmers were known to store their maize for planting in the next season above the kitchen fire position. This process is known to expose the dried maize to damage effect of storage pests like weevil. The end result of this method of storage was the availability of seeds with poor viability and inadequate seeds for planting in the next farming season.

The results in Table 2 further shows that the rate of value chain technology utilized by the farmers was fairly good as indicated by the value chain mean percentage score of 52.1%. This result shows

Table 2: Percentage Distribution of Selected Agricultural Value Chain Technologies Available to Farmers.

S/No	Value Chain Technologies	Frequency (n=112)	Percentage (%)
A	**Production Value Chain Technologies**		
1	Harvesting of farms as appropriate	105	93.7
2	Weeding farms as appropriate	102	91.1
3	Cassava/Maize/Egusi Intercropping System	93	83.0
4	Introduction of improved cassava varieties	96	85.7
5	Planting crops in rows	55	75.9
6	Planting /Banana production	75	67.0
7	Yam minisett technology	69	61.6
8	Plantain sucker multiplication package	62	55.3
9	Pineapple cultivation package	53	47.3
10.	Rearing of sheep and goat	45	40.2
11.	Poultry feed formulation with Kitchen waste	44	39.3
12.	Plantain/Cocoyam intercropping system	40	35.7
13.	Dry season vegetable production	39	34.8
14.	Fertilizer application on crops	39	34.8
15.	Introduction of agro-forestry	35	31.2
16.	Swine production package	35	31.2
17.	Off-season maize production	25	22.3
18.	Snail rearing at home	16	14.3
19	Homestead bee keeping	3	2.7
B	**Processing Value Chain Technologies**		
20	Processing of cassava into odourless fufu	81	72.3
21.	Processing of Plantain chips	71	63.4
22.	Processing and utilization of soyabean	34	30.3
23.	Production of cocoyam chips	13	11.6
C	**Storage and preservation Value Chain**		
24.	**technologies**	98	87.5
25	Shelling and storage of dried maize in air-tight	92	82.1
26.	containers	75	67.0
27.	Storage pests and diseases protection		1,354.1
	Storage of maize in cribs		52.1
	Value Chain Percentage Total Score		
	Value Chain Percentage Mean Score		

Source: Field Survey, (2017). Multiple response.

a rate of utilization which was a little above the average. The finding is similar to the adoption rate of 56.6% in the study of Nlerum (2013) among Niger Delta farmers in Nigeria. The implication of this finding is that farmers in the study area have fairly applied value chain technologies in agriculture in their farming activities. The rural sociological perspective of farmers in this area is that their production outputs would be below the optimal level. This is because their level of application of the value chain technologies in agriculture which were meant to improve production output was still at the average rate.

Socio-economic benefits of value chain technologies in agriculture.

The socio-economic benefits of value chain technologies in agriculture is shown in Table 3 below.

Table 3: Mean Distribution of the Socio-economic Benefits of Value Chain Technologies in Agriculture to farmers.

S/No	Benefits	SA (4)	A (3)	D (2)	SD (1)	Total Score (n-112)	Mean Score ($\bar{x}$)
1	Increased productivity	90	21	1	-	425	3.8
2	Improved standard of living	53	55	3	1	384	3.4
3	Improved managerial skill	34	64	8	6	350	3.1
4	Enhanced production skill	40	70	1	1	373	3.3
5	Enhanced attitude towards farming	45	56	8	3	367	3.2
6	Education of other farmers	55	28	24	5	357	3.1
7	Increased income	60	27	25	-	371	3.3
8	Improved household food and nutritional security	88	20	3	1	419	3.7
9	Durability of shelf life of farm products	79	24	9	-	406	3.6
10	Increased purchasing power	58	36	13	5	371	3.3
11	Reduced poverty	64	24	18	6	370	3.3
12	Reduced rural-urban migration	53	35	36	6	359	3.2
13	Enhanced esteem as a farmer	39	31	36	6	327	2.9
14	Provided means of livelihood	44	49	14	5	356	3.2
15	Employment creation	63	45	3	1	394	3.5

Source: Field Survey, (2017). Mean $\geq$ 2.50 = Beneficial. Mean< 2.50 = Not beneficial

The major benefit of value chain technologies in agriculture as perceived by farmers in the study was increased farm productivity with the mean of 3.8 (Table 3). This result agreed with the study of Salazar et al (2015) in Boliva that there was increased agricultural productivity and income of small subsistence farmers who adopted improved agricultural technologies. The implication of the study was that the utilization of value chain technologies assisted the farmers to experience higher productivity in their crop, livestock, fisheries and agro-forestry activities.

Improved household food and nutritional security was the next important benefit of value chain technologies in agriculture with a mean of 3.7. This finding agreed with that of the study of Zeng *et al* (2014) which showed that improved agricultural technology adoption enhanced household nutrition especially those of children in the rural area of Ethiopia. This result connotes that value chain technologies brought about higher farm productivity which in turn made available to farm households adequate food supply to meet the nutritional and food security needs of the people.

Enhanced durability of shelf life of farm products with a mean of 3.6 was the third major benefit of value chain technologies in agriculture to the respondents. Shelf life means the period of time an agricultural product stay before it is unsuitable for eating, selling, storage, processing and planting. Shelf lives of agricultural products vary from one commodity to another depending on source of the product such as crop, livestock, fishery or agro-forestry. Even within the same product source, shelf life varies. As a result of poor shelf life, one third of the world's annual food produced for consumption is wasted (Sani, 2012). This approximate to 1.3 billion tones and worth roughly 680 billion United States dollars in developed countries and 310 United States dollars in developing countries (Saini, 2012) such as Nigeria. Global annual agricultural products wasted for root crops, fruits and vegetables approximately amounts to 40-50%. The fact that poor shelf life affects farmers,

processors, retailers and consumers alike has called for the study of value chain technologies in agriculture of which the result of this study has demonstrated that it is beneficial to farmers.

Further results in Table 3 indicate that all the studied variables had values which were above the cut-off mean of 2.50. This showed that value chain technologies in agriculture impacted positively on all the variables. The rural sociological perspective of this result to farmers is that value chain technologies in agriculture are of immersed benefit in this study area and therefore need to be sustained by rural sociological agents.

Relationship between socio-economic characteristics of farmers and the rate of value chain Technologies Utilized.

Relationship between socio-economic characteristics of farmers and the rate of value chain technologies utilized in the study area.

Table 4: Summary of Relationship between Personal Characteristics of Respondents and Rate of Value Chain utilized.

Characteristics	**Coefficients**	**t-ratio**	**Remarks**
Age	(X_1)0.0555.362	Significant	
Educational level	(X_2) 0.048	0.829	Significant
Farming experience	(X_3)-5.938	2.048	Not Significant
Extension contact	(X_4) 0.032	0.776	Significant
Household size	(X_5) 2.611	2.306	Not Significant
R^2	0.618		
F- Statistics	0.000	10.211	

Field Survey, (2017). Alfa level = 0.05

Results in Table 4 shows that the coefficient of multiple determination (R^2) was 0.618, meaning that 61.8% of the variation in the rate of value chain technologies in agriculture utilized by farmers was achieved by the combined efforts of the five socio-economic characteristics of farmers considered in the study. Result of F-statistics (0.000) was significant, meaning that the studied socio-economic characteristics were effective in the determination of the farmers' rate of value chain technologies used. The coefficients for age (X_1), educational level (X_2) and extension contact (X_4) 0.055, 0.048 and 0.032 respectively were significant at 0.05 Alfa level. These variables were determinants of value chain technologies in agriculture among these respondents. Farming experience (X_3) and household size (X_5) with the coefficient of -5.938 and 2.611 respectively were not significant. In view of these findings, the null hypothesis was rejected for the significant variables and accepted for the non-significant variables.

CONCLUSION AND RECOMMENDATIONS

The study assessed the utilization of value chain technologies in agriculture by farmers from a rural sociological perspective and indicated that harvesting of farms as appropriate was the major value chain technology in the area. This was followed by weeding of farm as appropriate and the third was shelling and storage of dried maize in air tight containers. The rate of agricultural value chain utilized

by farmers in the area was fairly good. The three major benefits of value chain technologies in agriculture in their order of importance were increment in farm productivity, improvement in household food and nutritional security and durability of shelf life of farm products. The rural sociological perception of farmers in terms of the use of value chain technologies in agriculture was that, it is immensely beneficial to farmers. The study recommends a sustained effort of the rural social change agents in the delivery of more value chain technologies to agriculture to farmers in this study area.

REFERENCES

Achuthan, Sivapalan & Kajananthan, Rajendran. (2012). "A study on value chain analysis in dairy sector of Kilinochchi District, Srilanka". *Global Journal of Management and Business Research*, 12(21), 1-15.

Coopers, R &Lybran, (19960). "Costing techniques to support corporate strategy: Evidence from Japan".*Management Accounting Research*, 7(2,: 21-46.

FGN (2006). Federal Government of Nigeria, National Population Census, 2006. National Bureau of Statistics, Abuja.

Gwary, M.M., Yekini, I. B & Diyaware, M.Y. (2014). Value chain analysis of fish caught in lake Alau, Borno State, Nigeria. *Nigerian Journal of Fisheries and Aquaculture,* 2(1), 15-23.

Henri-Ukoha, A., Anaeto, F.C., Chikezie C., Ibeagwa, O. B.,Ukoha, I.I., Oshaji, I. & Anyiam K. H. (2015). Analysis of Cassava value chain in Ideato South Local Government Area of Imo State, South-East Nigeria". *International Journal of Life Science*, 4(4), 209-215.

Husaini, T. (2012). "Impact of agricultural farming technology on rural farmers in Malawi".*Malawi Journal of Agricultural Extension*, 24(1&2).

Ibekwe, U.C., & Orebiyi, J. S. (2012). "Determinants of agricultural sustainability in Southeast Nigeria–The climate change debacle. *Global Journal of Agricultural Research*, (2), 1-13.

Ivande, B.O. (2014). Marketing supply response and marketing problems of farmers in the Hills. *India Journal of Agricultural urban Economics,* 52(1), 139-150.

Jason,Donovan., Steven,Franzel., Marcelo,Chunha., Amos,Gyau&, Dagmar,Mithofer., 2015 "Guides for value chain development: A comparative review". *Journal of Agribusiness in Developing and Emerging Economics,* 5(1), 2-23.

Kaphinsky, R &Moris, M. 2001. *A Handbook for Value Chains Research*, London, Macmillan, 74 p.

Koppart, Murty S.&Kwizera, Alice. 2016. Impact of agricultural value chain financing on smallholder farmers' livelihoods in Rwanda: Case study of Rwanda rice value chain. *International Journal of Information Research and Review*, 03(12), 3331-3340.

Kumar, Anjani., Singh, Harbir., Kumar Sant., & Mittal, Surabhi. 2011. "value chain of agricultural commodities and their roles in food security and poverty alleviation-A synthesis". *Agricultural Economics Research Review, 24 (January-June)*: 169-181.

Mmasa, Joel J. 2013. "value addition practices to agricultural commodities in Tanzania" (CLKnet, Policy Brief No.20. Retrieved on 12th September 2017 (www.clknet.or.tz).

Nlerum, Franklin. E. 2013, "Comparative analysis of adoption of agricultural technologies of Green River Project by farm families of Niger Delta, Nigeria".*Journal of Sustainable Technology*, 4(1), 82-87.

Ogunrinde, S. I. 2006. "Agricultural technological need in 21st century Nigeria and its implication for agricultural education". Proceedings of 11th Annual Conference of Agricultural Extension Society of Nigeria, 3rd-6th of April, 2006, pp 82-92.

Oluyole, K.A. 2005. "Evaluation of economics of post-harvest processing of cocoa in Cross Rivers State, Nigeria".*Journal of Agriculture, Forestry and the Social Sciences*, 3(2), 58-64.

Omenze, C.A. 2010. Evaluation of Extension Delivery in North West Cameroon, Lynne Rinner Publisher, Cameroon.

Onwumere, Joseph., Onwubiribe, Ndubuisi&Iheanatu, Chinyere. 2014. "Value Chain analysis of palm fruit production and processing in Abia State, Nigeria". *Asian Journal of Agricultural Extension, Economics and Sociology,* 3(3), 243-256.

Rathee, R and Rajain, P.(2013). Service value chain models in higher education. *International Journal of Emerging Research in Management and technology*, 2(7), 1-6.

Saini, Kaur .S. 2012. "Extending the shelf life of agricultural products: Five approaches for success". Retrieved on 27th September, 2017 (www. globalfoodsaftyresource.com).

Salazar, Lina., Aramburu, Julian., Ganzalex-Flores, Mario &Winters, Paul. 2015. "Food security and productivity: Impacts of technology adoption in small subsistence farmers in Bolivia. Inter-American Development Bank, Working paper series No. IDB-WP-5671,-52P.

Smith, S. (2011). Institutional and intellectual origin of rural sociology. Paper presented at 2011 meeting of Rural Sociology Association. Retrieved 27th September, 2017.

Zeng, Di., Alwang, Jeffrey., Norton, George W.,Shiferaw, Bekele; Jaleta, Moti and Yirga, Chilot. 2014. Paper presented at the Agricultural and Applied Economics Association's AAEA Annual Meeting, Minneapolis, M.N. 1-4P,P.

PERFORMANCE OF CASSAVA VALUE CHAIN IN IMO STATE, NIGERIA

*Osuji M.N[1] , Henri-Ukoha, A [2], Uhuegbulem I.J[1], Igwenagu M. O[3] , Chikaire J.U[3]
[1] Department of Agricultural Economics, Federal University of Technology, Owerri, Imo State, Nigeria.
[2] Department of Agricultural Economics and Extension, University of Port Harcourt, River State, Nigeria
[3]Department of Agricultural Extension, Federal University of Technology, Owerri,Imo State, Nigeria.
Corresponding Author's Email: Maryann.osuji@futo.edu.ng +2348035804354.

ABSTRACT

This paper aimed to analyze the performance of cassava value chain in Imo State, a multi-stage sampling technique was used to select fifty (50) respondents out of which 49 respondents returned their questionnaire. Primary data were collected with the use of well-structured questionnaire. The data obtained were analyzed using value chain map which is an analytical tool, descriptive statistics, cost and return analysis, and Z-test model. The result showed that the mean age of the value chain actors was 43.5years, majority of them are females, 53.9% of them have attended secondary education, the mean household size was 6 persons, mean farm size was 0.3hectare, majority of them were members of cooperative organization, The performance of producers, processors and marketers revealed profit margin of 0.59, 0.83 and 0.74 respectively which implies that the various activities along cassava value chain are profitable. Problems faced by the farmers were inadequate finance, high cost of transportation, insufficient electricity supply and incidence of pests and diseases attack.

Keywords: Cassava**,** Performance, Imo State, Value Chain

INTRODUCTION

Cassava (Manihot esculenta Crantz) is a starchy root crop. It is easy to cultivate, tolerant to drought action and diseases, has the ability to grow in poor soil and hence a major source of food security in Africa (Meridian Institute, 2013). Cassava is an important food crop which has great potential to support and promote agricultural growth in Nigeria due to its wide range of use spanning from consumption to industrial use. Some of the product of cassava processing are; garri, dry cassava chips, cassava flour, cassava starch, etc. The current cassava production in Nigeria was estimated in 2013 to be 54 million metric tonnes, total area harvested in 2013 was 3.85 million hectares (Food and Agricultural Organization Statistics, 2014). Cassava value chain comprises input suppliers, farmers /farmers cooperatives, processors, traders and collectors, intermediate and final consumers within and outside the region, it presents the major markets for cassava products, the major actors are involved in the production, processing and marketing of cassava, and their relationships as they move product from the fields through to the end markets. The chain is categorized into three channels of small, medium and large scale production, each serving different markets to include various key players' functions are identified as production, collection, bulking, processing, storing, wholesaling, refining, packaging, retailing and marketing. The raw cassava is either purchased by the consumer directly or sent to the processor for value addition via private collectors or cooperatives and even by the farmer and or households. Traders in turn collect processed products from rural markets and transport to rural, semi-urban and urban markets for sales. Medium and large scale processors collect

raw produce and products to further process and refine for industrial and export markets (Partnership Initiatives in the Niger Delta, 2011).

Agricultural cooperatives are vital in the socioeconomic development of the rural economy to provide food value chain, food security and poverty alleviation (Omoregbee and Ighoro, 2012). The primary objective of introducing agricultural cooperative was to increase crop production and credit facilities to farmers. They have been deeply involved in activities that have impacted on the livelihood of members in particular and rural people in general. According to Omotosho (2007), cooperatives usually ploughed back resources in terms of dividend on share capital and distributed proportionally to members as patronage bonus. An important form of agricultural cooperative in Nigeria is the cassava farming societies whereby members engage in the production, processing and marketing of the products through cooperative efforts. Contract farming is a major agrarian institution that has been widely applied in developed and developing countries at different times for improved coordination and performance of the agricultural market and for addressing different types of market failures in general. It specified the agricultural production carried out according to an agreement between farmers and a buyer which places conditions on the production and marketing of the commodity. Such an agreement may be oral or written.

In this stance, contract farming are seen by many policy-makers and analysts as in effect a 'new' development paradigm for linking small-holders to markets towards making African agriculture more market-oriented arising from its potential benefits of providing market for produced commodities at regular intervals, higher incomes in periods of excessive output, stabilization of product prices, exposure and empowering farmers to operate in modern farming conditions and maximizing profits (Action Aid, 2015; Obasi, 2014). Myriads of market constraints necessitated the involvement of contract models in agribusiness (Olomola, 2010). These are borne as a result of persistent failures in both input and output markets owing to imperfect competition, public goods and institutional failure. Ogunleye and Ojedokun (2014) stated that despite the smallholder farmers uniqueness and pivotal position in cassava value chain, they still belong to the poorest segment of the population and cannot invest much on their farms and this vicious circle of poverty among these farmers has led to unimpressive performance of particularly the value chain linkages from production to the end-users. The smallholder farmers are resource poor and lack the necessary endowments to play effective roles in cassava value chain system. Majority of them lack the needed farm inputs required for cassava production in large quantity, and still use crude tools for farming and acquiring even simple processing equipment is an investment which is out of reach for the majority of them.

It is against this background that the study analyzed the performance of Cassava value chain in Imo State. The specific objectives were to; examine the socio-economic characteristics of cassava value chain actors, determine the net return of each of the actors.

MATERIALS AND METHODS

This study was conducted in Imo State. The state lies in the south east geopolitical zone of Nigeria with Owerri as its capital and largest city. The State also lies within latitudes $4^{0}45^{1}$N and $7^{0}15^{1}$N, and longitude $6^{0}50^{1}$E and $7^{0}25^{1}$E with an area of around 5,100sq.km. It is bordered by Abia State on the East, by the River Niger and Delta State on the west, by Anambra State to the north and Rivers State to the south. Imo State is composed of three Agricultural zones and it is subdivided into 27 Local Government Areas (LGAs). The State has a total population of 3,934,899 persons with a

population density that varies from 230 persons per square kilometer in the densely populated areas (NPC, 2006). Multistage random sampling technique was used to select respondents for the study. The sample is made up of 50 respondents. This include 25 cassava cooperative /contract and 25 non-cooperative/contract value chain actors (producers, processors and marketers) respectively. The study utilized primary data which was collected by use of structured questionnaire. The data obtained was analyzed using descriptive statistics, cost and return analysis, and Z-test model. The Net Return Model is stated as;

GM = TR – TVC ……Eq 1
NR = GM – TFC …….Eq 2
Where,
TR = Total Revenue
TC = Total Cost which is equal to Total Variable Cost (TVC) and Total Fixed Cost (TFC).
The Z-test model is stated as:

$$Zi = \frac{\bar{X}_c - \bar{X}_{nc}}{\sqrt{\frac{S_c^2}{n_c} + \frac{S_{nc}^2}{n_{nc}}}} \quad \text{…….Eq 3}$$

Where;
i = level of cassava value chain enterprise systems (production, processing and marketing)
$\bar{X}_c$ = mean net return of the cooperative actors from the ith enterprise system (Naira)
$\bar{X}_{nc}$ = mean net return of the non-cooperative actors from the ith enterprise system (Naira)
S_c^2 = Variance of net return of the cooperative actors from the ith enterprise system
S_{nc}^2 = Variance of net return of non-cooperative actors from the ith enterprise system
n_c = Number of observations of the cooperative actors from the ith enterprise system
n_{nc} = Number of observations of the non-cooperative actors from the ith enterprise system

RESULTS AND DISCUSSION

Socio-economic characteristics of the Value Chain Actors

The distribution of the farmers based on their socio-economic characteristics is presented in Table 1 below.

Table 1: Distribution of the farmers based on their socio-economic characteristics in the study area.

Age	Frequency	Percentage	Mean
29-38	27	55.10	
39-48	11	22.45	
49-58	1	2.04	43.5 years
59-68	1	2.04	
69-78	9	18.37	
Gender			
Female	38	77.55	
Male	11	22.45	
Educational level			

0(No formal education)	3	6.12	
1-6	17	34.69	
7-12	26	53.06	9.6 years
13-16	3	6.12	
Household size			
2-5	18	36.73	
6-9	27	55.10	
10-13	4	8.16	
Farm size			
0.1-0.5	38	77.55	
0.6-1.0	7	14.29	0.3
1.5-2.0	4	8.16	
Membership of Cooperative			
Yes	43	87.76	
No	6	12.24	
Total	**49**	**100.00**	

Source: Field Survey Data, 2017

From the table above, the mean age of the respondents was 43.5years, this implies that every activity along the cassava value chain in the study area are dominated by young people. This is because the business requires a lot of energy and is labour intensive, moving from one place to another to assemble the products for marketing and this is in line with Asogwa et al (2013). Majority of them are female. They are relatively literate which will give room for effective communication. Mean household size was 6 persons implies that they can serve as family labour in the value chain activities. It would also improve their accessibility to market information and training essential to operate profitably in the venture.

Performance analysis of value chain actors in the area

The costs and return of cassava root producers is presented in Table 2 below.

Table 2: Costs and return of cassava root producers(actors) in the study area.

Items	**Qty**	**Price (₦)**	**Value(₦)**	**%TC**
Cassava roots sold	1227.78kg	67.5	82,875.00	
Total Revenue (TR)			82,875.00	
Cassava stems	27.64 bundles	656.20	18,137.44	53.48
Fertilizer	23.03kg	231.89	5,340.56	15.75
Labour	4.0 mandays	1203.75	4,815.00	14.20
Transport			325.00	0.96
Pesticides			2,303.44	6.79
Total Variable Cost (TVC)			30,921.44	91.17
Cost of farmland			2,764.13	8.15
Depreciation of fixed assets			229.69	0.68
Total Fixed Cost (TFC)			2,993.83	8.83

Total Cost (TVC + TFC)	33,915.25	100.00
Gross Farm Income (TR-TVC)	51,953.56	
Net farm income (GFI – TFC)	48,959.75	
Profit margin (NFI/TR)	0.59	

Source: Field Source Data, 2017

From the table, the gross and net farm incomes of the ventures were N51,953.56 and N48,959.75 and profit margin of 0.59. This indicated that the proportion of net farm income to the total return was 59%.

Costs and returns of cassava products processors

The costs and return of cassava products processors is presented in Table 3 below.

Table 3: Costs and return of cassava products processors (actors) in the study area

Items	**Units**	**Price (₦)**	**Value (₦)**	**%TC**
Garri	745.33kg	75	55,915.18	
Fufu	670.98 wraps	50	33,549.11	
Total Revenue (TR)			89,464.29	
Cassava roots	447.32kg	67.63	30,254.46	69.98
Water used			447.32	1.03
Transport			223.66	0.52
Palm oil used			147.32	0.34
Total Variable Cost			31,072.77	71.87
Firewood	44.7 bundles	24.87	1,112.50	2.57
Labour	11 mandays	850	9,371.65	21.68
Packaging			335.49	0.78
Rent of stall			1,132.63	2.62
Depreciation of fixed assets			209.68	0.48
Total Fixed Cost			12,161.95	28.13
Total Cost (TVC+TFC)			43,234.72	100.00
Gross Margin (TR-TVC)			58,391.52	
Net Margin (GM-TFC)			46,229.57	
Profit margin (NR/TR)			0.8	

Source: Field Survey Data, 2017

From the above table, the gross, net and profit margins were estimated as 58,391.52, 46,229.57 and 0.83 respectively which indicates good performance as the profit margin revealed that 83% of the total revenue was profit for the processors in cassava value chain in the area. This is agreement with Henri-Ukoha et al. (2015), who reported that the processing of cassava is profitable for the actors in Imo state.

Costs and return of cassava products marketers

The costs and return of cassava products marketers in presented in Table 4 below.

Table 4: Costs and return of cassava products marketers(actors) in the study area.

Items	Unit	Price(₦)	Value (₦)	%TC
Garri sold	418.18	100	41,818.18	
Fufu sold	348.89	55	19,189.	
Total Revenue			61,007.33	
Cassava products bought	107.70	135	14,545.45	93.06
Transport			150.91	0.97
Loading/off loading			67.27	0.43
Total Variable Cost			14,763.64	94.46
Rent of stall			335.05	2.14
Dep fixed assets			106.36	0.68
Market levy			141.82	0.91
Packaging materials			283.64	1.81
Total fixed cost			866.86	5.55
Total Cost			15,630.50	100.00
Gross margin			46,243.70	
Net margin			45,376.83	
Profit margin			0.74	

Source: Field Survey Data, 2017

From the Table 4 above , the gross, net and profit margins were N46,243.70, N45,376.83 and N0.74 which implies that cassava products returns a good margins to the chain actors in the area. This means that the venture is lucrative and viable with the potential of sustaining livelihood in the area. It is in consistence with the finding of Osuji et, al. (2017), who asserted that value addition in cassava enterprise by gender in south east Nigeria is a profitable business.

CONCLUSION

It could be concluded that middle-aged, married female, with high experience dominated the cassava value chain. Also the performances of various activities along the cassava value chain are profitable and the major threats to the performance of cassava value chain were lack of access to credit, poor road network and incidence of pests and diseases attack in the area.

RECOMMENDATIONS

The findings call for:

1. Policies designed to improve access to credit facilities, good road network, good markets.
2. Farmers are advised to form associations and cooperatives in order to pool resources together for efficient production, processing and marketing.

REFERENCES

Asogwa, B.C., Ezihe, J.A.C., and Ater, P.I. (2013). Socio-economic Analysis of Cassava Marketing in Benue State, Nigeria. *International Journal of Innovation and Applied Studies*, (4) 384-391.

Food and Agriculture Organization Statistics (2014). Statistics blue print 2014. Food and Agriculture Organization Cooperate Document Repository.

Henri-Ukoha, A., Anaeto, F., Chikezie, C., Ibeagwa, O., Ukoha, L. O & Anyiam, K. (2015). Analysis of Cassava Value Chain in Ideato South Local Government Area, Imo State, South-East, Nigeria. *International Journal of Life Science*, *4*(4), 209-215.

Meridian Institute. (2013). *Cassava Value Chain Overview*. Innovations for Agricultural Value Chains in Africa: Applying Science and Technology to Enhance Cassava, Dairy, and Maize Value Chains. Accessed on 10/02/2013. http://www.merid.org/en/value-chain-innovations/Examples.aspx

National Population Commission (NPC, (2006). Census Publication.

Olomola A S. (2010). Formal-Informal Institutional Linkages in the Nigerian Agribusiness Sector and Implication for Pro-poor growth. IPPG Discussion papers, series 37, available @ www.ippg.org.uk

Ogunleye, K. Y. Ojedokun, A.O.(2014). Preference for Contract Farming in Sustainable Cassava Production among Farmers in Oriire Local Government Area of Oyo State – Nigeria. *Journal of Economics and Sustainable Development,* 5-(23).

Omoregbee, E. F., and A. Ighoro (2012). "Effect of agricultural cooperative membership in farmers' income and membership in Delta State, Nigeria". Open Science Repository, Agriculture Online, doi.10:7392/. [www.openscience-repository.ccom/effect... Accessed 25 December 2014]

Omotosho, O. A. (2007). 'Cooperatives as a vehicle for mobilizing resources for poor farmers in Nigeria'. In general reading studies in Nigeria. University of Ilorin Press. Pp 57-6.

Osuji, M.N, Mejeha, R.o, Nwaru, J, Nwankwo, F.U, Nwaiwu, U(2017). Cassava value chain mapping and Gender role analysis in Southeast Nigeria. www.iosrjournals.org.e-ISSN:2319-2380,P-ISSN: 2319-2372. VOL.10,(3); pp 20-24.

PIND (2011) "A Report on Cassava Value Chain Analysis in the Niger Delta"

Sanni, L.O., Onadipe, O.O., Ilona, P., Mussagy, M.D., Abass, A. and Dixon, A.G.O. (2009). Success and challenge of cassava enterprises in West Africa: A case study of Nigeria, Benin and Sierra Leone. International Institute of Agriculture (IITA). www. iita.org

ASSESSMENT OF LAND MANAGEMENT PRACTICES OF SMALLHOLDER FARMERS IN SOUTHEAST, NIGERIA.

Osondu, Charles Kelechi
Department of Agricultural Economics and Extension, Abia State University, Umuahia Campus, PMB 7010, Umuahia, Abia state, Nigeria.
Author Email: osonducharles87@gmail.com

ABSTRACT

This study assessed land management practices of small scale farmers in Southeast, Nigeria. Data were elicited from 360 small scale farmers selected by means of multistage random sampling technique using pre-tested and structured questionnaire. Data collected were analyzed using descriptive statistics and Ordinary Least Square (OLS) multiple regression technique. Results showed that mean age, farming experience, farm size and annual farm income of the farmers were 48 years, 15 years, 0.86 hectares and ₦156,870.86 respectively. Results further showed that 33.3% and 26.7% of the farmers belonged to environmentally unfriendly and environmentally damaging land management categories respectively, while, 25.8% and 14.2% of them belonged to environmentally sustainable and environmentally compatible land management categories respectively. It was found that education level, farming experience, extension contact, farm size and membership to farmers' association were significant determinants of rate of use of land management practices by farmers. Meanwhile, 72.5%, 65.0% and 60.8% of the farmers were constrained from using land management practices by inadequate capital, inadequate knowledge of land management practices and inadequate access to credit respectively. The Federal and State governments should make policies aimed at increasing linkage between extension workers and small scale farmers.

Keywords: Land management practices, smallholder farmers

INTRODUCTION

Land is the basic natural resource that provides sustenance for man (Amao, Ayantoye and Aluko, 2013). It is the major resource for the livelihood of farmers. Nigeria is endowed with enough land to undertake small and large scale activities to strengthen household food security and livelihood, national development, trans-boundary cooperation and regional integration to transform trade, and create new opportunities for sustainable development that is sensitive to the environment and social and economic issues (Amao *et al.,* 2013).The economic fortune of Nigeria revolves largely around the exploitation and use of land resources especially in a primary industry such as agriculture (Titilola and Jeje, 2008).Land, being limited in supply is pressured and competed for by several users (Akinnagbe and Umukoro, 2011 Not in reference). In Nigeria, large tracts of land are used by small scale farmers who form the bulk of the farming population for agricultural production. According to Brown and Wolf (2005) small scale farmers in Nigeria account for a large share of the total cultivated land and agricultural output. Thus, the importance of land to livelihood of the small scale farmers cannot be over emphasized.

However, expansion and intensification of agriculture by small scale farmers have often damaged the very resources essential to farming such as soil, water and genetic diversity of crops as well as the wider environment (Raufu, and Adetunji, 2012). As important as land is to the livelihood of farmers, Adekoya (1997) observed that many small scale farmers in Nigeria are not using many of the land management practices. Use of unscientific farming methods and unsustainable agricultural

practices by farmers in Nigeria have been identified by many studies as a primary cause of land degradation which alters the natural ecological conservatory balances in the landscape (Maiangwa *et al.,* 2007; Senjobi and Ogunkunle, 2010). Over exploitation of land resources through over grazing, over use of fertilizer, water erosion, soil acidification and salinization and overload of soil nutrients have degraded land in many parts of Nigeria (Amao *et al.,* 2013). The negative impacts of land degradation undermine people's livelihoods and economic wellbeing, and the nutritional status of more than 1 billion people in developing countries (Global Environmental Facility 2003). According to Oyekale (2008) and Subair (2009) the impact of land degradation on the local population include crop failure and famine, shortage of water, shortage of land for farming and prolong soil infertility. Land degradation has become a major problem in Nigeria and is projected to become even more severe unless sustainable land management practices are adopted by all land users especially the small scale farmers.

Sustainable land management (SLM) has been defined as the adoption of appropriate land management practices that enables land users to maximize the economic and social benefits from the land while maintaining or enhancing the ecological support functions of the land resources (Food and Agriculture Organization, 2009). It is the key point for improving land resource resilience and productivity, bridging the needs of agriculture and environment with the twin objectives of maintaining long term productivity and ecosystem functions (land, water, biodiversity). The major goal of SLM therefore is to develop economically viable agro-ecological system and to enhance the quality of the environment, so that farm lands will remain productive indefinitely. The livelihood and socio-economic development of farmers directly depend on land. As a result, all farmers especially the small scale farmers have significant stake in ensuring that the natural resources and their immediate environment are sustainably managed (Fakoya, 2000). However, Abdulazeez *et al.* (2014) noted that in spite of wide spread knowledge about cropping patterns such as fallowing and crop rotation known to significantly contribute to soil sustainability and other soil water and nutrient conservative measures which could help to remedy soil condition, land degradation continued to increase. It therefore appears as if small scale farmers in the study area, like in many other parts of Nigeria are not using the land management practices required for improved and sustainable agricultural production.

Knowledge of the current land management practices of small scale farmers who form the bulk of Nigeria's farming population is essential in order to design programmes and projects aimed at reducing land degradation and ensuring sustainable agricultural production in the country. The land in south-east Nigeria has been considered as low lying with exposed surface areas that are prone to flooding, coastal and sheet erosion, resulting to removal of top soil (Urama, 2005). Adequate use of land management practices is essential for maintenance of soil fertility. The identification of constraints to farmers' use of land management practices would provide a direction of action for government in trying to boost farmers involvement in land management practices and reveal areas of inadequacy. The results of this study is likewise expected to provide policy makers with good understanding of the situation in the south-eastern part of the country such that they would be adequately equipped with the right policy intervention tools that will promote the welfare of small scale farmers. Farmers, researchers, students and government agencies would benefit from findings and recommendations of the study. Specifically this study seeks to: describe socio-economic characteristics of small scale farmers in the study area; identify land management practices used by small scale farmers in the study area; categorize small scale farmers on the bases of their use of farm land management practices in the study area; determine socio-economic factors that influence the

extent (degree) of use of farmland management practices in the study area; and to identify constraints to use of land management practices by small scale farmers in the study area.

Review of Empirical Literature on Land Management Issues

Small scale farmers have been exposed to various land management practices such as contour mulching, terracing and crop rotation. These practices have been tested on farms and approved efficient. However, not all farmers are applying them despite the recognition that their land is getting increasingly degraded. The adoption of land management practices is multidimensional with numerous factors affecting the willingness of farmers to use various conservation practices (Rezvanfar, Samlee and Faham, 2009). Some of the explanations are farmer-specific in terms of household level characteristics (Nkonya, 2002; Doss, 2006), while others are related to economic factors (Salasya *et al.,* 2007).

However, the effects of most variables on the adoption of land management practices have not been conclusive and have been noted to vary with location given the divergent reports available from existing literature. It has been found that participation in government programmes (Bekele and Drake, 2003); credit access (Nkonya, 2002); education level (Okoye, 1998; Deininger, Jin and Adenew, 2003; and Pender, Gebremadhin and Haile, 2003; Raufu and Adetunji, 2012); age (Okoye, 1998); gender of household heads (Pender and Gebremadhin, 2004); household size (Mulat, Ali and Jayne, 1997); farm size (Hagos, 2003; Demeke, 2003; Teklewold, 2004); land tenure (Ayalew *et al*. 2005); extension access (Deininger, Jin and Adenew, 2003; Marshall, 2004; Okunade, 2006); membership to farmer groups (Tenge, Graaff and Hella, 2004); and slope of land (Amsalu and De Graaf, 2007) were positive determinants of adoption of land management measures. On the other hand, education level (Clay, Reardon and Kangasniemi*,* 1998); Abd-Ella, Eric and Warren*,* 1981); age (Okunade, 2006); gender of household head (Mulat, Ali and Jayne*,* 1997); household size (Shiferaw and Holden, 1998); and farm size (Deininger, Jin and Adenew, 2003) were also found to be negatively related with adoption of land management practices.

Another factor in adoption of land management practices is farmers' perception about the level of deterioration of arable land. Farmers who perceive their land as fast deteriorating and producing less than desired, tend to adopt land management practices. For instance, Yila and Thapa (2008) found that accelerated erosion had a positive influence on adoption of land management technologies in Plateau State, Nigeria. On the other hand, farmers who perceive their soils to be fertile tend to have low adoption of land management practices as observed by Amsalu and De Graaf (2007).

Several other studies have been undertaken with regards to land management issues in Africa including Nigeria. Amao *et al.* (2013) conducted a study on land degradation, soil conservation and poverty status of farmers in Osun State, Nigeria. The study which used probit regression to estimate determinants of poverty among the farmers found that degraded land area, education level, zero tillage and clean clearing increased poverty while, mulching, crop rotation, cover crops, organic manure, inorganic manure and harrowing reduced poverty.

According to Babalola and Olayemi (2013), in a study on determinants of farmers' preference for sustainable land management practices for maize and cassava production in Ogun State, Nigeria, the significant determinants of decision to use a particular choice of land management practice, using logit regression were membership of association, education level, farm size, topography of land and participation in government programmes.

Simon, Ndaghu and Yohanna (2013) assessed crop farmers awareness of sustainable agricultural land management practices in northern part of Taraba State, Nigeria and found that there was high level of awareness of use of sustainable agricultural land management practices among respondents. Raufu (2010) investigated pattern of land use among selected crop farmers in Osun State, Nigeria. Findings showed that intercropping was the major form of land use in the area. Other studies on the pattern of land use, agricultural system and soil degradation were conducted in different parts of Africa using remote sensing, household and field surveys and transect (Olsen, 1996; Breyer, Larsen, and Acen, 1997). The studies found that since the 1950s, almost all land that had been under pasture or wetlands have been converted to cultivation, and most fields are being managed with only short (one rainy season long) fallows and that characteristic land management technologies employed include crop rotation, trash lines, and use of mulch.

Socio-economic factors influencing seasonal fallowing was investigated by Grisley and Mwesigwa (1995). The study revealed that 76 percent of farmers had some cropland under grass fallow. Logit model estimates revealed that intercropping, distance to farm and farm size influenced land fallowing decision. The study recommended the use of capital intensive technologies such as terracing, agro-forestry and use of chemical fertiliser to overcome the problem of land being idle for a long time.

MATERIALS AND METHODS

The study was carried out in Southeast zone of Nigeria. The zone consists of five states namely: Abia, Anambra, Ebonyi, Enugu and Imo States and located between Latitudes $5^0$06'N and $6^0$34'N of the Equator and Longitudes $6^0$38' E and $8^0$08' E of the Greenwich Meridian. According to NPC (2007), the population of Southeast zone of Nigeria was 16,381,729 persons, disaggregated into 8, 306, 306 males and 8,075,423 females. Southeast Nigeria is a rainforest belt of tall trees with dense undergrowth of shorter species dominated by climbing plants. The zone experiences two distinct seasons, namely: rainy season and dry season. The rainy season normally starts in late March and ends in early November, while, the dry season lasts from late November to early march with slight variations. The prolonged rainy season results to high mean annual rainfall range of between 1,800mm - 2,500mm, humidity of above 80% during the rainy season and mean annual temperature range of between 21^0C and 25^0C and promotes growth of perennial trees. The inhabitants of this zone are predominantly farmers cultivating food crops such as cassava, yam, cocoyam, maize and rice and cash crops such as oil palm, cocoa and cashew (Nwajiuba and Onyeneke, 2010).

The population for the study consists of all the small scale farmers in Southeast Nigeria. Multistage random sampling technique was employed in selection of farmers from Southeast Nigeria for the study. In stage one, 3 states (Anambra, Ebonyi and Imo) were randomly selected from the 5 states that makeup the study area. In stage two, 3 agrarian Local Government Areas (LGAs)- one from the Northern part, another from the central part and the third from the southern part of each of the states - were randomly selected from each of the 3 states. This ensured adequate coverage of the states and gave 9 selected LGAs. The third stage involved random selection of 2 communities from each of the 9 LGAs, resulting to 18 communities. A list of small scale farmers in the selected communities were formulated with the aid of village secretaries and extension agents. This list served as the sampling frame, from which 20 small scale farmers were selected at random from each of the 18 communities, giving a sample size of 360 small scale farmers. Data were collected from the respondents from May - July 2017.

Data were collected through use of pre-tested and structured questionnaire that was administered to the respondents. Data were collected on respondents' socio-economic characteristics such as gender, educational level, household size, farm size, age, farm income, farming experience, credit access, extension contact and membership of farming association. Data were also generated on types of land management practices used, rate of land management practices and constraints to use of land management practices. Descriptive statistics such as frequencies, percentages and mean were used to analyse objectives i, ii, iii and v, while ordinary least square (OLS)multiple regression analysis was used to achieve objective iv.

For the multiple regression analysis, the dependent variable was the extent (degree) of use of farmland management practices. Ten (10) most popular and prevalent farmland management practices used by small scale farmers were identified in accordance with Fakoya (2000) thus: tree planting, multiple cropping, crop rotation, water erosion control/zero tillage, alley farming, cover crop planting, use of animal wastes, use of inorganic fertilizer, use of plant origin/organic fertilizer, and mulching. Multiple responses of the structured questions were allowed and farmers were requested to indicate level of use of the farmland management practices on Likert scale graded thus always = 3, often = 2, seldomly = 1 and never = 0.

For each farmland management practice, a score of 0, 1, 2 or 3 was allocated to a farmer depending on level of use. The total score per respondent for the number of practices indicated was expressed as a percentage of the overall score thus:

$$Z = \frac{X}{Y} x \frac{100}{1} \quad \ldots \qquad (1)$$

Where,
Z = level or rate of use of use of farmland management practices by the respondent
X = participatory score of farmers on number of farmland management practices engaged in.
Y = the overall score of all farmland management practices (30).
Based on the respondents Z value, they were categorized or grouped into four distinct groups as follows: a) Environmentally sustainable practice (>70%); b) Environmentally compatible practice (50% to 69%); c) Environmentally unfriendly practice (30% to 49%); and d) Environmentally damaging practice (0% to 29%)

The model of the OLS multiple regression analysis is formulated implicitly thus:
$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9, X_{10}, u)$ … (2)

Where: Y = Rate of use of farmland management practices (%);
X_1 = Age of small scale farmers (years);
X_2 = Gender (Male = 1; female =0);
X_3=Household size (number of people feeding from the same catering arrangement);
X_4= Education level (number of years spent in school);
X_5 = Farming experience (years);
X_6 = Farm income (Naira);
X_7 = Extension contact (Number of visits);
X_8 = Amount of credit accessed (Naira);

X_9 = Farm size (Hectare);
X_{10} = Membership to farmers association (number of farmers' association a farmer belongs); and u = Error term.

Four functional forms of the model (Linear, exponential, double logarithmic and semi- logarithmic) were fitted with the data. The lead equation was selected based on statistical and econometric criteria including number of significant variables, magnitude of the F- ratio, R^2 and the conformity of the variables to *a priori* expectation. The four functional forms are as stated:

RESULTS AND DISCUSSION

Socio-Economic Characteristics of the Respondents

Distribution of the small scale farmers according to socio-economic characteristics is shown in Table 1.

Table 1: Distribution of small scale farmers according to socio-economic characteristics.

Variables	**Mean**
Age (years)	48.42
Farm size (hectare)	0.86
Farming experience (years)	14.86
Annual farm Income (₦)	156,870.86
Gender	**Percentage**
Male	56.7
Female	43.3
Level of Education Attained	**Percentage**
No formal education	15.8
Primary school education	27.5
Secondary School education	50.0
Tertiary school education	6.7

Source: Field survey data, 2017

Table 1 shows that the mean age and farming experience of the small scale farmers were 48 years and 15 years respectively. This indicates low participation of youths in farming and agrees with Ajani *et al.*(2015) and Dankyang (2014) assertions that most youths in Nigeria have left agriculture in favour of employment in non-agricultural sector. According to Awoyinka *et al.* (2009) the number of years a farmer puts to cultivating a particular parcel of land could influence the choice of and the ability to use land management practices. The table also shows that mean farm size and annual farm income of the farmers were 0.86 hectare and₦156,870.86 ($513.74) respectively. The small size of farmland and low farm income could limit the farmers from adopting land management practices. With respect to gender, 56.7% of the small scale farmers are males, while 43.3% of them are females. This could be as a result of the stress attached to agricultural production activities which the female gender sometimes cannot bear. According to Omojola (2014) agricultural production has many energy demanding activities which makes males who are naturally endowed with abundant strength more suited for farming. The result could also be attributed to the fact that traditionally women in various parts of Nigeria in general and Southeast zone in particular are restricted from owning land (Raufu and Adetunji, 2012; Osondu *et al.,* 2015). Table 1 further shows that 84.2% of the small scale farmers had diverse level of formal education. The level of education attained by a farmer not only

increases his/her farm productivity but also enhances ability to understand and evaluate new production technologies (Nwaru, 2001).

Land Management Practices of Smallholder Farmers

Distribution of smallholder farmers according to land management practices is shown in Table 2 below.

Table 2: Distribution of smallholder farmers according to land management practices.

Land management practices	*Frequency	Percentage
Tree planting	66	18.3
Crop rotation	147	40.8
Use of terraces	51	14.2
Use of drainage channels	24	6.7
Minimum tillage	141	39.2
Bush fallow	255	70.8
Cover crop planting	78	21.7
Mulching	87	24.2
Use of inorganic fertilizer	186	51.7
Use of organic fertilizer	198	55.0
Crop residue recycling	93	25.8
Irrigation	48	13.3
Construction of contour ridges	177	49.2

*Source: Field survey data, 2017 * Multiple responses recorded; n = 360*

Table 2 shows that some land management practices undertaken by the farmers in decreasing order of frequency are: bush fallow (70.8%), use of organic fertilizer (55.0%) use of inorganic fertilizer (51.7%), construction of contour ridges (49.2%), crop rotation (40.8%) and minimum tillage (39.2%). Bush fallow, organic fertilizer, inorganic fertilizer and crop rotation were used to improve soil fertility and increase crop yields, while, minimum tillage and contour ridges helped to reduce soil erosion. This result compares favourably with findings of Fakoya (2000) and Zulu *et al.* (2011).

Categories of Small Scale Farmers Based on Land Management Practices

Distribution of the small scale farmers based on their use of land management practices is shown in Table 3.

Table 3: Category of small scale farmers based on use of land management practices

Category of land management practice	*Frequency	Percentage
Environmentally sustainable	51	14.2
Environmentally compatible	93	25.8
Environmentally unfriendly	120	33.3
Environmentally damaging	96	26.7

*Source: Field survey data, 2017 * Multiple responses recorded; n = 360*

The table shows that 33.3% and 26.7% of the farmers fell into environmentally unfriendly and environmentally damaging categories respectively based on their use of land management practices,

while, 25.8% and 14.2% of them fell into environmentally sustainable and environmentally compatible land management categories respectively. This result implies that 60.0% of the small scale farmers did not use adequate number of land management practices and highlights the fact that most small scale farmers in the study area are not using enough land management practices and are farming crops in an environmentally unsustainable way. The result compares favourable with findings of Fakoya (2000) among farmers in Oyo State.

Factors that influenced Use of Land Management Practices by Small Scale Farmers

The estimate of the factors influencing rate of use of land management practices by small scale farmers is presented in Table 4.

Table 4: OLS Regression Estimates of Determinants of Use of Land Management Practices by small scale farmers

Variables	Linear+	Exponential	Semi log	Double log
Constant	-4.039	2.567***	-32.687***	2.398***
	(-1.121)	(23.854)	(-2.583)	(11.460)
Age	0.632	0.012	2.001	0.030
	(0.726)	(0.478)	(0.633)	(0.578)
Gender	0.732	0.034	3.045	0.086
	(0.664)	(1.040)	(0.800)	(1.360)
Household size	-1.292	0.002	-1.043	-0.025
	(-0.734)	(0.037)	(-0.271)	(-0.398)
Education level	4.113***	0.086***	12.443***	0.281***
	(4.713)	(3.313)	(3.732)	(5.097)
Farming experience	0.176**	-0.001	11.527***	0.090
	(2.496)	(-0.551)	(2.886)	(1.360)
Farm income	-0.581	0.062	-2.649	0.019
	(-0.387)	(1.383)	(-0.818)	(0.349)
Extension contact	5.484***	0.151***	11.667***	0.392***
	(4.334)	(4.005)	(2.640)	(5.372)
Access to credit	-1.304	-0.041	0.587	-0.030
	(-0.813)	(-0.861)	(0.173)	(-0.532)
Farm size	1.296**	0.022	3.365	0.072
	(2.324)	(1.330)	(1.189)	(1.543)
Membership to association	2.351***	0.049**	3.760	0.096*
	(3.013)	(2.083)	(1.249)	(1.930)
R^2	0.751	0.724	0.746	0.750
Adjusted R^2	0.739	0.705	0.769	0.737
F-value	76.494***	47.633***	33.540***	74.335

Source: Field Survey data, 2017. ***, **, * statistically significant at 1.0%, 5.0% and 10.0% alpha levels respectively. Figures in parentheses are t-ratios. + = Lead equation

All the tried functional forms of the regression model were significant at 1.0% alpha level implying that any of the functional forms can be used for predictive purposes. However, the linear functional form gave the best fit to the data having produced highest R^2 value of 0.751, F-value of 76.494 and highest number of significant variables. The R^2 value of 0.751 implies that 75.1% of variations in the dependent variable are caused by changes in the independent variables fitted into the OLS model. Table 4 shows that five out of the ten variables fitted into the OLS model significantly determined rate of use of land management practices by farmers at various alpha levels.

Specifically, education level had a positive coefficient (4.113) that was significant at 1.0% alpha level. The sign of the coefficient indicates that the rate of farmers usage of land management practices increased with higher educational attainment. Farmers with higher education level will have higher level of planning and better understand the potential benefits inherent in the use of land management practices. According to Ogbe (2009) education raises human capital and significantly increases a farmer's ability to make correct and meaningful choices for farm operations. Education has been shown to be a factor in the adoption of agricultural innovations and is considered an important variable that enhances farmers' adoption of new agricultural technologies (Ijioma and Osondu, 2013; Osondu *et al.,* 2014). This result compares favourably with findings obtained in Abdulazeez *et al.* (2014) and Tsue *et al.* (2014) among farmers in Kwara State and North central Nigeria respectively.

Farming experience had a positive coefficient (0.176) that was significant at $p<0.05$. This implies that increase in farming experience of the farmers' increased their use of land management practices. This is expected because an experienced farmer should have known those land management practices that conserved the ecological configuration of the fragile ecosystem (Tsue *et al.,* 2014). According to Tsue *et al.* (2014), farming experience increased the probability of using adaptation options because experienced farmers had better knowledge and information on environmental conditions and management practices. This result is consistent with the findings of Awoyinka *et al.*(2009); and Tsue *et al.* (2014) but contrasts with the findings of Pender *et al.* (2003).

Extension contact had a positive coefficient (5.484) that was significant at 1.0% alpha level. This implies that rate of use of land management practices by the farmers increases as their number of contacts with extension agents increases. The aim of extension service is to provide farmers with the necessary education, skills and technical information to enable them take effective and efficient farm management decisions for enhanced daily farm practices (Tsue *et al.,* 2014). Tsue *et al.*(2014)further asserted that increased access to extension services increases farmers' awareness of environment change and empowers them with better information on how to adapt to the adverse effects of land degradation. This result compares favourably with finding of Abdulazeez *et al.* (2014).

The coefficient of farm size (1.296) was significant at 5.0% alpha level, implying that farmers' use of land management practices increased as farm size increases. According to Badru (2002) farmers with small farms are more constrained to adopt recommended technologies. The result supports Awoyinka *et al.*(2009) and Babalola and Olayemi (2013) assertions that land management practices are used more when a large hectarage is being cultivated. Farm size has been positively linked to the adoption of land management practices (Hagos, 2003 and Demeke, 2003). However, the result contrasts with finding of Abdulazeez *et al.* (2014) that negatively linked adoption of land management practices with farm size.

The coefficient (1.9011) of membership of farmers' association was significant at 5.0% alpha level. The sign of the coefficient implies that the rate of usage of land management practices by the farmers increases as they belong to more farmers' association. Membership to farmers' association increases farmers access to technology information and credit which could allow them gain access to greater economic opportunities and enhance their technology adoption capability (Ijioma and Osondu, 2013). According to Ijioma and Osondu (2015) membership to farmers association improves a farmer's social capital and collective endeavour allows for better adoption of innovations, inputs

supply, extension support, credit facilities, processing and marketing facilities. The result compares favourably with finding of Babalola and Olayemi (2013) among farmers in Ogun State, Nigeria.

Constraints to Use of Land Management Practices by the Small Scale Farmers

Distribution of the small scale farmers according to constraints to use of land management practices is shown in Table 5.

Table 5: Constraints to small scale farmers' use of land management practices

Constraints	*Frequency	Percentage
High cost of labour	138	38.3
Low educational level	93	25.8
High cost of some land management practices	141	39.2
Inadequate extension service	156	48.8
Inadequate credit access	219	60.8
Land tenure	207	57.5
Low farm produce price	201	55.8
Low participation in government land management programmes	98	30.6
Poor government policies	69	19.2
Inadequate knowledge of land management practices	234	65.0
Inadequate capital	261	72.5

*Source: Field survey data, 2017 * Multiple responses recorded; n= 360*

As shown in Table5 inadequate capital, inadequate knowledge of land management practices and inadequate credit access were identified by72.5%, 65.0% and 60.8% of the farmers respectively as constraints to their use of land management practices. Inadequate knowledge of land management practices may be as a result of the poor level of extension contact earlier reported. According to Liniger *et al. (*2011) lack of information and knowledge is one of the major obstacles to reducing land degradation, improving agricultural productivity and facilitating the uptake of sustainable land management (SLM) practices among farmers. Furthermore, even when farmers are aware of available land management practices, they are financially incapacitated to use them, due to inadequate capital and credit access. Meanwhile, 57.5% and 55.8% of the small scale farmers reported being constrained by land tenure and poor farm produce price. According to Tsue *et al.* (2014) farmers are not willing to make necessary investments in land management practices from which they may not be able to reap future benefits. This finding lends credence to Food and Agriculture Organization (2011) assertion that insecure land tenure may underlie land degradation by hampering farmers' incentives to invest in sustainable land management practices. The problem of low farm produce price results to low farm income and inability of farmers to invest properly in land management. Other problems as reported by the farmers are inadequate extension service (48.8%),high cost of some land management practices (39.2%), high cost of labour(38.3%), low participation in government land management programmes (30.6%), low educational level (25.8%) and poor government policies (19.2%).

CONCLUSION AND RECOMMENDATIONS

From findings of the study it is adduced that although some farmers used various land management practices that are good for sustainable agricultural production, many farmers in the area were not managing land adequately and hence fell into environmentally unfriendly and environmentally damaging categories. Also, educational level, farming experience, extension contact, farm size and membership of farmers' association were significant determinants of rate of use of land management practices by small scale farmers.

There is need for the federal and state governments to make policies aimed at increasing the linkage between extension workers and small scale farmers in the area. This will help to enhance the farmers' use and knowledge of the benefits of land management practices. Also, agriculture should be accorded more priority in youth empowerment schemes of the state governments. This is with a view to encourage the youth to take better interest in agricultural food crops production using sustainable land management practices. Farmers should make concerted efforts to avail themselves of training opportunities on appropriate use of available land management practices. Such training programmes should be used as a springboard for updating the knowledge of experienced farmers on appropriate land management practices for their cropping systems. Farmers should be encouraged and educated by extension workers to belong to cooperative associations so as to enjoy the numerous benefits emanating from being members of agricultural association. Policies should be made by the state governments that would specifically improve farmers' access to credit and training in land management practices. Farmers need to be sensitized on the importance and effect of using land management practices measures. To this effect, seminars on use of land management practices should be held in designated venues in all communities in Southeast Nigeria. Attempts should be made to motivate farmers to attend in mass. There is need for further studies to be carried out to examine the costs of land degradation and the benefits and costs of use of sustainable land management in Nigeria in general and Southeast Nigeria in particular.

ACKNOWLEDGEMENT

I am grateful to Prof. C.I. Ezeh, Prof. C.O. Emerole and Prof. J.C. Ijioma for mentoring and making me part of their research team and to staff of Agricultural Development Programme in Anambra, Ebonyi and Imo States for helping to generate data for this project.

REFERENCES

Abd-Ella, M., Eric, O.H., and Warren, R.D. (1981). Adoption behavior in family farm systems: An Iowa study. *Journal of Rural Sociology,* 46(1), 42-61.

Abdulazeez, M. L., Omotesho, K. F., Adekola, O. F. and Adekunle, D. (2014). Assessment of Land Management Practices in Food Crops Production among Small Scale Farmers in Kwara State, Nigeria. *International Journal of Agricultural Management and Development, 4(2), 105-116.*

Ajani E.N, Mgbenka R. N. and Onah O. (2015). Empowerment of Youths in Rural Areas through Agricultural Development Programmes: Implications for Poverty Reduction in Nigeria. *Journal of Research in Agriculture and Forestry*, 2(2), 34-41.

Akinnagbe, O. M and Umukoro, E. (2011).Farmers' Perception of the Effects of Land Degradation on Agricultural Activities in Ethiope East Local Government Area of Delta State, Nigeria. *Agriculturae Conspectus Scientificus*, 76(2), 135-141.

Amao J.O., Ayantoye K. and Aluko A.M. (2013). Land Degradation, Soil Conservation and Poverty Status of Farmers in Osun State, Nigeria. *International Journal of Science, Environment and Technology,* 2 (6), 1205-1231.

Amsalu, A. and de Graaff, J. (2007), Determinants of adoption and continued use of stone terraces for soil and water conservation in an Ethiopian highland watershed. *Ecological Economics,* 6: 294-302.

Awoyinka, Y.A., Akinwumi, J.A., Okoruwa, V.O. and Oni, O.A. (2009). Effects of Livelihood Strategies and Sustainable Land Management Practices on Food Crop Production Efficiency in South-West Nigeria. *Agricultural Journal,* 4(3), 135-143.

Ayalew, D., Dercon, S. and Gautam, M. (2005). Land tenure insecurity and investment in Ethiopian agriculture: Evidence from panel data. Mimeo.

Babalola D. A. and Olayemi, J. K. (2013). Determinants of Farmers' Preference for Sustainable Land Management Practices for Maize and Cassava Production in OgunState, Nigeria. Invited paper presented at the 4th InternationalConference of the African Association of Agricultural Economists, September22-25, 2013, Hammamet, Tunisia.

Badru, E.C. (2002). Adoption of Modern Agricultural Production Technologies by Farm Households in Ghana: What Factors influence their Decisions? *Journal of Biology, Agriculture and Healthcare,* 2(3), 8-9.

Bekele, W. and Drake, L. (2003). Soil and water conservation decision behavior of subsistence farmers in the Eastern Highlands of Ethiopia: a case study of the Hunde-Lafto area. *Ecological Economics,* 46: 437-451.

Breyer, J., Larsen, D and Acen, J. (1997). Land Use Cover Change in South West Uganda: International Centre for Research in Agroforestry.

Brown, L. R.and Wolf, E.C. (2005).Reversing Africa decline. World Watch Courier (June) Environmental and Development No 87.

Clay, D., Reardon, T. and Kangasniemi, J. (1998). Sustainable intensification in the highland tropics: Rwandan Farmers' Investments in Land Conservation and Soil Fertility. *Economic Development and Cultural Change*, 45 (2), 351-378.

Dankyang, Y. (2014). Risk sources and management strategies of small scale farmers in Kaduna State, Nigeria. Unpublished M.Tech thesis. Department of Agricultural Economics, Federal University of Technology, Minna.10-37.

Deininger K., Jin, S. and Adenew, B. (2003). Market and non-Market transfers of land in Ethiopia: Implications for Efficiency, Equity, and Non-Farm Development. World Bank Policy Research Working Paper 2992. World Bank, Washington, DC.

Demeke, A.B. (2003). Factors influencing the adoption of soil conservation practices in Northwestern Ethiopia. Discussion Paper 37. Institute of Rural Development, University of Goettingen.

Demeke, A.B. (2003). Factors influencing the adoption of soil conservation practices in Northwestern Ethiopia. Discussion Paper 37. Institute of Rural Development, University of Goettingen.

Doss, C.R. (2006), Analyzing technology adoption using micro-studies: Limitations, challenges, and opportunities for improvement. *Agricultural Economics,* 34: 207–219.

Ebukiba, E. (2010). Economic analysis of cassava production farming in Akwa Ibom State. *Agriculture and Biology Journal of North America* 1(4), 612-614.

Fakoya, E.O. (2000). Farmers use of sustainable Land Management Practices in Oyo State. Ph.D Thesis. Department of Agricultural Extension and Rural Development.University of Ibadan.Pp 20-24.

Fakoya, E.O., Banmeke,T.O.A., Ashimolowo, O.R. and Fapojuwo, O.E. (2010). Cassava Production and Poverty Eradication among Crop Farmers in Ondo State, Nigeria. *International Journal of Sustainable Development,* 2 (5), 67-72.

Food and Agriculture Organization (2009).Country support tool for scaling up sustainable land management in Sub-Saharan Africa. Food and Agriculture Organization of the United Nations, Rome, Italy.

Food and Agriculture Organization (2011). Sustainable Land Management in Practice Guidelines and Best Practices for Sub-Saharan Africa. Food and Agriculture Organization of the United Nations, Rome, 2011.

Global Environmental Facility (2003). Operational Program 15 on Sustainable Land Management.

Grisley, W. and D. Mwesigwa. (1995), Socio- economic determinants of seasonal fallowing: smallholders in SouthWestern Uganda. *Journal of Environmental Management,* 42: 81-89.

Hagos, F. (2003). Poverty, institutions, peasant behavior, and conservation investment in Northern Ethiopia. PhD thesis No. 2003:2. Department of Economics and Social Sciences, Agricultural University of Norway, As.

Hagos, F. (2003). Poverty, institutions, peasant behaviour, and conservation investment in Northern Ethiopia. PhD thesis No. 2003:2. Department of Economics and Social Sciences, Agricultural University of Norway.

Henri-Ukoha, A. (2011). Determinants of Loan Acquisition from the Financial Institutions by Small Scale farmers in Ohafia Agricultural Zone of Abia State, South East Nigeria. *Journal of Development and Agricultural Economics*, 3 (2), 69 – 74.

Ijioma, J. C and Osondu, C.K (2013). Adoption of Improved Rice Varieties in Bende Local Government Area of Abia State, Nigeria. *Journal of Agriculture, Forestry and the Social Sciences*, 11 (2), 204 - 215.

Ijioma, J. C. and Osondu, C. K. (2015). Social capital participation levels and determinants among farm households in Enugu State, Nigeria. *Mycopath,Institute of Agricultural Sciences, University of Punjab, Pakistan,* 13(1), 43 49.

Liniger, H. P., Studer, R. M., Hauert, C., and Gurtner, M. (2011). Sustainable Land Management in Practice–Guidelines and Best Practices for Sub-Saharan Africa. TerrAfrica, World overview of conservation approaches and technologies (WOCAT) and food and agriculture organization of the United Nations (FAO).

Maiangwa, M.G., Ogunbile, A.O., Olukosi, J.O. and Atala, T.K. (2007). Land Degradation: Theory and Evidence from the North-West Zone of Nigeria. *Journal of Applied Sciences,* 7 (6), 785-795.

Marshall, G.R. (2004). From words to deeds: Enforcing Farmers' Conservation Cost-sharing Commitments. *Journal of Rural Studies,* 20: 157-167.

Mulat, D., Ali, S., and Jayne, T. (1997). Promoting fertilizer use in ethiopia: The implications of improving grain market performance, input market efficiency, and farm management. Working Paper 5, Grain Market Research Project, Ministry of Economic Development and Cooperation, Addis Ababa.

National Population Commission (NPC, 2007). Details of the breakdown of the National and State Provincial Population Totals 2006 Census. Federal Republic of Nigeria Official Gazzette, 94(24), 1-26.

Nkonya E. (2002). Soil conservation practices and non-agricultural Land use in the south western highlands of Uganda. A Contribution to the Strategic Criteria for Rural Investments in Productivity (SCRIP) Program of the USAID Uganda Mission. The International Food Policy Research Institute (IFPRI).

Nwajiuba, C.U. and Onyeneke, R. (2010). Effects of climate on the agriculture of sub- Saharan Africa: Lessons from Southeast Rainforest Zone of Nigeria Paper presented at Oxford Business and Economics Conference Program. St. Hugh's College, Oxford University, Oxford, U.K.

Nwaru, J.C (2001). Stimulating Entrepreneurship in Nigerian Farms through Sustainable Agricultural Extension system, Privatization and commercialization of Agricultural Extension Service delivery in Nigeria, Problems and prospects.7th Annual Conference of the Agricultural Society of Nigeria. Pp 19-27.

Ogbe, S. E. (2009). Determinants of microcredit and microfinance outreach to farmers in Abia State; a case study of National Special Programme on Food Security.MSc Thesis, Department of Agricultural Economics, Michael Okpara University of Agriculture, Umudike.pp. 51.

Okoye, C. (1998). Comparative analysis of factors in the adoption of traditional and recommended soil erosion control practices in Nigeria. *Soil and Tillage Research,* 45: 251-263.

Okunade, E.O. (2006). Factors influencing adoption of improved farm practices among women farmers in Osun State. *Journal of Human Ecology,* 19 (1), 45-49.

Olorunsanya, E.O. (2009). Gender of Household Heads and Relative Poverty among Rural Farming Household in Kwara State. PhD Thesis. Department of Agricultural Economics and Farm Management, University of Illorin, Nigeria.

Olson, J. M. (1996). Initial Results Concerning the Use of Fallow in Kabale District, Uganda. Nairobi: International Centre for Research in Agroforestry.

Omojola, J.T. (2014). Economic efficiency and profitability of yam production in Southwest Nigeria. Ph.D Thesis, Anambra state University, Igbariam campus, Nigeria.

Osondu, C. K. and Ibezim, G.M.C. (2015). Awareness and Perception of Farmers to the Use of Information and Communication Technologies (ICTs) in Agricultural Extension Service Delivery: A Case Study of Imo State, Nigeria.*International Journal of Agriculture Innovations and Research,* 4 (1), 55-60.

Osondu, C. K., Ogbonna, S. I. and Emerole, C. O. (2015). Level and Determinants of Women Farmers Access to Informal Credit in Abia State, Nigeria. *Asian Journal of Agricultural Extension, Economics and Sociology,* 7(1), 1-10.

Osondu, C.K. (2014). Performance of Informal Micro-financing on Poverty of Women farmers in Abia State, Nigeria. M.Sc. Dissertation, Department of Agricultural Economics and Extension Abia State University Uturu.

Osondu, C.K., Ezeh C.I., Emerole C.O and Anyiro C.O. (2014). Comparative analysis of technical efficiency of small holder Fadama II and Fadama III cassava farmers in Imo State. *Nigeria Journal of Rural Extension and Development*, University of Ibadan, Nigeria. 8(1), 26-37.

Oyekale, A.S. (2008): Land Degradation, Soil conservation Practices and Poverty incidence in South Western Nigeria. *Agricultural Journal,* 3 (6), 482 -487.

Pender, J. and Gebremedhin, B. (2004). Impacts of policies and technologies in dry land agriculture: Evidence from Northern Ethiopia In S.C. Rao (ed.), Challenges and Strategies for Dryland Agriculture. American Society of Agronomy (ASA) and Crop Science Society of America (CSSA) Special Publication 32. Madison: ASA and CSSA.

Pender, J., Gebremedhin, B. and Haile, M. (2003). Livelihood strategies and land management practices in the highlands of tigray, presented at the conference on policies for sustainable land management in the East African Highlands, April 24-26, 2002, United Nations Economic Commission for Africa, Addis Ababa (revised). International Food Policy Research Institute (IFPRI), Washington, DC.

Raufu, M.O. (2010). Pattern of land use among selected crop farmers in Osun State. *Research Journals of Soil and Water management,* 1(1), 1-4.

Raufu, M.O. and Adetunji M.O. (2012). Determinant of Land Management Practices among Crop Farmers in South-Western Nigeria. *Global Journal of Science Frontier Research Agriculture and Biology,* 12 (1), 8-14.

Rezvanfar, A., Samlee, A. and Faham, E. (2009). Analysis of factors affecting adoption of sustainable soil conservation practices among wheat growers. *World Applied Sciences Journal,* 6 (5), 644-651.

Salasya, B., Mwangi, W., Mwabu, D. and Diallo, A. (2007). Factors influencing adoption of stress tolerant maize hybrid (WH 502) in western Kenya. *African Journal of Agricultural Research,* 2(10), 544-551.

Senjobi, B.A. And Ogunkunle O.A. (2010).Effect of Land Use on Soil Degradation and Soil Productivity Decline on Alfisols and Ultisols in Ogun State in South Western, Nigeria. *Agriculturae Conspectus Scientificus*, 75 (1), 9-19.

Shiferaw, B., and Holden, S.T. (1998). Resource degradation and adoption of land conservation Technologies in the Ethiopian Highlands: A Case Study in Andit Tid, North Shewa. *Agricultural Economics,* 18: 233-247.

Simon, B.P., Ndaghu, A.A., Yohanna, I. (2013). Awareness of sustainable agricultural land management practices among crop farmers in northern part of Taraba State, Nigeria. *Journal of Science and Technology*, 3(5), 557-560.

Subair, K. (2009). Environment–Productivity Relationship in the South West Nigeria's Agriculture. *International Journal of Environmental Affairs*, 27(1), 75 – 84.

Teklewold, H. (2004). Risk and time preferences on soil conservation decision in the central Ethiopian Highlands of Ethiopia. M.Sc thesis. Addis Ababa University.

Tenge, A. J., De Graaff, J. and Hella, J. P. (2004). Social and Economic Factors Affecting the Adoption of Soil and Water Conservation in West Usambara Highlands, Tanzania. *Land Degradation and Development,* 15: 99–114.

Titilola, S.O. and Jeje, L.K. (2008). Environmental Degradation and its Implications for Agricultural and Rural Development: The Issue of Land Erosion. *Journal of SustainableDevelopment in Africa,* 10 (2), 116-146.

Tsue, P.T., Nweze, N.J. and Okoye, C.U. (2014). Effects of Arable Land Tenure and Use on Environmental Sustainability in North-Central Nigeria. *Journal of Agriculture and Sustainability,* 6 (1), 14-38.

Urama, J.C. (2005). Land Use Intensification Environmental Degradation: Empirical Evidence from Irrigated and Rain-fed Farms in South Eastern Nigeria. *Journal of Environmental Management,* 75:199-217

Yila, O. M. and Thapa, G. B. (2008). Adoption of agricultural land management technologies by smallholder farmers in the Jos Plateau, Nigeria. *International Journal of Agricultural Sustainability* 6(4), 277–288.

Zulu, M., Wamulume, M. and Mugisha, J. (2011). Socio-Economic Analysis of Land Management Practices in the Agricultural Highlands of Uganda: A Case of Kabale Highlands. *Research Report Series,* I (5), 5-22.

AWARENESS, ATTITUDE AND CONSUMPTION INTENTION TOWARDS SUSTAINABLE FOODS IN NIGERIA: EVIDENCE FROM OGUN STATE

[1]Akerele, D., [2]Ayinde, F. O., [1]Ezeonyekwelu, V.and[1]Oladeinde, K. B.
[1]Department of Agricultural Economics and Farm Management, Federal University of Agriculture, Abeokuta, Nigeria
[2]Department of Environmental and Geographical Sciences, University of Cape Town, South Africa
Email of Lead Author: akereledare@yahoo.co.uk

ABSTRACT

This study examined consumers' awareness, attitude and intention towards consuming sustainable foods in Yewa South Local Government Area of Ogun State, Nigeria. A multi-stage sampling procedure was used to select respondents from whom data were collected with the aid of questionnaire. Descriptive statistics and Tobit regression were the main tools for data analyses. The average age of the respondents was 37 years, having a family size of 5persons and monthly income of ₦66,537.50. More than 85% of the respondents had moderate to high level of awareness about the linkage between sustainable foods and environment. The majority (75%) of them also showed positive favorable attitude towards sustainable foods. Although the majority of the consumers claimed to have positive attitudes towards sustainable foods, environmental friendliness of foods and social consideration ranked lowest among the underlying factors motivating food purchases. Consumer attitude and level of awareness about sustainable foods exerted positive and statistically significant influence on consumption intention towards sustainable foods, while income had negative influence. Hence, income improvement may be a less effective pathway for stimulating positive behavior towards consumption of sustainable foods in the studied population. Efforts to promote favorable attitude towards consumption of sustainable foods by means of awareness creation and advocacy for social consideration in food purchase (consumption) decisions are therefore recommended.

Keywords: Green foods, environment, behavioral intention, attitudes, income.

INTRODUCTION

Globally, multi-prong efforts are currently being geared towards achieving the sustainable development goals, of which good health, nutrition, and environmental health are critical components. Fulfilling these goals within the confine of ecosystems health have continued to feature intensely in global debates and policy discussions (Laheri *et al*., 2014; Braimah, 2015). One of the key issues is on how human production (and consumption)activities can be manipulated towards the sustainability (Ukenna & Nkamnebe, 2016) of the environment. This is because the current global challenges such as climate change, desertification, land degradation as well as loss of biodiversity have been attributed, among others, to excessive production and consumption of goods and services, as well a sun wise use of natural resources (Zur & Klöckner, 2014).

Following Reisch *et al.* (2017), the present food consumption patterns cannot be regarded as "sustainable", as they pose a threat to earth resources and human health. Global population keeps growing rapidly, and consumer preferences keep changing with tendencies towards environmentally costly source foods (Godfray *et al*., 2010); contributing to biodiversity loss, climate change and ecosystem degradation. This thus brings into view the notion of sustainable food consumption. The

concept of sustainable or "green" foods has been expressed as diets with low environmental impacts which can contribute to food and nutrition security as well as healthy life for present and future generations (FAO, 2016).Sustainable food consumption derives generally from the concept of sustainability which focuses on issues relating to fairness, resources conservation, minimizing wastage, consumer health and safety, quality of life, and caring for nature and community (society) (Organisation for Economic Co-operation and Development (OECD), 2008).This could be in the form of preference for meatless diets, reducing meat in meals, consuming more organically produced foods, minimizing processed foods or tasty food products such as sugar, and foods packed with non-biodegradable foods or in ecologically unfriendly manners (Leitzmann, 2003).

From the perspective of agricultural production and food systems, it appears much of the efforts towards achieving sustainable environment have focused largely on changing farmers' behaviour towards employing sustainable agricultural production practices (European Union, 2017). Some of which include adoption of climate smart agricultural production practices such as minimum/zero tillage, erosion control, and practicing organic agriculture. While this is commendable and justifiable on its own, it must be noted that the synergies between food supply (production) and demand require that concerns relating to consumers' attitude and behavior towards issues of sustainability of the environment also need to be investigated in order to evolve a much more comprehensive strategy towards ensuring sustainable environment. For example, the projection by FAO (2012) suggests that future consumption of animal-based food products in developing countries (Nigeria inclusive) will rise from 29% to 35% in 2030 and 37% in 2050. This is against the backdrop that livestock industry (and most especially beef and dairy products) is a major contributor to greenhouse gas emissions (Goodland & Anhang, 2009).

The need to examine the demand (consumption) concerns on environmental sustainability is further supported by the strong nexus exists between population growth, changing food consumption needs/preferences and the environment. Belz & Peattie (2009) warned that the population of the least developed countries (where most sub-Saharan Africa is categorized) is expected to be more than double between 2005 and 2050 (rising from approximately 760 million to about 1.7 billion) with the attendant implications for utilization of earth resources (for food production and consumption) and sustainability of the environment. It has been noted that Nigeria will most likely take the third place in the list of the most populous (populated) countries of the world by the year 2050 (United Nations Department of Economic and Social Affairs (UNDESA), 2015).Like any other developing region of the world, Nigeria would need rapid consumption (including food) to trigger development in order to "catch-up" with some other developed parts of the world (UNDP, 2013).This suggests that Nigeria will be a hub where research on consumers, food and environmental sustainability is expedient. Moreover, whenever an individual makes a decision about whether (or not) to buy a product (or services), there is the possibility that such decision contributes to a more or less sustainable pattern of consumption (Young*et al*., 2010). Therefore, information about how people rank certain factors that underlie their food consumption/purchase decisions can provide insight as to whether eco-friendliness of products and social consideration (responsibility) are of great concern to consumers.

A number studies have examined factors influencing consumer behaviour towards sustainable foods. Grunert & Juhl (1995) reported a strong positive association between favourable environmental attitudes and purchasing frequency of environmentally friendly (sustainable) foods. Chalmers *et al*. (2016) noted that education as a vehicle through which consumer behavior can be stimulated towards

consumption of sustainable foods. Purchasing power of consumers is another factor that can induce consumption of sustainable products (McCarthy *et al*., 2003).For the poor or low level income groups, price of foods may even be the most important underlying factor influencing the readiness to purchase, and use (sustainable) food products. Hence, in low income countries such as Nigeria, examination of the role consumer income could play in stimulating consumption intention towards sustainable products is an important subject for investigation. Awareness of the linkage between sustainable foods and environment can also play substantial role in biasing people's behaviour towards consumption of sustainable (green) food products (Lyndhurst, 2012). There is paucity of empirical studies on the influence of consumer awareness, attitudes and/or socioeconomic characteristics on consumer behaviour towards sustainable foods in Nigeria. The few available evidences indicate insignificant influence of the knowledge of green products on purchase intention (Karatu & Mat, 2015).

This current study is an attempt to contribute to exiting (but scanty) on sustainable foods in Nigeria by examining, among others, the roles consumer awareness and attitude could play in influencing consumption intention towards sustainable foods in Yewa South Local Government Area, a relatively low income setting of Ogun State. It is believed that findings from the study may fairly provide insights on how rural population could behave towards sustainable foods, and information about drivers of consumption intention that can useful to government and policy makers on how to evolve new strategies, strengthen or re-orientate existing policy actions to induce consumption of sustainable foods. The findings may also provide insights for marketing professionals on how to promote consumption of sustainable food products among low income groups in Nigeria.

MATERIALS AND METHODS

The study was carried out in Yewa South Local Government Area of Ogun State which was formerly known as Egbado South, Nigeria. Its headquarters are in the town of Ilaro at $6^0$53'00N, $3^0$01'00E in the north of the Area. It has a population of 168,336 as at 2006 census and a projected population of 192,090 in 2010 (National Population Commission (NPC), 2006; National Bureau of Statistics (NBS), 2011). The Local Government Area has a Guinea savanna- like vegetation and most of the inhabitants are engaged in farming activities to earn a living. It is a relatively rural local government in which the level of awareness or intention to consume sustainable foods products is expected to be low.

The data for this study were collected from 80 households whose respondents were either heads of households or adult members of households in a cross sectional survey using a structured questionnaire which served as interview guide. The selection process involved two stages. First, four (4) towns were selected using simple random sampling procedure out of the existing towns in the Local Government Area. Thereafter, twenty (20) buildings were randomly selected from each of the selected towns and a household head (respondent) was selected primarily in each building to make a total of 80 households. However, in cases where the household head was not at home, another adult member who could also supply reliable information was interviewed. Data collected include socioeconomic characteristics of respondents, attitudes and awareness about sustainable food products, and consumption intention towards sustainable foods.

Descriptive statistics (such as mean, frequency table and percentages) and Tobit regression were used for analysis. The regression was used to examine factors influencing consumption intention towards sustainable foods.

The Tobit regression model is specified as:

$$y_i^* = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_4 X_{4i} + \beta_5 X_{5i} + \beta_6 X_{6i} + \beta_7 X_7 + \beta_8 X_8 + \mu_i$$

$$y_i = \begin{cases} y_i^* \text{if } y_i^* > 0 \\ 0 \quad otherwise \end{cases} \quad (1)$$

where y_i^* is the latent variable characterizing consumption intention towards sustainable foods subject to a set of independent variables (covariates) associated with individual respondent *i*. y is an index of consumption intention towards sustainable foods (computed based on responses to set of questions on behavioral intention towards sustainable foods)

X_1 = Age of respondent (years)
X_2 = Education of respondent (years of schooling)
X_3 = Household size (number)
X_4 = Sex of respondent (1 if respondent is a male, 0 for female)
X_5 = Awareness of the respondent (it is an index indicating the level of respondent's awareness about the nexus between food, food packaging, human health and environmental sustainability).
X_6 = Marital status of respondent (1 if respondent is married, or otherwise)
X_7 = Total monthly income respondents (Naira)
X_8 = Attitude of respondents towards sustainable food consumption practices (index)
μ = random error term

Index for Awareness, Attitude and Consumption Intention towards Sustainable Foods

In the calculation of the index for consumption intention, awareness and attitude towards sustainable foods, a set of questions (with yes or no response) were asked as appropriate. On awareness, 3 questions were asked about the respondents' awareness of the linkage between food and environmental sustainability. For attitude, six (6) set of questions were asked about the attitude of respondents towards sustainable food and consumption practices while to capture the consumption intention towards sustainable foods, four (4) questions were asked. The estimated index for each of the variables (consumption intention, awareness, and attitude) were computed for each respondent as follows:

$$S_{ji} = \frac{1}{n_j} \sum_{k=1}^{n_j} L_{kji} \quad (2)$$

where S_j= estimated index capturing either attitude, awareness, or consumption intention towards sustainable foods. In the estimation, a score of 1 was assigned if the response to a question is yes and 0 if the response is no. Thus L is the one-zero response to a specific question. j=1, 2, 3; representing awareness, attitude and consumption intention respectively. k = 1, 2, 3,…, n_j. Where n_j is the total (maximum) number of questions asked in relation to awareness, attitude and consumption intention respectively. By construction, the value of the index falls between 0 and 1. For the purpose of descriptive analysis, each index was further transformed such that 1 was assigned to any index value between 0 and 0.399; 2 was assigned to index value between 0.4 and 0.6 while 3 was assigned to index value between 0.61 and 1. Consequently, for awareness; 1, 2, and 3 would

mean low, medium and high level of awareness about sustainable foods respectively. Similarly, for attitude; 1, 2 and 3 would translate to unfavourable, moderately favourable and highly favourable attitudes towards sustainable foods and consumption practices while for consumption intention; 1, 2, and 3 would mean low, fairly high and very high consumption intention towards sustainable foods.

Perceived Underlying Factors Motivating Food (Product) Purchase Decisions

To determine this, a range of factors motivating food (products) purchase decisions were compiled and presented to respondents who were asked to rank five of the factors (beginning) from the perceived most important factor (with a rank score of 5) to the least (with a rank score of 1). The total (rank) scores for each of the strategy given as:

$$R_d = \sum_{s=1}^{S} L_{ds} T_s \qquad (3)$$

Where,

R_d = total rank scores for specific motivating factor *d*; $L_{ds}$is the total number of respondent assigning rank score *s* to factor *d*; Ts represents the assigned rank scores; Ts=1, 2, 3, 4, 5. Factors with higher total rank scores denote these that are most frequently considered as very important in food purchase decisions, and can provide information about certain factors underlying consumer (people's) behavior towards sustainable food products.

RESULTS AND DISCUSSION

Socioeconomic Characteristics of the Respondents

Table 1: Distribution of Respondents by their Socioeconomic Characteristics

Socioeconomic Characteristics	Frequency (80)	Percentage (100%)	Mean
Sex			
Male	50	62.5	
Female	30	37.5	
Age (Years)			
21 – 30	27	33.75	
31 – 40	31	38.75	37
41 – 50	13	16.25	
51 and above	9	11.25	
Marital Status			
Single	23	28.75	
Married	42	52.50	
Divorced/widowed	15	18.75	
Household Size (Number of people)			
1-3	20	25.00	5
4-7	54	67.50	
Above 7	6	7.50	
Educational Qualification			
Primary education	16	20.00	
Secondary education	28	35.00	
Tertiary education	36	45.00	
Monthly Income Occupation (₦)			
Less than 30001	10	12.50	₦66,537.50
30001 – 50000	12	15.00	
50001-80000	40	50.00	
Above 80000	18	22.50	

Source: Field Survey, 2016

The results of the socioeconomic characteristics of the respondents are presented in Table 1. The results indicated that the majority (62.5%) of the respondents were male, with approximately 39% of them falling within the age group of 31-40 years. Most (52.50%) of the respondents were married and the majority (67.50%) of them had household size of between 4 to 7 persons. The mean household size was5 persons. It could be deduced from the findings that households in the study area are largely headed by males, who are married and belong to actively working age group, with relatively larger members. Approximately 45% of the respondents had tertiary education, 20% had primary school education and 35% of them had secondary school education. This implies that the majority of the respondents had access formal education above primary school level, and this is expected to affect their knowledge of environmental sustainably, the linkage it has with foods and willingness to embrace food consumption practices. The majority (50%) of the respondents earned in between ₦50, 001-80,000 per month. The average month income was approximately ₦66,537.50. This translate to an average of 1.23 US Dollars per person per day which is lower than the international poverty benchmark of 1.90 Dollars per day (Jolliffe & Prydz, 2016). From international income poverty perspective, this would mean that an average household in the study area is income poor, with its attendant implications for food choices, including purchase of eco-friendly foods.

Awareness of Respondents about Sustainable Foods

Table 2: Distribution of Respondents by their Awareness about Sustainable Foods

Awareness related questions	Frequency (80)	Percentage (100%)
Are you aware that polythene for food package are beneficial to the environment		
No	8	10.00
Yes	72	90.00
Are you aware that organically produced foods are beneficial to health and environment		
No	30	37.50
Yes	50	62.50
Are you aware that food wastage is beneficial to the environment		
No	21	26.25
Yes	59	73.75
Overall awareness		
Low	9	11.25
Medium	40	50.00
High	31	38.75

Source: Field Survey, 2016

Presented in Table 2 are results indicating awareness of respondents about sustainable foods in terms of the linkage to human health and sustainability of the environment. The majority (90%) of the respondents indicated they were aware that polythene bags for packing foods are closely linked to environmental degradation. The majority (62.5%) of them also reported that they were aware that organically grown foods have a positive impact on the environment. In addition, the result showed that majority (73.75%) of the respondents were aware of the relationship between food wastage and environmental sustainability while (26.25%) of them were unaware. On the overall level of awareness, the results suggest that more that 75% of the respondents had fairly high to very high level of awareness of the relationship between foods (including food packaging) and sustainable environment. It is expected that the level of knowledge should have positive effect on choice of sustainable foods.

Most (68.75%) of them were concerned whether their food purchase habits can affect the environment. Half of the sampled respondents care about additives in foods while more than 60% of them were concerned whether foods were grown organically or not. On the average, the result suggested that the majority (over 60% of respondents) had moderately high favourable attitude towards consuming sustainable foods.

Attitude of Respondents towards Sustainable Foods and Consumption Practices

Table 3: Distribution of Respondents by their Attitude towards Sustainable Foods and Consumption Practices

Attitude of Respondents to Sustainable Foods Consumption Practices	Frequency (80)	Percentage (100%)
I think of saving energy while preparing foods		
Yes	17	21.25
No	63	78.75
I think of meat consumption as a threat to the environment		
Yes	39	48.75
No	41	51.25
It is important that foods are packed with organic materials (like leaves) than with polythene bags		
Yes	53	66.25
No	27	33.75
It is not important to me whether a food product was grown organically or conventionally		
Yes	49	61.25
No	31	38.75
It is important to me that food contain no artificial food preservatives		
Yes	40	50.00
No	40	50.00
I believe my food purchase behaviour can enhance environmental sustainability		
Yes	55	68.75
No	25	31.25
Overall Attitude level		
Relative Unfavourable	20	25.00
Moderately favourable	52	65.00
Highly favourable	8	10.00

Source: Field survey 2016

The results of the respondents' attitudes to sustainable foods and consumption practices are presented in Table 3. The table shows that the majority (78.75%) of the respondents do not think of energy maintenance or saving while preparing their food, and the majority (61.25%) of them do not care whether the food they eat are organically grown or otherwise. Most (68.75%) of them were concerned whether their food purchase habits can affect the environment. Half of the sampled respondents care about additives in foodswhile more than 60% of themwere concerned whether foods were grown organically or not. On the average, the result suggested that the majority (over 60% of respondents) had moderately high favourable attitude towards consuming sustainable foods.

Consumption Intension towards Sustainable Foods

Table 4: Distribution of Respondents by Consumption Intension towards Sustainable Foods

Consumption intention	Frequency (80)	Percentage (100%)
Do you plan to reduce fat and sugar in your diets		
Yes	36	45.00
No	44	55.00
Do you intend reducing meat for some more other environmentally friendly sources of animal proteins?		
Yes	16	20.00
No	64	80.00
Do you intend to reduce consumption of processed foods (other than sugar)?		
Yes	19	23.75
No	61	76.25
Would you buy organically produced foods even if price increase?		
Yes	42	52.50
No	38	47.50
Overall intention towards consuming sustainable foods		
Relatively low	45	56.25
Moderately high	26	32.50
Very highly	9	11.25

Source: Field Survey, 2016

Presented in Table 4 are results relating to consumption intension towards sustainable foods. The Table shows that less than 46% of the respondents indicated their intension to reduce consumption of meat, processed foods, sugar and fatty foods in their diets. Most (52.50%) of the respondents indicated intention to purchase organically produced foods even at a higher price. However, only 20% of them indicated intention to reduce meat for some more other environmentally friendly sources of animal proteins. On the overall, the majority (56.25%)of the respondents had low consumption intention towards sustainable foods while only 11.25 % had relatively high consumption intention. This findings is not at variant with previous findings. do Paço *et al*. (2013) observed that even when consumers indicate environmentally responsible attitudes, their purchase decisions may not always be beneficial for the environment.

Factors Influencing Consumption Intention towards Sustainable Foods

The results of factors influencing consumption intention towards sustainable foods are presented in Table 5. Results indicate that awareness and attitude towards sustainable foods are factors with positive and statistically significant influence on consumption intention towards sustainable foods at 10% and 1% level of significance level respectively. This is line with previous studies that found strong positive relationship between attitude and consumption intention towards or willingness to purchase sustainable foods (Zhen & Mansori, 2012; Robinson & Smith, 2002). Income has

significant and negative influence on consumption intention towards sustainable foods at 1% significance level. This is contrary to expectation.

Table 5: Factors Influencing Consumers Intention toward Sustainable Foods

Variable	Coefficient	t-value	p-value
Age	-0.007	-1.470	0.147
Education	0.009	0.840	0.405
Household Size	0.003	0.180	0.859
Sex	0.109	1.430	0.158
Awareness	*0.267	1.940	0.057
Marital status	*0.146	1.790	0.077
Total income	***-0.002	-2.680	0.009
Attitude	***0.865	4.480	0.000
Constant	-0.156	0.660	0.514
F-value	3.55		
Log-Likelihood	-25.44		
p-value	0.002		

Source: Field survey, 2016 Note: *, and *** imply that coefficients are statistically significant at 10% and 1% respectively.

This suggests that (for an average person in the study area) income growth is less likely to be a very effective pathway to achieving positive change in behavior towards consumption of sustainable foods. The implications is that awareness creation about the nexus between sustainable foods and environmental sustainability as well as efforts to promote favourable attitude towards consuming sustainable foods are critical for stimulating strong intention towards (and by extension actual) consumption of sustainable foods.

Some underlying factors mostly considered during food purchase

The rank scores of some factors mostly considered by consumers when purchasing food products are presented in Table 6. The total rank score for each specific factor was compiled based on how high each factor was ranked (1 is the minimum rank score while 5 is the maximum) and how many respondents chose each factor. The results revealed price of food (with a score of 327) as the first most important factor considered during purchase. This is followed by the taste of food which has a ranking score of 247. Food Quality comes up next with a score of 235 and then the expiry date of the food which has a score of 234. The next to expiry date is the nutritional/health benefits of food with a scores of 221 and then the brand of food with a score of 149. Social consideration (responsibility) and environmental friendliness are at the bottom with score of 137 and 135 respectively. This implies that social consideration and environmental friendliness of the food are considered as the least important factors when making food purchase decision. It can be deduced from the findings that personal/individual concerns (needs) such as taste, price, product quality as well as nutrition and health seem to have stronger/dominant influence on product purchase decisions than consideration for the society (social consideration) and environmental friendliness of food products upon which the notion of sustainable consumption is based. The findings are contrary to

Table 6. Rank Scores of Factors Considered during Food Purchase

	Ranks					
Factors	**1st(5)**	**2nd(4)**	**3rd(3)**	**4th(2)**	**5th(1)**	**Total Scores**
Price of Food	53	2	12	5	8	327
Taste of Foods	22	16	15	13	2	247
Quality of Food	22	8	13	17	20	235
Expiry Date of Food	14	21	12	11	22	234
Nutritional/Health Benefits of Foods	19	15	8	10	22	221
Brand of Foods	11	6	8	5	36	149
Social Consideration	13	-	9	2	41	137
Environmental Friendliness of Foods	12	5	4	3	37	135

Source: Field Survey, 2016.

Bronfman *et al*. (2015) who noted more responsible environmental behaviors among Chilean community. Hence, efforts to raise people's consciousness/awareness in relation to the importance of consuming/purchasing eco-friendly foods become very important from policy development and programming standpoint.

CONCLUSION

The study examined the factors affecting consumption intention towards sustainable foods in Yewa South Local Government, Area of Ogun State, Nigeria. Data collected from randomly selected respondents in the study area were analysed using descriptive statistics and Tobit regression. An average respondent was 37 years old, having a household size of 5 persons and monthly income of ₦66,537.50. The majority of the respondents were awareness of sustainable foods, showed positive (favourable) attitude but low consumption intention towards sustainable foods. Environmental friendliness of foods and social consideration ranked lowest among the underlying factors motivating food purchases. Consumer attitude and level of awareness about sustainable foods were factors with positive and statistically significant influence on consumption intention towards sustainable foods.

RECOMMENDATIONS

Based on the findings of the study, efforts to promote favourable attitude and behavior towards purchase/consumption of sustainable foods are suggested. This could be in the form of awareness creation (on sustainable foods and social consideration in food consumption decisions) through the print and electronic media, and other avenues.

REFERENCES

Belz, F. & Peattie, K. (2009). Sustainability marketing: A global perspective. Chichester, England: Wiley

Braimah, M. (2015). Green brand awareness and customer purchase intention. *Management Science Letters,* 5(10), 895-902.

Bronfman, N. C., Cisternas, P. C., López-Vázquez, E., de la Maza, C. and Oyanede, J. C. (2015). Understanding attitudes and pro-environmental behaviors in a Chilean Community. *Sustainability*, 7:14133-14152

Chalmers, N.G., Revoredo-Giha, C. & Shackley, S. (2016). Socioeconomic effects of reducing household carbon footprints through meat consumption taxes. *Journal of Food Products Marketing,* 22 (2), 258-277

Do Paço, A., Alves, H., Shiel, C. & Filho, L. W. (2013). Development of a green consumer behaviour model. *International Journal of Consumer Studies,* 37(4), 414-424

European Union (2017). Food security, sustainable agriculture and forestry, marine, maritime and inland water research and the bioeconomy. Horizon 2020 - Work Programme 2018-2020. http://ec.europa.eu/research/participants/data/ref/h2020/wp/20182020/main/h2020wp1820-food_en.pdf

Grunert, S.C. & Juhl, H.J. (1995). Values, environmental attitudes, and buying of organic foods. *Journal of Economic Psychology*, 16 (1), 39–62

FAO (2016) Sustainable crop production intensification (SCPI). Available online: http://www.fao.org/3/a-i6168e.pdf (Accessed 3/6/2018)

FAO (2012). World agriculture towards 2030/2050: the 2012 revision. Rome: ESA Working paper No. 12-03.

Godfray H. C. J., Beddington, J. R., Crute, I. R., Haddad, L., Lawrence, D., Muir, J. F., Pretty, J., Robinson, S., Thomas, S. M. and Toulmin, C. (2010). Food security: the challenge of feeding 9 billion people.*Science,* 3275967), 812-818.

Goodland, R. & Anhang, J. (2009). Livestock and climate change. What if the key actors in climate change were pigs, chickens and cows? Worldwatch November/December 2009, Worldwatch Institute, Washington, DC, USA, pp. 10–19.

Jolliffe, D. and Prydz, E. B. (2016). Estimating international poverty lines from comparable national thresholds. Policy Research Working Paper 7606.

Karatu, V. M. H. & Mat, N. K. N. (2015). Predictors of green purchase intention in Nigeria: The mediating role of environmental consciousness. *American Journal of Economics,* 5(2), 291-302

Laheri, K. V., Dangi, H.& Vohra, A. (2014). Green marketing: Development of construct and its evolution. *Asia-Pacific Journal of Management Research and Innovation*, 10 (2),147-155.

Leitzmann, C. (2003), Nutrition ecology: The contribution of vegetarian diets. *American Journal of Clinical Nutrition:* 78 (3), 657-659

Lyndhurst, B. (2012). Selling Sustainability? In search of the retail business case for sustainable diets. WWF Report. Retrieved from http://www.wwf.org.uk/wwf_ articles .cfm?unewsid=6028.

McCarthy, M.., de Boer, M.., O'Reilly, S. & Cotter, L. (2003). Factors influencing intention to purchase beef in the Irish market. *Meat Science,* 65(3),1071–1083

National Bureau of Statistics (NBS) (2011). Annual Abstract of Statistics, Federal Republic of Nigeria. http://istmat.info/files/uploads/53129/annual_abstract_of_statistics_2011.pdf

National Population Commission (NPC), 2006 Population and Housing Census, "Population Local Government Area and Sex" http://population.gov.ng/core-activities/surveys/dataset/2006-phc-priority-tables/

OECD (2008). Promoting sustainable consumption: good practices in OECD countries. www.oecd.org/publishing.

Reisch, L., Eberle, U. & Lorek, L. (2017) Sustainable food consumption: an overview of contemporary issues and policies, *Sustainability: Science, Practice and Policy,* 9 (2), 7-25

Robinson, R. & Smith, C. (2002). Psychosocial and demographic variables associated with consumer intention to purchase sustainable produced foods as defined by the Midwest Food Alliance. *Journal of Nutrition Education and Behaviour,* 34 (6), 316–325.

Ukenna, S. I. & Nkamnebe, A. D. (2016). Sustainable consumption behavior in Sub-Saharan Africa : A Conceptual Framework. *Thunderbird International Business Review*, 59 (1), 33-50

United Nations Department of Economic and Social Affairs (UNDESA) (2015). World population prospects: The 2015 revision. New York, NY: UNDESA Population Division.

United Nations Development Programme (UNDP) (2013). The rise of the South: Human progress in a diverse world. New York, NY: United Nations Development Programme

Young, W., Hwang, K., McDonald, S. & Oates, C. J. (2010) Sustainable Consumption: Green consumer behaviour when purchasing products. *Sustainable Development,* 18 (1), 20–31

Zhen J. S. S. & Mansori, S. (2012). Young female motivation for purchase of organic food in Malaysia. *International Journal of Contemporary Business Studies*, 3(5), 61-72

Zur, I., & Klöckner, C. A. (2014). Individual motivations for limiting meat consumption. *British Food Journal,* 116(4), 629-642.

PROFITABILITY IN BACKWARD AND NON-BACKWARD INTEGRATION OF FISH CULTURE BUSINESS IN RIVERS STATE, NIGERIA: A COMPARATIVE APPROACH

Benson[1], D.N., Ebong[2], V.O and Henri-Ukoha[3], A
1 Department of Agricultural Education, Federal College of Education (Technical),Omoku, Rivers State, Nigeria.
2 Department of Agricultural Economics and Extension, University of Uyo, Akwa Ibom State, Nigeria.
3 Department of Agricultural Economics, University of Port harcourt, Choba, Nigeria.
E-mail:dumka.benson@yahoo.com.07066580000

ABSTRACT

This study compared the backward and non-backward integrated fish culture farms in Rivers State, Nigeria. Data for the study were obtained from 37 backward integrated and 119 non-backward integrated fish culture farms. Purposive and multistage sampling were used to select backward integrated and non-backward integrated farms respectively. Data were analyzed using descriptive statistics, budgetary, profitability indices as well as Z-tests. Findings revealed that the year of establishment, number of workers employed, status of the staff, distribution of pond size, and stock size employed by the backward integrated fish culture farms led to an increase in output, employment generation as well as enhanced the level of income of the farms. Results also showed that backward integrated fish culture farms spent ₦262, 411 compared to ₦583, 874 that was spent by the non-backward integrated fish culture farms in the study area. Large farms that can afford the cost of feed production internally should do so, as government provides infrastructure like electricity as a cost-saving strategy. This will enable the backward integrated fish culture farms make high profit which will translate to the larger economy and go a long way in removing economic recession.

KEY WORDS: Backward integration, Fish Culture Business, Comparative Approach, Rivers State.

INTRODUCTION

The global economic financial crisis has reduced the value of money in Nigeria in terms of exchange rate (Oluchukwu, 2012). According to Onoja (2011), Nigeria exchanged large amount of her naira for few dollar on imported seafood which cost the nation at least $400 million annually. Nigeria fish production has been below consumption with imports accounting for about U$$48.8 million in 2002 (Central Bank of Nigeria, 2004). Nigeria fishery output is inadequate. Recent knowledge shows that the world's natural stocks of fish and shell fish, though renewable, have finite production limits, which cannot be exceeded even under the best management regimes (Okechi, 2004). For most of our lakes, rivers, and oceans, the maximum sustainable fishing limit has been exceeded (FAO, 2000). Therefore, fish production will depend on aquaculture to bridge the gap of fish supply (Tacon, 2001). Rivers State is a coastal state located in the Niger River Delta of Southern Nigeria and therefore has great potential for sustainable aquaculture development (Anyanwu, Gabriel, Akinrotimi, Bekibele and Onunkwo, 2007). Fish has become an integral part of Nigerian diet and remains the main product consumed in terms of animal protein. Aquaculture provides thousands of jobs in operation. In Nigeria, about 30, 000 jobs have been created (Adewuyi, Phillip, Ayinde, and Akerele, 2010). The major integral activities involved in aquaculture production are fingerling production, feed production; table fish production, processing which are cost-sensitive (Ozigbo, Anyadike, Adegbite, and Kolawole, 2014). Feeds take the largest among the operational cost, accounting for more than

50% of the variable costs in growing fish and at least 60% of the total cost of production (Ozigbo *et al,*2014). The cost of feed claims over half of the total budget for most fish culture farms (Ogugua and Eyo, 2007). This and other cost of aquaculture has increased the price of fish and other fish products which brings about low profit (Bamiro, Shittu, and Kola-Olutokun, 2001).

According to Bamiro *et al* (2009), comparative analysis of the gross margin and profitability measures of the levels of integration of the aquaculture farms were carried out so as to make inference on the effect of backward integration and non-backward integration on the profitability of the farms. Against this background, it became imperative to study the backward and non-backward integrated fish culture farms in Rivers state. The study sought to achieve the following objectives: to describe the socio-economic characteristics of the fish farmers as well as to determine the costs and return of the backward and non-backward integrated fish culture farms in the study area.

MATERIALS AND METHODS

The study was conducted in Rivers State, Nigeria. Rivers state lies between 4^0 47^1 22" North and 6^0 59^1 55" East. The estimated total area of the state is about 11,077km^2 with a population of 5,185,400 (National Population Commission, 2006). There are 23 Local Government Areas in Rivers State. The geomorphology of the State shows that the soil types are formed from the Coastal Plain Sand (Ayolagha and Onuegbu, 2002). Rainfall in the state exhibits a double maxima regimes, with peaks in July and September and a little dry season in the month of August. The mean annual rainfall ranges from 2,300 -2,500mm approximately*(Source).* The mean monthly relative humidity is 79-85% (Benson, 2015). The commonly cultured fish species in the area include *Tilapia Spp, Heterobranches bidorsalis, Clarias gariepinus, Mugie spp, Chrysichthys nigrodigitatus, Heterotis, Niloticus, Ophiocephalus Obscure, Cyprimus carpio and Megalo spp.*

The population of the study comprises all the backward integrated and non-backward integrated fish culture farms in Rivers State. The sampling frame comprises 37 backward integrated and 357 non-backward integrated fish culture farms in Rivers State. Multi-stage sampling technique was adopted in the selection of respondents. In the first stage, the three agricultural zones were selected. In the second stage, a purposive sampling of 7 out of the 9 area offices of the Agricultural Development Programme in Rivers State, namely; Ahoada East, Bori, Degema, Eleme, Ikwerre, Okirika, and Rumuodomaya (Bonny and Port Harcourt area office did not possess list of fish culture farms hence were not selected). Third stage involved a purposive selection of 10 functional blocks out of the 48 blocks that exist in Rivers State. This was based on the areas where backward integrated and non-backward integrated fish culture farms were most predominant.
In the fourth stage, a purposive sampling of 27 functional cells out of 282 cells that exist in the State was done. This was based on the functional cells. Finally, the simple random sampling technique was employed to select 119 non-backward integrated fish culture farms. This resulted in a total sample size of 156 respondents (37 backward integrated and 119 non-backward integrated) fish culture farms for the study. Sampling comprised 55 and 327 backward integrated and non-backward integrated fish culture farms in the study area.

For the purpose of this work, the backward integrated farms are those farms that produced feed and fingerlings as well as used them internally for the production of table fish whereas the non-backward integrated fish culture farms are those farms that purchased the fish feed as well as the fingerlings

used in fish production from independent suppliers. This was based on the list collected from the Rivers State Agricultural Development Programme, Fishery Unit, which classified the aquaculture farms into backward integrated and non-backward integrated (Dobashi, Fallon, Eizmendi, Loureiro, Parrish and Raquet,1999).

Data were analysed using descriptive statistics such as mean, frequency count, percentages as well as budgetary technique and z-statistics. Annual depreciation value of each farm asset was calculated using the straight-line method (Ebong, 2007). Thus:

AD= (OC–SV)/(UL)…….Equation 1

Where:

AD=Annual depreciation
OC=Original cost at the time of purchase
SV=Salvage Value
UL=Useful life

The profitability model is expressed as:

$\prod$ = TR –TC…….Equation 2

Where,

TR = Total revenue, Q x P
TC = Total cost
Q = Quantity of output
P = Price of output

Net Farm Income is given by,

NI = Gross Farm Income – Total Cost…….. Equation 3
Value added as a percentage of sales =100 [(TR–TVC)]/TR……....Equation 4
Rate of Return on Investment = [100 (Net Farm Income)]/ [Total Revenue]…....Equation 5
Rate of Return on Fixed Cost = [100 (Net Farm Income)]/ [Total Fixed Cost]…..Equation 6

Where:

$\prod$ = Profit (₦)
TR = Total Revenue from the sales of fish (₦).
TC = Total Cost of fish production (₦)
TVC = Total Variable Cost of fish production (₦)
TFC = Total Fixed Cost of fish production (₦)
NFI = Net Farm Income (₦)
Q = Total quantity of fingerling bought/ mature fish sold (₦)
P = Price per fingerling/mature fish sold (₦)

Z-test is expressed as:

$$z = \frac{\overline{X_1} - \overline{X}_2}{\sqrt{\frac{S_1^2}{N_1} + \frac{S_2^2}{N_2}}}$$ ……..Equation 7

Where:

$\overline{X}_1$ = mean profit of backward integrated fish culture farms.
$\overline{X}_2$ = mean profit of non-backward integrated fish culture farms.
S_1^2 = variance for backward integrated fish culture farms.
S_2^2 = variance for non-backward integrated fish culture farms.
N_1 = number of cases for backward integrated fish culture farms.
N_2 = number of cases for non-backward integrated fish culture farms.

RESULTS AND DISCUSSION

The characteristics of backward integrated and non-backward integrated aquaculture farms is presented in Table 1 below.

Table 1: Characteristics of Backward Integrated and Non-backward Integrated Fish Culture Farms in the study area.

	N = 37		N = 119	
Characteristics	Backward Integrated		Non-backward Integrated	
	Frequency	%	Frequency	%
***Year of Establishment**				
One year old	0	0.0	30	25.2
Two years old	0	0.0	71	59.7
Three years old	6	16.2	12	10.0
Four years old	11	29.7	04	3.4
Above five years	20	54.1	2	1.7
Type of Pond				
Earthen pond	6	16.2	16	13.4
Concrete tank	19	51.4	86	72.3
Plastic trough	5	13.5	8	6.7
Flow through	3	8.1	0	0.0
Re-circulatory water system	4	10.8	9	7.6
***Number of Workers Employed**				
One	14	37.8	82	68.9
Two	21	56.8	30	25.2
Three	2	5.4	7	5.9
Above three	0	0.0	0	0.0
***Status of Staff Employed**				
Regular	30	81.1	7	5.9
Hired	7	18.9	93	78.2
Both	0	0.0	19	15.9
***Pond Size (m^2)**				
1 – 11m^2	0	0.0	83	69.7
12 – 22m^2	4	10.8	22	18.5
23 – 33m^2	10	27.0	4	3.4
Above 33m^2	23	62.2	10	8.4
***Stocked Size (Fingerlings)**				
1000 – 3000	4	10.8	93	78.2
3000 – 5000	10	27.0	22	18.4
5000 or more	23	62.2	4	3.4
Species of Fish Stocked				
Cat fish	24	64.9	94	79.0
Tilapia	10	27.0	21	17.6
Both	3	8.1	4	3.4

Source: Field Survey, 2016

Table 1 shows that majority (54.1%) of the operators of the backward integrated fish culture farms established their farms from five years and above. This was followed those who established four years ago (29.7%) and three years ago (16.2%) respectively. None was established within one or two years. However, majority (59.7%) of the non-backward integrated aquaculture farms established in the early years of two. This was also followed by those who established within one year (25.2%), three years (10.0%), then four years (3.4%) respectively. Only 1.7% established above five years. The suggests that the backward integrated fish culture farms were established more than five years ago, while the non-backward integrated fish culture farms were newly established The implication is that the backward integrated fish culture farms established were more experienced than the non-backward integrated fish farms, which leads to enhanced production, employment generation as well as increased farm income.

Table 1 also shows that majority (56.8%) of the respondents who established backward integrated fish farms employed two staff. This was followed by those who engaged one staff (37.8%), and then three staff (5.4%). Those that do not employ more than three staff had none. The study also revealed that the backward integrated fish culture farms in the study area employed more workers in the operation of their fish culture farms than the non-backward integrated fish culture farms. This implied that the backward integrated fish culture farms had capacity to produce in larger quantity and to generate more income. The backward integrated fish culture farms enjoyed economics of scale. Adequate staffing boosted the production capacity of the backward integrated fish culture business, as the youths were employed thereby leading to increased level of income.

Also from the results, majority (81.1%) of the farmers who established backward integrated farms accepted that their staff were employed on a regular basis, while only (18.9%) had none. None of the respondents agreed that neither regular nor hired staff was employed whereas their counterparts had majority (78.2%) of the employees hired with 21.8% being employed on regular basis. None of the respondents accepted that both regular and hired staffs were maintained in their fish culture business. As the backward integrated fish culture business employed regular paid staff to raise large number of fish, production and the savings of the workers are increased as a result of steady production and income respectively. The non-backward integrated fish culture business hired its staff to raise a relatively small number of fish which showed no significant difference in production and savings of the workers, thereby leading to low income. The study revealed that most of the aquaculture farmers that backward integrated operated on a full time basis, while few of the non-backward integrated aquaculture farmers operated on part time basis. This implied that the backward integrated aquaculture business generated employment, increased production and thereby increased income. This will ultimately remove recession in the economy of Rivers State. Conversely, the non-backward integrated aquaculture business that is practiced on part time basis will result in low output which neither increase income nor generate employment thus resulting in recession in an economy. A full time aquaculture business can rapidly respond to change by adapting its product to meet customer demands and taking advantage of human resources thus help a weaker economy to come out on top (Leybourn, 2013); Wieland and Wallenburg, l2012).

Table 1 also shows that majority (62.2%) of the respondents had a pond size of $33m^2$ and above. This was followed by $23\text{-}33m^2$ (27.0%) and $12\text{-}22m^2$ (10.8%) respectively. None of the respondents agreed that pond size of $1\text{-}11m^2$ was used. Whereas in the non-backward integrated farms, majority

(69.7%) used pond size of 1-11m^2, followed by 12-22m^2 (18.5%), then 23-33m^2 (8.4%) and above 33m^2 (3.4%) respectively. The indicates that backward integrated farms used large pond sizes in stocking their fish than their counterparts. The economic implication of this is that the backward integrated fish culture farms used large pond size that can stock large quantity of fish, employed more staff, and pay staff more money which can be saved after tax deduction; which lead to increased income as this has implications of reducing economic recession.

Majority (62.2%) of those who used backward integrated farms stocked 5,000 fingerlings and above. This was followed by 3,000-5,000 fingerlings (27.0%), and 1,000-3,000 fingerlings (10.8%) respectively. However, majority (78.2%) of the non-backward integrated farms stocked 1,000-3,000 fingerlings. This was also followed by those who stocked 3,000-5,000 fingerlings (18.4%) and those who stocked 5,000 or more fingerlings (3.4%) respectively. The shows that backward integrated farms stocked more fish, while the non-backward integrated fish culture farms stocked less. The economic implication of this is that as the backward integrated fish culture farms stocked large size of fish with its attendant increased production and retail sales, employment is generated for the unemployed youths as well as increased income level. Conversely, the non-backward integrated fish culture farms have small pond sizes that do not encourage high production and thus led to low profit which affects the income of the farm.

Costs and Return of Backward Integrated and Non-back Integrated Aquaculture Farms.
The costs and return the backward integrated and non- backward integrated aquaculture farms is presented in Table 2 below.

Table 2: Costs and Return of Backward Integrated and Non-back Integrated Fish Culture Farms in the study area.

Item	Extent of Integration					
	Integrated			Non-Integrated		
	Quantity	Amount ₦	Share %	Quantity	Amount ₦	Share %
Revenue						
Costs						
A. Gross Revenue		1,087,200.0	100.0		1,128,000.0	100.0
Fingerlings (₦)	1,812	20,811	3.70[3]	1,880	36,000	4.01[4]
Liming/Fertilization (kg)	255	6,985	1.23[5]	255	6,100	0.68[6]
Feed (kg)	71,520	262,411	46.0[1]	71,520	583,874	65.01[1]
Medication (g)	200	6,854	1.20[6]	200	6,837	0.76[5]
Labour (man days)	301	150,405.4	26.3[2]	301	148,748	16.56[2]
Water (Litres)	3,126.1	31,261.3	5.48[4]	3,790.7	37,907.4	4.22[3]
Transportation (km)	309.2	3,092	0.50[7]	477.9	4,779	0.53[7]
Repair of plumbing Facilities (₦)	37	2,691	0.47[8]	119	3,445	0.38[8]
B. TVC		484,510.7	85.0		827,690.4	92.20
C. TFC		85,631	15.0		70,461	7.80
D. TC (B+C)		570,141.7	100.0		898,151.4	100.0
E. GM (A-B)		602,948.8			300,309.6	
F. NFI (A-D)		517,317.8			229,848.6	
Profitability Indicators						
Value Added/Sale Ratio (%)			55.44			26.62

Rate of Returns on Investment (%)	47.58	20.38
Rate of Returns on Fixed Cost (%)	604	326.2

Source: Field Survey, 2016 Note: Figures in superscript denote the rank of cost share in an average fish culture farm.

The results on Table 2 indicates that the backward integrated and non-backward integrated fish culture farms produced mature fish at the average cost of ₦314.65 and ₦477.74 respectively per 1,000 fingerlings and was sold at the least price of ₦600.00 each. The average cost of production ₦314.65 for a mature fish *(what is the average weight of this mature fish?)* which was sold at ₦600.00 per fish by the backward integrated fish culture showed that the fish culture farmer makes more than 47% profit. Feed cost ranked 1st in the two levels of integration with 46% and 65% for the backward integrated and non-backward integrated fish culture farms, respectively. The total cost of ₦262, 411 was realized by the backward integrated fish culture farms that produced feeds internally for the two production batches per year when approximately 132 bags or 71520kg of feeds were used. This gives an average cost of ₦132.53/kg. The non-backward integrated aquaculture farms bought locally produced and imported feeds at an average cost ₦ 294.93/kg for the two production batches per year when the same 132 bags or 71520kg of feeds was used. This result corresponds with the Feed Conversion Rate (FCR) in catfish production which is based on 1kg of feed to get 1 kg of fish (Akara, 2014). This result also shows that feed cost is low among the backward integrated fish culture farms than the non-backward integrated fish culture farms. This could be attributed to the fact that feed is produced by the backward integrated fish culture farms, while the non-backward integrated fish culture farms buy fingerlings and feeds from independent suppliers. This implies that it is economical to produce feed locally or buy semi-processed feed from Ibadan in Nigeria and process it in one's farm than buying the imported feeds which is expensive and drains our resources to the foreign countries thereby encouraging recession in the economy. The high percentage share of feed cost is in consonance with the findings of (Shittu, Olayode, Bamiro,and Fehintola (2004) and (Ozigbo *et al* 2004) who reported that the cost of feeds is the highest among the operational cost and sometimes represents greater than 50% of the variable costs in growing fish in Ibadan, Nigeria.

Labour cost is ranked next to feed (though, there is a wide gap) in terms of the percentage share of the total cost of production. The backward integrated and non-backward integrated fish culture farms had 26.38% and 16.56%, respectively. The integrated and non-integrated aquaculture farms used 301 man days in the two batches of fish production per year at an average cost of (₦499.70) and (₦494.20) per day, respectively. This amounted to (₦150, 405.40kobo) and (₦148, 748.00kobo), respectively; for the two batches of fish production per year. The high in percentage cost of labour for the backward integrated farms is because these farms were established in the urban centres where the cost of labour is high.

Table 2 also reveals that the cost of fingerlings ranked 3rd and 4th among the backward integrated and non-backward integrated fish culture farms with 3.70% and 4.01%, respectively. The cost of fingerlings among the backward integrated fish culture farms is the lowest (₦20, 811.00) compare with (₦36, 000.00) for the non-backward integrated fish culture farms. This is because the backward integrated fish culture farms produced their fingerlings internally at a reduced cost of (₦11.00) per fingerling, while the non-backward integrated aquaculture farms bought fingerlings at a high cost of

(₦19.00) per fingerling from independent suppliers. This does not encouraged cost-savings thereby leading to low profit and thus closure of the aquaculture firms. This contributes to recession in an economy.

The share of water cost ranked 4th and 3rd for the backward integrated and non-backward integrated fish culture farms. Water was bought at (₦10.00) per 20 litres of jerry can by the backward integrated and non-backward integrated aquaculture farms. The backward integrated aquaculture farms used 3,126.1 litres of water at the cost of (₦31,261.30), while the non-backward integrated aquaculture farms used 3,790.7 litres of water at the cost of (₦37,907.40). The backward integrated fish culture farms spent less on water than the non-backward integrated fish culture farms. This is because the backward integrated aquaculture farms were mostly government owned and so provided with electricity at any place where they were sited. When there is power failure, the backward integrated aquaculture farms buy water from independent suppliers. Water is very important in fish culture business. It was changed at least thrice in every week or once observed to be polluted when the fish have started feeding more than before. The non-backward integrated fish culture farms were located in areas where electricity supply was poor which makes the cost of water to be expensive. This is in agreement with the findings of Ibemere and Ezeano (2014) who asserted that one of the major problems of aquaculture production in Rivers State is irregular electricity and it affects the cost of water supply. The backward integrated fish culture farms incurred low cost of electricity which brings about high profit. This translates to the larger economy and goes a long way in reducing economic recession.

The cost of liming/fertilization ranked 5th and 6th among the backward integrated and non-backward integrated fish culture farms, respectively. The backward integrated and non-backward integrated aquaculture farms used more of concrete tanks than earthen ponds in the production of mature fish. This reason was responsible for the poor use of liming/fertilization materials among the two production systems. The same quantity of lime/fertilizer (255kg) at an average cost of (₦1,000.00) per quarter bag of 15kg of hydrated lime per pond and approximately ((₦200.00) per 50kg of poultry dropping was used as fertilizer depending on the location of the aquaculture business. The backward integrated fish culture farms incurred more cost (₦6,985.00) in liming/fertilization of the ponds than the non-backward integrated fish culture farms (₦6,100.00). This is because most of the fish culture farms were located in the rural areas where the cost of liming material is expected to be high. Besides, the retailers who delivered them to the fish culture farmers added their mark up in order to make profit. However, the liming material was more expensive than the fertilizer (poultry manure) used for the fertilization of the ponds. Hydrated lime (CaoH) was used when the fishes are not yet stocked for a period of 14 days which pH ranges from 6.5-9.0, once it exceeds; the fingerlings are bound to die. It is therefore necessary to measure the pH of the water with a pH meter or pH indicator paper before stocking the fingerlings. This helps in sealing the pores in the pond soil and kills unwanted animal in the pond. It also makes the fertilizers applied to work better. The poultry droppings were put in a bag and suspended in the fish pond once the fingerlings have been stocked for them to grow along with it.

The share of veterinary cost is ranked 6th and 5th among the backward integrated and the non-backward integrated aquaculture farms, respectively. The backward integrated and non-backward integrated aquaculture farms incurred costs of (₦6,854.00) and (₦6,837.00) respectively for (200grammes) of medication administered to the fish in five days to prevent this disease.

Transportation cost is ranked 7th among the two production systems of backward integrated and non-backward integrated aquaculture farms. The average cost of (₦10.00) was spent per kilometer on transportation in the study area. The share of transportation cost is ranked high (₦4,779.00) among the non-backward integrated aquaculture farms than the backward integrated aquaculture farms (₦3,092.00) This is true because feeds and other inputs were mostly conveyed with commercial vehicles by the operators of the non-backward integrated aquaculture farms. On the other hand, the backward integrated aquaculture farms may have used commercial vehicles when the farm's vehicle was not functional in conveying feeds and other inputs which reduced the cost of transportation. This report is in agreement with that of Bamiro *et al* (2009) who emphasized that feeds and other inputs conveyed with purely commercial vehicles by the non-backward integrated aquaculture farms increased the expense incurred in operating their farm businesses. This becomes a cost-saving measure for the backward integrated aquaculture farms and therefore brings about high profit which translates to the larger economy and help to reduce recession in an economy.

The other variable cost incurred in repairing water facilities (plumbing) was ranked 8th among the two levels of integration. The 119 non-backward integrated aquaculture farms incurred (₦3,445.00) for repairing water bole holes in the two production batches of fish per year against (₦2,691.00) incurred by the 37 backward integrated aquaculture farms in repairing water bole hole facilities for the same production period. The high cost incurred by the non-backward integrated aquaculture farms is because the farms were scattered all over the rural areas where plumbers were hardly found to repair the spoilt facilities. The few plumbers in the rural areas or hired from outside charged high prices. This again saves cost for the backward integrated aquaculture farms and as a result increased the level of income of the farms which increased employment and subsequently reduced recession.

It can also be observed from Table 2 that the backward integrated fish culture farms in accordance with *a-priori* expectation have high gross margin/1,000 fingerlings and net farm income/1,000 fingerlings than the non-backward integrated fish culture farms gross margin/1,000 fingerlings and net farm income/1,000 fingerlings, respectively. The value added/sale ratios for the backward integrated and non-backward integrated fish culture farms were above 55.44% and 26.62%, respectively. This shows that the backward integrated fish culture farms added more value than the non-backward integrated fish culture farms. This report agrees with that of Bamiro *et al* (2009) in Ogun and Oyo States, Nigeria who reported that the backward integrated poultry farms added more value than the non-backward integrated poultry farms.

The rate of returns on investment also known as return to capital is high for the backward integrated fish culture farms than the non-backward integrated aquaculture farms with 47.58% and 20.38%, respectively. The rate of returns on investment per 1,000 fingerlings for the backward integrated and non-backward integrated fish culture farms of 47.58% and 20.38%, respectively implied that for every naira invested in any backward integrated and non-backward integrated fish culture business, ₦47.58 and ₦20.38 were realized respectively. This result revealed that the rate of returns per capital invested of 47.58% is greater than the prevailing bank lending rate of 18.5% for the backward integrated fish culture business. This implies that the backward integrated fish culture business is more profitable than the non-backward integrated in the study area. A farmer that takes loan from the bank to finance backward integrated fish culture business will be 47kobo or more better off on every one naira spent after paying the loan at the prevailing interest rate. This report agrees with that of Bamiro *et al* (2009) in Ogun and Oyo States, Nigeria who reported that the rate of returns on

investment in backward integrated poultry farms is higher than the non-backward integrated poultry farms.

The rate of returns on fixed cost follows the same trend. The rate of returns on fixed cost per 1,000 fingerlings for the backward integrated farm is higher than that of the non-backward integrated fish culture farms. Specifically, the result shows that for every naira invested on fixed assets, there is return of about 604% and 326.2% per 1,000 fingerlings for the backward integrated and the non-backward integrated fish culture farms, respectively. This is in agreement with the findings of Bamiro *et al* (2009) who asserted that for every naira invested on fixed assets, there is a return of about 359% and 490% per 1,000 birds to non-backward integrated and backward integrated poultry farms, respectively in Ogun and Oyo, States in Nigeria.

Test of Hypothesis

The result of the hypothesis that there is no difference in the profit realized by backward integrated and non-backward integrated aquaculture farms are is presented in Table 3

Table 3: The result on test of hypothesis of Profit Realized by Backward Integrated and Non-Backward Integrated Aquaculture Farms.

S/No	Hypothesis	Type of Test	Decision Rule	Value of Calculated Statistics	Tabulated Value	Probability Level	Decision
1.	There is no difference in the profit realized by backward integrated (₦ 517,317.8)and non-backward integrated(₦ 229,848.6) aquaculture farms.	Z-test	Reject H_0 if z-calculated value > tabulated value.	5.99 (119)	1.96	0.05	Reject the H_0

Source: Field Survey, 2016 (Note: Degree of freedom is given in parenthesis)

Table 3 shows the result of the hypothesis testing-there is no difference in the profit realized by backward integrated and non-backward integrated aquaculture farms in the study area was rejected at the 5% probability level of significance. This result reveals that the backward integrated aquaculture farms were more profitable than the non-backward integrated aquaculture farms in the study area. The implication is that the high profit made by the backward integrated aquaculture farms will enable the farms to employ more, thus increased the level of income of the farms which goes a long way in reducing recession in an economy; as external borrowing is minimized.

CONCLUSION

From the findings, backward integration in fish culture business had increased production as well as provision of more regular jobs than the non-backward integrated fish farms. Again, backward integrated farms made more profit than non-backward integrated farms. However, the percentage share of feed was higher in non-backward integrated farms than backward integrated farms while the percentage share of labour was higher in backward integrated farms than their non-backward integrated counterparts in the study area.

RECOMMENDATIONS

Based on the findings of this research work,

1. fish culture farms should build into their farms those characteristics that will increase production, generate employment which will increase the income of the farms.
2. Government should invest in "economic enablers" such as road, electricity, communication among others that will help the farms produce fish at low cost. This will lead to high profit which will strengthen a weak economy.
3. Large backward integrated fish culture farms that can afford the cost of backward integration should do so in order to reap high profit.

REFERENCES

Adewuyi, S.A, Phillip, B.B, Ayinde, I.A.A, and Akerele, D (2010). Analysis of Profitability of Fishing Farming in Ogun State Nigeria. *Journal of Human Ecology.*31(31): 179-184.

Abdul, A (2009). The Effect of Global Financial Crisis on Nigeria Economy. Department of Business Administration. Nasarawa State University, Keffi Nigeria. Retrieved from: Adamua bdul meem@yahoo.comUooba1009@gmail.com

Ajana, A.M (1995). A Diagnostic Survey of the Status of Agriculture in Ogun State. A Report of the National Agricultural Project.

Akara, D (2014).Analysis of Fish Feed Market in Delta State. Director of Programs.PIND. Economic DevelopmentResearch. www.pindfoundation.org. Retrieved 16/4/2016.

Anyanwu, P.E, Gabriel,U.U, Akinrotimi, O.A, Bekibele, D.O and Onunkwo,D.N (2007). Brackish Water Aquaculture: A Veritable Tool for the Empowerment of Niger Delta Communities. *Sceint. Res. Essay*,2:295-301.

Agyuleaus , E (2008). Financial Regulation Behavioural Finance and the Financial Credit in Search of a New Regulation Model. Retrieved from: http:/papers-ssm.com

Ayolagha, G.A and Onnegba B.A (2002). *The Soils of Rivers in the Land and People of Rivers State in* Allagoa and Derefika (Ed) 19-26.

Bamiro, O.M, Shittu, A.M, and kola-Olutokun, A.S (2001). Private Feed Production as Cost Reduction Strategy. Effects on Profitability of Poultry Business in Ogun State, Nigeria. *The Ogun journal of Agricultural Sciences*: 37-51.

Bamiro, O.M, Momoh, S, and Philip, D.O.A (2009). Vertical Integration and Profitability in Poultry Industry in Ogun and Oyo States, Nigeria. *International Journal of Poultry Science* 5 (12): 1164-1171.

Benson, D.N (2015). Socio-Economic Impacts of Crude Oil Exploration and Production on Farmers in Khana Local Government Area of Rivers State, Nigeria: An Unpublish

Dissertation Submitted to the Institute of Geosciences and Space Technology (IGST), Rivers State University of Science and Technogy, Port Harcourt, Rivers State, Nigeria P.33.

Bolorunduro, P.I (2003). Improved Fisheries Technologies and Approaches for their Dissemination: A Case Study of Niger State.Pp.74-79. *In*: Proceedings of the 16th Annual Conference of the Fisheries Society of Nigeria, November 4-9, 2001, Maiduguri, Nigeria.

Central Bank of Nigeria (2004). *Statistical Bulletin*, CBN Publication Pp. 264-267.

Dobashi, I.J. Fallon, F.C. Eizmendi, M. Loureiro, K. Matchett, R. Parrish and Raquet, B (1999). *The Value Chain for Poultry*. Pacific Basin Economic Council Working Committee on Food products, March

Food and Agriculture Organization (1987). Introduction to Aquaculture. United Nations Programme, Food and Agriculture Organization of the United Nations. Nigerian Institute for Oceanography and Marine Research Project RAF/82/009.

FAO.(2000). Fishery Country Profile, Nigeria. Food and Agriculture Organization of the United Nations, Rome, Italy. FID/CP/NIR Rev.4.

Gabriel, U.U, Akinrotimi, O.A, Bekibele,D.O, Onunkwo, D.N and Anyanwu,P.E (2007). Locally Produced Fish Feed: Potentials for Aquaculture DevelopmentinSubsaharan Africa. *African Journal of Agricultural Research*, 2(7):287-295.

Godwin, E (2012). 7 Things to Consider before Starting a Fish Farm Available at (http://connectNigeria.com/articles/category/technology Accessed 5/10/2015.

Ibemere, I.F and Ezeano, C.I (2014). Status of Fish Farming in Rivers State, Nigeria. *Journal of Fisheries and Aquatic Science,*9:321-329.

Ifejika, P.I and Ayanda, J.O (2005). Status of Fisheries Aquaculture in Kainji Lake Basin of Nigeria, Pp: 281-286. In: Proceedings of the 20th Annual Conference of the Fisheries Society of Nigeria, November 14-18, 2005, Port Harcourt, Nigeria.

Meriam-Webster (2008). Meriam-Webster on Live Dictionary. Retrieved from: http www/merrianm Webster.com/dictionary/recession.

National Bureau of Economic Research (NBER), (2008). Text of the NBERS Statement for Recession. Retrieved from: http/www USA today.com/money/2008-12-01 recession-nber statement/Nhtm.

National Population Commission (2006). Legal Notice on Publication of 2006 Census Final Results. Federal Republic of Nigeria Official Gazette, Abuja 2 (96):1-42

NEPAD, (2005). The NEPAD Action Plan for the Development of African Fisheries and the Aquaculture. pp: 15-20. In: Proceedings of the NEPAD – Fish for All Summit, August 22-25, Abuja, Nigeria

Ogugua,N.M and Eyo,J.E (2007). Finfish Feed Technology in Nigeria. *Journal of Research in Bioscience*,3(1):23-39

Ojanuga, A.G, Lekwa, G, and Akamigbo, F.O.R (1981). Sort Survey Classification and Genesis of Acid Sand. Ex Udo and Sobulo, R.A. (Ed) Acid Sand Southern Nigeria, *Soil Science Society of Nigeria, Special Publication Monograph* 1:1-17

Okechi, J.K (2004). Profitability Assessment: A Case Study of African Catfish (*Clarias gariepinus*) Farming in the Lake Victoria Basin, Kenya. Fisheries Training Programme. The United Nations: Iceland.

Oluchukwu, N.B (2012). The Global Economic Recession: Nature, Impact, and Investment Opportunities for an Emerging Market-Nigeria. *Arabian Journal of Business and Management Review (OMAN Chapter).* 1(11), 71-78.

Olawoye, J (2001). Contemporary Research and Problem Areas in Agricultural Extension and Rural Development. The Ibadan Extension Monograph Series No.2 Department of Agricultural Extension and Rural Development, University of Ibadan, Nigeria PP: 17-20.

Onoja, A. O and Achike, A.I (2011). Resource Productivity in Small Scale Catfish (*Clarias gariepinus*) Farming in Rivers State, Nigeria: A Translog Model Approach. *Journal of Agriculture and Social Research* (JASR) 11 (2), 139-146.

Ozigbo, E, Anyadike, C, Adegbite, O, and Kolawole, P (2014). Review of Aquaculture Production and Management in Nigeria. *American Journal of Experimental Agriculture* 4 (10),1137-1151

Shittu, A.M, Olayode, G.O, Bamiro, O.M, and Fehintola, A.M (2004). Effect of Using Non-Conventional Feedstuff on the Productivity and Cost of Egg Farms in Ibadan, Nigeria. *Nigerian Journal of Animal Production.* 31(1), 65-78.

Tacon, A.G.J (2001). Increasing the Contribution of Aquaculture for Food Security and Poverty Alleviation. Pp.63-72. *In*: Subasinghe, R.P, Bueno, P, Phillips, M.J, Hough, S.E, McGladdery & J.R Arthur, J.R (eds). Aquaculture in the Third Millenium, Technical Proceedings of the Conference on Aquaculture in the Third Millennium, Bangkok, Thailand, 20-25 February 2000.

SOCIOECONOMIC DETERMINANTS OF THE CONSUMPTION OF FRESH CATFISH "*CLARIAS GARIEPINUS*" BY HOUSEHOLDS IN KWARA STATE, NIGERIA

Babatunde, R.O., Omoniwa, A.E and Sanni, O.A.
Department of Agricultural Economics and Farm Managemennt
University of Ilorin, Ilorin, Nigeria
Corresponding Email: esteromotade@yahoo.ca

ABSTRACT

Fresh Catfish "Clarias gariepinus" is an important source of easily digestible and high quality animal protein which contributes some of the fatty acids necessary for the proper development of the brain and human body. However, in Nigeria a lot of people still suffer various deficiencies from protein deficiency with most of people living below the World Health Organizations' recommendation. This paper therefore examined the factors that determine fresh fish consumption expenditures by households in Kwara state, Nigeria using primary data obtained from 120 households within Ilorin metropolis. Using descriptive statistics and multiple regression analysis analytical tools, monthly income of household head, years of schooling and price of fresh fish per kilogram were found to be the major factors influencing the consumption of fresh fish in Kwara state. About 80.83 per cent of the households were also willing to pay ₦100 above the current ₦500 price per kilogram of fresh fish because of their educational status and the fact that they are aware of the nutritive value of fresh fish. It was therefore recommended that efforts should be made to reduce the price of fresh fish within Ilorin metropolis by granting fish farmers access to inputs that would reduce their cost of production. This will in-turn improve the health as well as the standard of living of the people in Kwara state and Nigeria at large.

Keywords: Fresh fish, Consumption, Nutritive value, Expenditure.

INTRODUCTION

Fish and fish products are known worldwide as a very important diet in improving human health, but many Nigerians still suffer from protein deficiency because of low protein intake (Olagunju *et al*, 2007). Fish which contributes 36.6 grams per day of net protein utilization is still below the world health organization's recommendation in Nigeria (Amoo *et al,* 2006). Fresh fish is very important because it constitutes 40 percent of animal protein intake. It is rich in essential omega-3 unsaturated fatty acid which is lacking in other food items. It also provides employment opportunity for many rural dwellers in different fields of fish farming and it has impact on human being throughout various stages of human life including pregnancy and childhood.

Over 17.5 percent and 50 percent of the animal protein intake comes from fish in many African and Asian countries respectively (Willman *et al*, 1998). Fish can be obtained from artisanal fishing which involves gathering fishes from the wild or from fish husbandry in different types of ponds. After harvesting, fish can be processed or handled through different methods before they are consumed. Fresh fish has been widely acknowledged as the one which minimizes nutrient loss and spoilage thereby giving maximum benefit for human health, body development and value for money (Akinbode and Dipeolu, 2012). Annual domestic fish supply in Nigeria stands at about 400,000 tones with the fisheries sector accounting for about 2 per cent of the national GDP, 40 per cent of animal protein intake and a substantial proportion of employment particularly in the rural areas (FAO, 2000). The major species of cultured fish include fin fish (Tilapia, Catfish and Carp),

mollusks and shrimp (FAO fisheries report, 2000). However, this paper considered Catfish "*Clarias gariepinus"*.

While many studies such as those of Rajani (2010), Pieniak *et al* (2010) and Madan *et al* (2005) confirm that per caput fish supply is much higher in developing countries than in developed countries, the importance of fish as a major source of animal protein is higher in these developing countries than in the developed world. A research into the problem of nutrition reveals that at least one out every nine persons sampled in the developing countries of the world is under nourished.

Protein deficiency can lead to malnutrition and a variety of ailments including mental retardation and kwashiorkor. Protein consumption is important in the physical, mental, and physiological development of man. It not only supports growth, mental development, and replacement of worn out tissues, but also improves health maintenance and general well-being. Unfortunately, sub-optional consumption of animal protein by a large percentage of Nigerians has become a major concern not only to livestock producers, but also to policy makers (Madubuike, 2004). This increased attention particularly to fish products has caused prices to increase and as such serious consequences on the willingness to pay for it in developing countries. Therefore, because of high price of animal protein most especially beef, sheep and goat, an average household in Nigeria regards fish as a close substitute for these food-items. This observation has led to increase in per capita consumption of these products among Nigerians in recent years. Besides, surge in fish demand in the country have also been associated with increase in aquaculture production across the country with aquaculture fish contributing more than 200 percent to total fish supply in the country lately in Nigeria (Ogundari and Akinbogun, 2010).

It is fundamentally consistent with basic economic theory that a rational consumer tends to exhibit preferences for higher taste (presumably quality) by shifting from less expensive foods such as grains, starch and so on to more expensive foods such as meat, fish and fruits when income level rises vice versa (Deaton, 1997). Meaning that a shift from quantity to quality especially when higher quality food becomes more affordable as income rise is a reflection of change in consumer tastes and preferences. Also, the importance of fresh fish consumption has become particularly important in countries such as Nigeria in which a larger proportion of the diets comprise of staple crops (cereals, cassava, plantain and so on). In such situations, at least a small quantity of fish can help in improving the overall palatability of the food and adding to its nutritive value (Kurien, 2005). With the growing importance of fresh fish, empirical findings on the households' consumption pattern have become important for producers, marketers and policy makers alike. This paper therefore aims to examine the factors that determine fresh fish consumption expenditures by households in Kwara state, Nigeria.

MATERIALS AND METHODS

The study was conducted in Kwara state in the north-central zone of Nigeria. The study has a population of about 2.4 million people, 70 per cent of which are peasant farmers (NPC, 2006). Kwara state lies between latitudes 7^0 45' N and 9^0 30' N of the equator and longitudes 2^0 30' E and 6^0 25'E of the equator. The state was created on the 27th of May, 1987 and share boundaries with Osun, Oyo, Ondo, Kogi, Niger and Ekiti states. The state is also made up of 16 Local Government Areas divided into four agro-ecological zones (KWSG, 2006).

Primary data was used through the use of well-structured questionnaire to collected data on the socioeconomic characteristics of the households, sources of fresh fish, frequency of consumption of

fresh fish, awareness about the nutritive value of fresh fish and the willingness to pay for fresh fish. A multi-stage sampling technique comprising of three stages was used to select 120 households from which data was collected.

The first stage is the purposive sampling of Ilorin metropolis. Ilorin metropolis was selected for the study because the production and consumption of fresh fish in the area is higher than in any other part of the state. The second stage comprises of a random selection of three (3) local government areas from the local government areas present within Ilorin metropolis. The third stage is the random selection of 40 households from each of the selected local government area to give a total of 120 households.

Descriptive statistics such as frequencies, means, percentages and Ordinary Least Square Multiple Regression Technique were used for data analysis. The implicit function of the model is given as:

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \cdots + \beta_n X_{ni} + v \qquad \text{(i)}$$

Where:

Y_i = Consumption expenditure on fresh fish consumed per household per month in Naira.

$X_{1i}, X_{2i} \ldots X_{ni}$ = vectors of explanatory variables

$\beta_0, \beta_1 \ldots \beta_n$ = coefficients of explanatory variables

Where;

X_1 =Age of household head (years)

X_2 = Gender of household head (male =1, 0 otherwise)

X_3 = Marital status (Married =1, 0 otherwise)

X_4 = Years of schooling of household head

X_5 = Household size (Adult Equivalence)

X_6 = Income of household head (₦/ month)

X_7 = Price of Fresh Fish per kilogram (₦)

v = Error term

RESULTS AND DISCUSSION

Table 1 shows that majority (55.83) of the respondents are females who are married (91.67) and falls within the age bracket of 41 – 46 years (61.67 percent). This implies that most of those who understand the consumption pattern of fresh fish are married women within the active (mid-life) age bracket (40 years and above). Most of the household (80 percent) have a size of between 1 to 5 persons. This may be due to the fact that most of them are educated (70 percent). This means they have greater than 12 years of schooling which is equivalent to tertiary level of education) and as such know the disadvantages of having large family sizes. This implies that the higher the level of education, the more the level of awareness on the importance of having minimal family sizes that one can take care of. This is expected in an urban metropolis such as Ilorin. Also, most (55.33 percent) of the respondents purchase their fresh fish from the market while 22.5 percent purchase directly from the pond sites, road side among others.

The analysis also shows that 96.67 percent of the respondents are aware of the nutritive value of fresh fish and are willing to pay for it given a maximum of ₦100 increase over the prevailing ₦500 current price per kilogram. This can be attributed to the high literacy level in the urban center. 19.17

per cent of the respondents are not willing to pay and this can be attributed to the current price of fresh fish per kilogram in the market within Ilorin metropolis.

Table 1: Socioeconomic characteristics of respondents

Characteristics	**Frequency**	**Percentage**
Gender		
Female	67	55.83
Male	33	44.17
Age (years)		
≤ 30	22	18.33
31 – 40	18	15.00
41 - 50	50	41.67
51 – 60	24	20.00
>60	6	5.00
Household Size (Adult Equivalence)		
1-5	96	80.00
6-10	24	20.00
Marital Status		
Married	110	91.67
Single	10	8.33
Occupation		
Civil servant	50	41.67
Teaching	24	20.00
Business	29	24.00
Others	17	14.17
Years of schooling		
0 (Non-formal)	1	1.00
1-6	2	2.00
7-12	84	70.00
>12	33	27.00
Source of Fresh Fish		
Pond site	27	22.50
Market	70	58.33
Others	23	19.17
Fresh Fish Consumption		
Yes	112	93.33
No	8	6.67
Awareness of the Nutritive value of Fresh Fish		
Aware	116	96.67
Not Aware	4	3.33
Pattern of Fresh Fish consumption		
Daily	9	7.50
Once in a week	43	35.83
Twice in a week	42	35.00
Three times in a week	12	10.00
Others	14	11.67
Willingness to Pay for Fresh Fish		
No	23	19.17
Yes	97	80.83
Price of Fresh fish (₦/Kg)		
≤400	32	26.67
401-600	69	51.50
≥600	19	15.83

Source: Field Survey, 2010; AE= Adult Equivalent, Number of observations = 120

This was found to be in agreement with the findings of Ehirim *et al*, (2007) for Bayelsa state, Nigeria that respondents with higher educational level are more aware of the nutritive value of fresh fish but contrary to Kwara state, they are not willing to pay for it. This they attributed to the level of poverty among the people in the area which makes them allocate their income to source of protein with more quantity than with high quality.

Table 1 also shows majority representing 93.33 percent consumes fresh fish but does so (70.83 percent) once to twice in a week while only 7.50 percent of the respondents consume fresh fish daily. This is might not be too good enough as most of these households do not have other source of animal protein (Rahji *et al*, 2014).

Factors affecting consumption expenditure on fresh fish by households

Table 2: Factors affecting consumption expenditure on fresh fish by households

Variables	Linear function Coefficients	t-values
Age (years)	-15.17	-3.02
Gender (Male=1, 0 otherwise)	-295.25	-0.53
Marital status (Married = 1, 0 otherwise)	68.49	0.06
Years of schooling	375.04**	5.43
Household size (AE)	-133.79	-0.61
Income (₦/month)	0.02*	2.08
Price of Fresh fish (₦/kg)	9.92***	4.32
Constant	-7131.86	-3.02
R^2	0.375	

Source: Field Survey, 2010: AE = Adult Equivalent

*,**,***implies 10, 5 and 1% level of significance

The R^2 as shown in Table 2 explains 37.5 per cent of the variation in the monthly fresh fish consumption expenditure using the multiple regression analysis. The variables that were significant include the monthly income of household head (10 per cent level), years of schooling (5 per cent level) and price of fresh fish per kilogram (1 per cent level). The monthly income of household head, years of schooling and price were positively significant. This implies that a unit increase in any of these variables will increase the monthly fresh fish consumption expenditure by 375.037 units, 0.021 units and 9.921 units for the years of schooling, monthly income of household head and price per kilogram of fresh fish respectively. This is because a person who is educated earns more and is more aware of the nutritive value of fresh fish. Such a person will be ready to pay more just to get the required nutrient. All these are consistent with the findings of Pieniak *et al* (2010) and Mai (2007) both for Vietnam which showed that household size, number of dependent in the home, educational level, household income and occupation are important factors influencing the consumption of sea-foods and catfish by households.

CONCLUSION AND RECOMMENDATIONS

The study showed that the consumption of fresh fish among households is influenced by many factors among which are the number of years of schooling, average monthly income of household head and the price per kilograms of fresh fish. The study therefore recommends that government and

non-governmental organizations should organize enlightenment programs on the importance of consuming fresh cat fish. This will make people more willing to pay for it even in the case of slight increase in price since they know the importance.

REFERENCES

Akinbode S. O. and Dipeolu A. O. (2012). "Double-Hurdle Model of Fresh Fish Consumption among Urban Households in South-West Nigeria", *Current Research Journal of Social Sciences* 4(6): 431-439.

Amoo J., Oluwatayo and Osuntope F. (2006). "Economics of fish demand in Lagos state, Nigeria", *Journal of Human Ecology* 19:25 – 30

Deaton A. (1997). "The analysis of Household Surveys: A micro econometric approach to development policy", Baltimore USA: *John Hopkins University press.*

Ehirim N. C. et al (2007). "Determinants of willingness to pay for fish safety in Bayelsa state, Nigeria.

FAO (2000). "Inland fisheries development report", FAO corporate Document Respository, Rome.

Kurien J. (2005). "Responsible fish trade and food security", FAO Fisheries Technical Paper 456, *Centre for Development Studies Trivandrum*, India.

KWSG (2006). "Planning studies in Kwara State. Kwara State Government of Nigeria", Ministry of land and Regional resources.

Madan M. D., Mohammed A. R., Ferdinand J. P., Somying P., Ramachandra B., Md Ferdous A. and Mahfuzuddin A. (2005). Fish Consumption And Food Security: A Disaggregated Analysis By Types Of Fish And Classes Of Consumers In Selected Asian Countries, *Journal of Aquaculture Economics and Management*, 9, (1-2)

Madubuike F. N. (2004). "Arresting animal protein insufficiency in Nigeria: A multi- sectional approach", Department of Animal Science and Fisheries Imo State University, Owerri, Nigeria.

Mai H. T. (2007). "Factors affecting the decision process of catfish consumers: An empirical study in the two biggest cities in Vietnam", Department of Economics and Management, University of Tromso.

Nigerian Population Commission 2006

Ogundari, K. and Akinbogun O. (2010). "Modelling production efficiency with risk: a study of fish farms in Nigeria". *Marine Resources Economics*, 25 (3), 295-308.

Olagunju F., Adesiyan I. and Ezekiel A. (2007). "Economic viability of catfish production in Oyo state, Nigeria". *Journal of Human Ecology* 21(2),121-124.

Pieniak, Z., Verbeke, W., Scholderer, J. (2010). Health-related beliefs and consumer knowledge as determinants of fish consumption. Journal of Human Nutrition and Dietetics, 23, 5, 480-488.

Rahji, F.R. and M.A.Y. Rahji (2014). A Comparative Analysis Of Diet Quality In Urban And Rural Households In Ibadan Zone Of Oyo State, Nigeria, *Agrosearch* : Volume 14(2), 90-102

Rajani, N. (2010). Values, attitudes and intention to consume wild fish versus farmed fish in Nha Trang. Master's Thesis, Nha Trang University, Nha Trang, Vietnam.

Willman, R., M., Halwart and U. Barg, (1998). "Integrating fisheries and agriculture to enhance fish production and food security". *FAO Aquaculture Newsletter* No. 20:3-8.

LIMITATIONS TO YAM PRODUCTION ENTERPRISE DEVELOPMENT IN NIGERIA

Amaefula A.[1,4], Farquharson R[2]., Ramilan T[2,3]., and Asumugha G.N[4].
[1] PhD Candidate University of Melbourne, Faculty of Veterinary and Agricultural Sciences, Building 142 Royal Parade, VIC 3010, Australia
[2] University of Melbourne, Faculty of Veterinary and Agricultural Sciences, Building 142 Royal Parade, VIC 3010, Australia
[3] Massey University, New Zealand
[4] National Root Crops Research Institute, Umudike, PMB 7006 Umuahia, Abia State, Nigeria
a.amaefula@student.unimelb.edu.au and adamaefula@yahoo.com

ABSTRACT
This paper determines the constraints to yam production enterprise development in Nigeria. A multi-stage random sampling technique was used to extract data from three hundred and sixty yam farmers in Nigeria. Data were analyzed with descriptive statistics. The investigation indicates that high cost of planting material, lack of fund, and unavailability of planting material impede yam production enterprise development in Nigeria. Nigerian yam farmers are poor and resource constrained. Unavailability of financial institutions in the rural areas of Nigeria, the major constraint to loan acquisition by yam farmers, prevents farmers from obtaining loan to purchase sufficient inputs for yam production. Nigerian yam producers adopt the indigenous yam production techniques. They use mainly planting materials from previous harvest. Macro sett is the commonly use type of planting material. The traditional yam production methods encourage the use of excessive and poor quality planting materials for yam production. In Nigeria, yam farmers obtain agricultural information from sources which could be unreliable. This research makes these three key recommendations: establishment of financial institution in the rural areas to increase farmer access to loan; development of an ideal farming system for yam that would increase the availability and affordability of seed yam; also recommended is for Nigerian yam farmers to obtain agricultural information from appropriate sources such as research institutes and extension agents.

Keywords: Limitations, Yam production, Enterprise development

INTRODUCTION
Nigeria is an agrarian economy with over seventy percent of the population engaged in agriculture (Encyclopedia of the Nations, 2015*)*. Despite this, the country still depends heavily on food imports. There is potential for agricultural development in Nigeria (Chinedu & Okoro, 2009). However, this has not been harnessed to develop a sustainable agriculture. Nigeria could be more food secure if its favourable agricultural endowment could be explored and the conditions for farming improved.

Yam is a major staple widely accepted and consumed in Africa. It is important in the diet of people in yam-producing areas (Opara, 2003). Although low in protein and fat, yam has been found to be nutritionally superior to other root and tuber crops (Wanasundera & Ravindran, 1994). It is a highly prized crop in terms of sociocultural significance; evidenced by the annual celebration of New Yam Festival in some yam-producing areas. Yam has greater value than other comparable staples; it is an important source of farm income (Babaleye, 2003) and a major employer of labour in Nigeria (Verter & Bečvařova, 2015). Yam contains pharmacological substances (Lebot, 2009) which are used in the manufacture of drugs.

Nigeria is the leading yam producing country (Food and Agricultural Organization (FAO), 2015). Being a leading yam producer does not imply a higher yield than other yam-producing countries. Currently, Japan has the highest global yam productivity, followed by Papua New Guinea then Tonga (FAO, 2015). Although yam production in Nigeria has risen over time (FAO, 2012), yield has been declining (Ikeh et al., 2012). Increased yam production is due to expansion of land area under yam cultivation.

The traditional yam production techniques practiced in Nigeria are expensive, labour-intensive, physically demanding and limit mechanization of yam farming in Nigeria (Authors' observation, 2013; Okoro, 2008; Opara, 2003). Large quantities of inputs, especially planting materials, are required for yam production using traditional methods (O'Sullivan, 2010). Over reliance on traditional farming systems contributes to food insecurity in Nigeria. Farmers usually use poor quality seed yams obtained from last harvest. However, the use of poor quality seed yams has contributed to declining yam productivity. There are no standard storage facilities for yam and this has contributed to significant loss of yam during storage. There is an urgent need to improve the current state of yam farming to enhance yam production. The traditional production techniques for yam in Nigeria are inadequate to meet the demand from the Nigerian population.
This project describes yam production in the predominantly yam-growing States of Nigeria. It discloses the perception of farmers on the development of yam production enterprises. It also determines the constraints to yam production enterprise in Nigeria.

MATERIALS AND METHODS

A multi-stage random sampling technique was adopted in collecting cross sectional data from yam farmers in Nigeria. The first stage involves a random selection of three agro-ecological zones of Nigeria. The second stage involves a random selection of three yam-producing States, producing a minimum of 1.2 million metric tonnes of yam per annum. The States include Benue, Enugu and Ondo. The third stage involved random selection of two major yam-producing Local Government Areas (LGAs) from each State. The LGAs selected were Buruku and Katsina-Ala in Benue State, Nkanu-east and Uzo Uwani in Enugu State, and Owo and Ose in Ondo State. A total of three hundred and sixty (360) respondents were selected from Nigeria. Primary data were used for this study. Primary data were collected from the respondents by using a well structure questionnaire and by direct observation. Data collected include resource endowment data (such as availability of inputs, information and credit); resource utilization data (such as labour, land use, planting materials and use of fertilizer); and attitudinal data (such as farmers' responses to issues on yam production). Data were analyzed with descriptive statistics.

RESULTS AND DISCUSSION

Farmer willingness to expand area under yam production in Nigeria

This research suggests that the majority of Nigerian yam farmers are willing to expand the scale of yam production. Table 1 presents farmers responses on willingness to expand area under yam production in Nigeria. Farmers in Benue were more willing to expand yam production.

Table 1: Farmer willingness to expand area under yam production in Nigeria

Expand of yam production	Nigeria (%)	Benue (%)	Enugu (%)	Ondo (%)
Willing to expand	96.0	97.8	95.5	94.8
Reasons for not willing to expand				
Lack of fund	1.4	0.7	1.5	1.9
Unavailability of land	0.2	0	0.8	0
Lack of access to fertilizers	0.7	0.7	0.8	0.6
High cost of fertilizers	0.2	0	0	0.6
Unavailability of seed yam	0.2	0	0	0.6

Source: Field Survey, 2013

Negligible population of the farmers (4%) were reluctant to expand production. The few who were unwilling to expand yam production indicated lack of funds as the main reasons why they were unable to expand yam production in Nigeria.

Hindrances to yam production enterprise development in Nigeria

Table 2 shows the hindrances to yam production enterprise development in Nigeria.

Table 2: Ranking of hindrances to yam production enterprise development in Nigeria

	1(%)	2(%)	3(%)	4(%)	Weighted Average	Rank
High cost of planting material	0	0.5	1.9	16.1	7.11	1
Unavailability of planting material	0	0	1.4	3.3	1.74	3
Lack of fund	0	0.2	1.7	16.1	6.99	2
Lack of time	0	0	0	0.2	0.08	6
Have adequate farm	0.2	0.5	0	0.2	0.2	5
No strength to plant more	0.2	0.2	0.2	0.9	0.48	4

Source: Field Survey, 2013

Note: 1- 4 denote scores in increasing order of magnitude; the most important was scored 4. Ranking is in decreasing order of magnitude; the most severe was ranked 1. The percentage of the variables did not add up to one hundred because zero score was excluded.

It reveals that high cost of planting material, lack of fund and unavailability of planting material are the major constraints to yam enterprise development in these States. Yam farmers are mostly poor and have insufficient funds to purchase the inputs required for yam production. This is consistent with Omojola (2014) who reported that yam production in Osun State of Nigeria is mostly limited by lack of capital, scarcity of planting material and high cost of planting material.

Availability and use of inputs

An assessment of farmer access to farm inputs in Nigeria discloses that most Nigerian yam farmers have difficulties acquiring loans for purchasing farm inputs. Table 3 shows availability and use of inputs in Nigeria. Farmers in Benue State had more difficulties acquiring farm inputs. It was less difficult to access inputs in Ondo State. Most of the yam farmers admitted that they employed

sufficient labour for yam production. However, a significant percentage of the farmers used insufficient labour.

Table 3: Availability and use of inputs

Farmers situation	**Nigeria**(%)	**Benue**(%)	**Enugu** (%)	**Ondo**(%)
Have difficulty acquiring farm input	76.4	86.7	85.8	56.7
Employ adequate labour	62.5	68.3	60.0	59.2
Use fertilizer	78.6	99.2	90.0	46.7
Have difficulty obtaining loan	66.5	86.7	65.9	50.3
Use adequate planting material	58.5	62.2	53.8	59.4

Source: Field Survey, 2013

Benue State had access to labour than other States followed by Enugu then Ondo.
The vast majority of yam farmers in Nigeria used fertilizer for yam production. Nevertheless, they used below the recommended rate of fertilizer. Fewer farmers in Ondo used fertilizer for yam production. Although yam is nutrient demanding and thrives on fertile soil, unexpectedly some Nigerian farmers deliberately avoid the use fertilizers for yam production.

Loan acquisition is a serious challenge faced by Nigerian yam farmers. A significant percentage of the farmers had difficulties obtaining loans. It was more difficult to access loans in Benue State. Ondo farmers had less difficulty acquiring farm loans.

Limitations to input acquisition in Nigeria

Distribution of the respondents according to limitations in input challenge is shown in Table 4 below.

Table 4: Limitations to input acquisition in Nigeria

Limitations	**Farmers (%)**
Lack of fund	46.0
Unavailability of input	20.8
Untimely inputs	2.6
High cost of input	13.3

Source: Field Survey, 2013

Nigerian farmers are poor and lack the funds to acquire sufficient farm inputs. Table 4 highlights the limitations to input acquisition in Nigeria. Approximately 46% of the respondents specified lack of fund as the major constraint to input acquisition in Nigeria. The Table also indicates that unavailability of inputs hinders its acquisition in Nigeria. High cost of input is another limitation to input acquisition. Approximately 13.3% of the respondents indicated it as a constraint to input acquisition in Nigeria. Few farmers have reported that untimeliness of inputs such as fertilizer and planting materials prevent the use of inputs by yam farmers in Nigeria.

Sources of capital for yam production in Nigeria

The investigation of the sources of capital for yam production in Nigeria reveals that Nigerian yam farmers obtain funds for yam production mainly from non-farm activities. Table 5 highlights the sources of capital for farm activities in Nigeria. The vast majority of the farmers

Table 5: Sources of capital for yam production

Income Sources	Nigeria(%)	Benue(%)	Enugu(%)	Ondo(%)
Non-farm income	97.1	97	94.3	99.4
Bank loan	6.6	6.7	4.1	8.4
Local Saving Scheme	14.1	26.9	5.7	9.7
Loan from friends and relations	24.8	14.2	29.3	30.5
Money lender	1.5	2.2	0	1.9
Loan form cooperative	4.9	0.7	5.7	7.8
Gift	1.5	0	3.3	1.2

Source: Field Survey, 2013; Multiple Responses recorded

(approximately 97%) used non-farm income for yam production. Some yam farmers obtained loans from friends and relations. More Enugu farmers borrowed funds from friends and families. Other farmers obtained loans from local saving schemes. Those who obtained funds from the local saving schemes were more in Benue State. Few Nigerian farmers borrowed money for yam farming from the commercial banks; more farmers in Ondo fall into this category. Farmers in the State had more access to financial institutes and were able to obtain loans from the Banks. Other sources of farm income in Nigeria include cooperatives, money lenders and gifts.

Constraints to loan acquisition in Nigeria

Constraints to loan acquisition in Nigeria is presented in Table 6 below.

Table 6: Constraints to loan acquisition in Nigeria

Problems	5 (%)	4 (%)	3 (%)	2 (%)	1 (%)	Weighted Average	Rank
High interest rate	15.4	3.1	8.3	1.2	0.2	7.8	4
Unavailability of loan	16.1	15.6	9.7	0.9	0	11.6	2
Unavailability of Financial Institution	25.1	14.9	5	0.5	0	13.4	1
Lack of knowledge on how to obtain loan	18.7	9.2	7.3	0.5	0	10.2	3
Reluctant to obtain loan	4	1.2	1.9	0.2	0	2.1	5
Other problems	1.7	0.2	0.2	0	0	0.7	6

Source: Field Survey, 2013

Note: 1- 5 denote scores in increasing order of magnitude; the most important was ranked 1.The percentage of the variables did not add up to one hundred because zero score was excluded.

Table 6 shows the constraints to loan acquisition in Nigeria. Yam farmers are interested to obtain loan. However, lack of financial institutions in the rural areas is the major limitation to loan acquisition by Nigerian yam farmers as it ranks first. Table 6 also indicates that unavailability of loan ranks second. This is another reason why farmers are unable to obtain loan in Nigeria. Ignorance of how to obtain loan ranks third. Many Nigerian yam farmers are ignorant of loan acquisition from the financial institutions; this hinders them from obtaining loans from the Banks.

Ranking of sources of planting material used for yam production in Nigeria

Table 7 shows the ranking of sources of planting material for yam production in Nigeria.

Table 7: Ranking of sources of planting material used for yam production in Nigeria

Sources of planting material	4(%)	3 (%)	2 (%)	1 (%)	Weighted Average	Rank
Own farm	82.9	9	1.4	0.2	36.16	1
Research institute	0	0.5	1.2	0.5	0.44	5
Market	21.1	31	20.9	0.2	21.94	2
Fellow farmers	10.2	29.1	10.7	0.5	15	3
Extension agents	1.4	0	2.1	0.2	1	4

Source: Field Survey, 2013

Note: 1- 4 denote scores in increasing order of magnitude; the most important was ranked 1. These variables did not add up to one hundred because zero percent was excluded from the estimation.

The main sources of planting material for yam production in Nigeria are own farms, local markets and fellow farmers. Planting materials from these sources often have poor quality and are disease infested. Aighewi et al. (2015) observed that seed yams are subject to contamination with pests and disease pathogens in the traditional yam production system in Nigeria. International Institute of Tropical Agriculture, IITA (2009) observed that the use of such planting material leads to a build-up of disease causing organisms and reduction in yield. Few Nigerian yam farmers obtained planting material from research institutes and ADPs, which are the reliable sources of planting material.

An analysis of the adequacy of planting material used for yam production in Nigeria has shown that most Nigerian yam farmers use insufficient and poor quality planting material obtained mainly from their farms for yam production; this has adverse effect on yam yield. In Nigeria, over 40 percent of the farmers used inadequate planting materials for yam production (see Table 3). The adequacy of planting material differs between regions. Benue has a relatively higher adequacy in the use of planting material while Enugu had the lowest.

Ranking of types of planting material used for yam production in Nigeria

Table 8 shows the ranking of the types of planting material used for yam production in Nigeria.

Table 8: Ranking of types of planting material used for yam production in Nigeria

Types of planting material	4 (%)	3 (%)	2 (%)	1 (%)	Weighted average	Rank
YMT	17.5	3.6	1.2	0	8.32	4

Mini tuber	32.7	5	3.8	0	15.34	3
Milk yam	34.8	6.2	4.7	0.2	16.74	2
Macro sett	51.5	12.1	5.2	0.2	25.29	1

Source: Field Survey, 2013

Note: 1- 4 denote scores in increasing order of magnitude; the most important was ranked 1. The percentage of the variables did not add up to one hundred because zero score was excluded.

It indicated that macro sett was the major type of planting material used for yam production in Nigeria. A significant quantity of planting material is required for yam production using this technique (O'Sullivan, 2010). Seed yam obtained from YMT was the least used type of planting material for yam production in Nigeria. Nigerian yam farmers mainly use macro setts for yam production. This method of yam production requires the use of yam tubers meant for food as planting material. This type of planting material is inappropriate for yam production. It is susceptible to diseases and rot due to exposure of cut yam surface, which could cause low yield of yam.

Constraints to planting material acquisition in Nigeria

Table 9 presents the limitations to planting material acquisition in Nigeria

Table 9: Ranking of the constraints to planting material acquisition

Limitations	**4 (%)**	**3 (%)**	**2 (%)**	**1 (%)**	**Weighted Average**	**Rank**
Costly	16.1	1.9	0.5	0	7.11	1
Unavailability	3.3	1.4	0	0	1.74	3
Lack of fund	16.1	1.7	0.2	0	6.99	2
Lack of time	0.2	0	0	0	0.08	5
Lack of strength	0.9	0.2	0.2	0.2	0.48	4

Source: Field Survey, 2013

The major constraints to planting material acquisition in Nigeria are high cost of planting materials, lack of fund to purchase them and unavailability of planting materials. Planting material for yam production in Nigeria is expensive, this limits its acquisition. Nigerian yam farmers are poor and resource constrained. They lack fund to purchase sufficient planting material for yam production. Other factors preventing yam farmers from obtaining planting materials include lack the strength and time to purchase seed yams and plant more yams.

Ranking of sources of agricultural information in Nigeria

Table 10 shows the ranking of sources of agricultural information in Nigeria.

Table 10: Ranking of sources of agricultural information in Nigeria

Sources	**5 (%)**	**4 (%)**	**3(%)**	**2 (%)**	**1 (%)**	**Weighted average**	**Rank**
Fellow farmers	59.5	6.4	1.9	0	0	21.92	1
Relatives	5.7	8.1	2.4	0.5	0.2	4.62	4
Television	22	4.7	2.4	0.5	0	9.13	3

Extension agents	32	3.3	1.4	0.2	0	11.85	2
Research Institutions	2.1	0.2	0.5	0	0	0.85	5
Traditional leaders	0.2	0	0	0	0	0.07	7
No information Source	2.1	0	0	0	0	0.70	6

Source: Field Survey, 2013

Note: 1- 4 denote scores in increasing order of magnitude; the most important was scored 5. These variables did not add up to one hundred because zero percent was excluded from the estimation.

There is poor dissemination of agricultural information and technology in Nigeria. Nigerian yam farmers obtain agricultural information mainly from fellow farmers. This confirms Rimi et al (2015), who noted that the major source of agricultural information in Katsina State of Nigeria was fellow farmers. However, this information could be unreliable and have a negative impact on farmer performance. Information is usually altered down the communication line (Talloo, 2007). Therefore, yam farmers are likely to obtain low quality information from other farmers. This could have adverse effect on their performance.

CONCLUSION

Yam production in Nigeria is mainly limited by unavailability and high cost of planting materials and lack of fund. Farmers have insufficient funds to purchase ample inputs for yam production. Nigerian yam farmers lack access to financial institutions. This prevents them from obtaining loans for yam production. Provision of financial support to farmers is crucial in developing the Nigerian yam enterprise. Nigerian yam farmers obtain income for yam production mainly from non-farm activities. They had difficulties acquiring loans and farm inputs. Most yam farmers accepted that they employed adequate labour for yam production. However, significant percentage of the farmers used insufficient labour. The majority of the farmers also indicated that they used adequate fertilizer for yam production. Nevertheless, the quantity of fertilizer these farmers use for yam production is below the fertilizer requirement for yam production in Nigeria. Increased farmers' access to financial institutions, provision of financial support to farmers and input subsidy would contribute to developing yam production enterprise in Nigeria.

This research suggests that the indigenous yam production method adopted by most farmers in Nigeria is a setback to yam enterprise advancement. Development of an alternative farming system for yam that would increase the availability and affordability of planting materials, boost yam yield and reduce the cost of yam production would contribute to the development of the Nigerian yam enterprise.

Farmers obtain agricultural information mainly from fellow farmers. This source of information could be unreliable. Sourcing agricultural information from reliable sources such as research institutes and extension agents would enhance farmer performance.

RECOMMENDATIONS

1. Establishment of financial institutions in the rural areas of Nigeria to increase farmers' access to loan for farm activities.
2. Subsidizing inputs to increase their affordability.
3. Provision of financial support to farmers to make fund available for yam production.

4. Development of an ideal farming system for yam that would increase the availability and affordability of seed yam.
5. Nigerian yam farmers should be encouraged to obtain information from appropriate sources such as research institutes and extension agents.

REFERENCES

Aighewi, B. A., Maroya, N. G., & Asiedu, R. (2014). *Yam production from Minisetts: A training manual* (p. 43) Ibadan . IITA.

Babaleye, T. (2003). West Africa improving yam production technology; *ANB-BIA supplement issue/edition Nr 463.*

Chinedu, U. O., & Okoro, D. (2009). Agricultural expenditures: Budget tracking/investment analysis of agricultural sector in Nigeria (2000-2008). Report submitted to Voices for Food Security: Civil Society Coalition Poverty Eradication (CISCOPE), pp. 1-55

Encyclopedia of the Nations. (2015). Nigeria - Agriculture. Retrieved 23 March, 2015, from http://www.nationsencyclopedia.com/economies/Africa/Nigeria-AGRICULTURE.html

Food and Agriculture Organization of the United Nations. (2012). FAOSTAT Database. Rome, Italy: FAO. Retrieved July 25, 2012 from www.fao.org/faostat/en/#data

Food and Agriculture Organization of the United Nations. (2015). FAOSTAT Database. Rome, Italy: FAO. Retrieved August 25, 2015 from www.fao.org/faostat/en/#data

International Institute of Tropical Agriculture. (2009). Yam-growing technique. Ibadan, Nigeria: IITA. Retrieved 25 July, 2015, from http://r4dreview.org/2009/03/yam-growing-technique/

Ikeh, A., Ndaeyo, N., Uduak, G., Udoh, E., Obinaju, L., & Nkeme, K. (2012). Evaluation of yield productivity and economic returns of some yam (Dioscorea esculenta Poir) genotypes grown in a kaolinitc ultisol. *Journal of Biology, Agriculture and Healthcare, 2*(6) 65-69.

Lebot, V. (2009). *Tropical root and tuber crops: cassava, sweet potato, yams and aroids.* (Vol. 17). UK: MPG Biddles Ltd, King's Lynn.

Okoro, J. K. (2008). Awareness and use of the Rapid Seed Yam Multiplication Technology by farmers in Nigeria's yam belt. *PAT, 5* (1), 22-29.

Omojola, J. T. (2014). Gross Margin analysis and constraints to yam production in Osun State, Nigeria. *World Journal of Agricultural Sciences, 2* (4), 62-68.

Opara, L. U. (2003). Yams: Postharvest operation. Rome, Italy: FAO. Retrieved July 20, 2015 from http://www.fao.org/inpho/content /compend/text/ch24_02.htm

O'Sullivan, J. N. (2010) Yam nutrition:nutrient disorders and soil fertility management. Canberra.*:* Australian Centre for International Agricultural Research (ACIAR) *Monograph No 144*, pp 112

Rimi, T. A., Akpoko, J. G., & Abdullahi, K. A. (2015). Sources of agricultural information used by cowpea farmers in Rimi Local Government Area of Katsina State. *Journal of Agricultural and Crop Research, 3*(2), 21-26.

Talloo, T. J. (2007) Business organization and management for B.com (Hons.) Course of the University of Delhi, Delhi: TATA Mc Graw-Hill Publishing Company Limited.

The asia Mag. (2009). Yam I am. Retrieved November 15, 2012 from www. the asiamag.com.

Verter, N., & Bečvařova, V. (2015). An analysis of yam production in Nigeria. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis, 63* (2), 659–665.

Wanasundera, J. P. D., & Ravindran, G. (1994). Nutritional assessment of yam (Dioscorea alata) tubers. *Plant Foods for Human Nutrition, 46*, 33-39.

ASSESSMENT OF LAND MANAGEMENT PRACTICES OF SMALLHOLDER FARMERS IN SOUTHEAST, NIGERIA.

Osondu, Charles Kelechi
Department of Agricultural Economics and Extension, Abia State University, Umuahia Campus, PMB 7010, Umuahia, Abia state, Nigeria.
Author Email: osonducharles87@gmail.com

ABSTRACT

This study assessed land management practices of small scale farmers in Southeast, Nigeria. Data were elicited from 360 small scale farmers selected by means of multistage random sampling technique using pre-tested and structured questionnaire. Data collected were analyzed using descriptive statistics and Ordinary Least Square (OLS) multiple regression technique. Results showed that mean age, farming experience, farm size and annual farm income of the farmers were 48 years, 15 years, 0.86 hectares and ₦156,870.86 respectively. Results further showed that 33.3% and 26.7% of the farmers belonged to environmentally unfriendly and environmentally damaging land management categories respectively, while, 25.8% and 14.2% of them belonged to environmentally sustainable and environmentally compatible land management categories respectively. It was found that education level, farming experience, extension contact, farm size and membership to farmers' association were significant determinants of rate of use of land management practices by farmers. Meanwhile, 72.5%, 65.0% and 60.8% of the farmers were constrained from using land management practices by inadequate capital, inadequate knowledge of land management practices and inadequate access to credit respectively. The Federal and State governments should make policies aimed at increasing linkage between extension workers and small scale farmers.

Keywords: Land management practices, smallholder farmers

INTRODUCTION

Land is the basic natural resource that provides sustenance for man (Amao, Ayantoye and Aluko, 2013). It is the major resource for the livelihood of farmers. Nigeria is endowed with enough land to undertake small and large scale activities to strengthen household food security and livelihood, national development, trans-boundary cooperation and regional integration to transform trade, and create new opportunities for sustainable development that is sensitive to the environment and social and economic issues (Amao *et al.,* 2013).The economic fortune of Nigeria revolves largely around the exploitation and use of land resources especially in a primary industry such as agriculture (Titilola and Jeje, 2008).Land, being limited in supply is pressured and competed for by several users (Akinnagbe and Umukoro, 2011). In Nigeria, large tracts of land are used by small scale farmers who form the bulk of the farming population for agricultural production. According to Brown and Wolf (2005) small scale farmers in Nigeria account for a large share of the total cultivated land and agricultural output. Thus, the importance of land to livelihood of the small scale farmers cannot be over emphasized.

However, expansion and intensification of agriculture by small scale farmers have often damaged the very resources essential to farming such as soil, water and genetic diversity of crops as well as the wider environment (Raufu, and Adetunji, 2012). As important as land is to the livelihood of farmers, Adekoya (1997) observed that many small scale farmers in Nigeria are not using many of the land management practices. Use of unscientific farming methods and unsustainable agricultural

practices by farmers in Nigeria have been identified by many studies as a primary cause of land degradation which alters the natural ecological conservatory balances in the landscape (Maiangwa *et al.,* 2007; Senjobi and Ogunkunle, 2010). Over exploitation of land resources through over grazing, over use of fertilizer, water erosion, soil acidification and salinization and overload of soil nutrients have degraded land in many parts of Nigeria (Amao *et al.,* 2013). The negative impacts of land degradation undermine people's livelihoods and economic wellbeing, and the nutritional status of more than 1 billion people in developing countries (Global Environmental Facility 2003). According to Oyekale (2008) and Subair (2009) the impact of land degradation on the local population include crop failure and famine, shortage of water, shortage of land for farming and prolong soil infertility. Land degradation has become a major problem in Nigeria and is projected to become even more severe unless sustainable land management practices are adopted by all land users especially the small scale farmers.

Sustainable land management (SLM) has been defined as the adoption of appropriate land management practices that enables land users to maximize the economic and social benefits from the land while maintaining or enhancing the ecological support functions of the land resources (Food and Agriculture Organization, 2009). It is the key point for improving land resource resilience and productivity, bridging the needs of agriculture and environment with the twin objectives of maintaining long term productivity and ecosystem functions (land, water, biodiversity). The major goal of SLM therefore is to develop economically viable agro-ecological system and to enhance the quality of the environment, so that farm lands will remain productive indefinitely. The livelihood and socio-economic development of farmers directly depend on land. As a result, all farmers especially the small scale farmers have significant stake in ensuring that the natural resources and their immediate environment are sustainably managed (Fakoya, 2000). However, Abdulazeez *et al.* (2014) noted that in spite of wide spread knowledge about cropping patterns such as fallowing and crop rotation known to significantly contribute to soil sustainability and other soil water and nutrient conservative measures which could help to remedy soil condition, land degradation continued to increase. It therefore appears as if small scale farmers in the study area, like in many other parts of Nigeria are not using the land management practices required for improved and sustainable agricultural production.

Knowledge of the current land management practices of small scale farmers who form the bulk of Nigeria's farming population is essential in order to design programmes and projects aimed at reducing land degradation and ensuring sustainable agricultural production in the country. The land in south-east Nigeria has been considered as low lying with exposed surface areas that are prone to flooding, coastal and sheet erosion, resulting to removal of top soil (Urama, 2005). Adequate use of land management practices is essential for maintenance of soil fertility. The identification of constraints to farmers' use of land management practices would provide a direction of action for government in trying to boost farmers involvement in land management practices and reveal areas of inadequacy. The results of this study is likewise expected to provide policy makers with good understanding of the situation in the south-eastern part of the country such that they would be adequately equipped with the right policy intervention tools that will promote the welfare of small scale farmers. Farmers, researchers, students and government agencies would benefit from findings and recommendations of the study. Specifically this study seeks to: i) describe socio-economic characteristics of small scale farmers in the study area; ii) identify land management practices used by small scale farmers in the study area; iii) categorize small scale farmers on the bases of their use of farm land management practices in the study area; iv) determine socio-economic factors that

influence the extent (degree) of use of farmland management practices in the study area; and v) identify constraints to use of land management practices by small scale farmers in the study area.

Review of Empirical Literature on Land Management Issues

Small scale farmers have been exposed to various land management practices such as contour mulching, terracing and crop rotation. These practices have been tested on farms and approved efficient. However, not all farmers are applying them despite the recognition that their land is getting increasingly degraded. The adoption of land management practices is multidimensional with numerous factors affecting the willingness of farmers to use various conservation practices (Rezvanfar, Samlee and Faham, 2009). Some of the explanations are farmer-specific in terms of household level characteristics (Nkonya, 2002; Doss, 2006), while others are related to economic factors (Salasya *et al.,* 2007).

However, the effects of most variables on the adoption of land management practices have not been conclusive and have been noted to vary with location given the divergent reports available from existing literature. It has been found that participation in government programmes (Bekele and Drake, 2003); credit access (Nkonya, 2002); education level (Okoye, 1998; Deininger, Jin and Adenew, 2003; and Pender, Gebremadhin and Haile, 2003; Raufu and Adetunji, 2012); age (Okoye, 1998); gender of household heads (Pender and Gebremadhin, 2004); household size (Mulat, Ali and Jayne, 1997); farm size (Hagos, 2003; Demeke, 2003; Teklewold, 2004); land tenure (Ayalew *et al*. 2005); extension access (Deininger, Jin and Adenew, 2003; Marshall, 2004; Okunade, 2006); membership to farmer groups (Tenge, Graaff and Hella, 2004); and slope of land (Amsalu and De Graaf, 2007) were positive determinants of adoption of land management measures. On the other hand, education level (Clay, Reardon and Kangasniemi*,* 1998); Abd-Ella, Eric and Warren*,* 1981); age (Okunade, 2006); gender of household head (Mulat, Ali and Jayne*,* 1997); household size (Shiferaw and Holden, 1998); and farm size (Deininger, Jin and Adenew, 2003) were also found to be negatively related with adoption of land management practices.

Another factor in adoption of land management practices is farmers' perception about the level of deterioration of arable land. Farmers who perceive their land as fast deteriorating and producing less than desired, tend to adopt land management practices. For instance, Yila and Thapa (2008) found that accelerated erosion had a positive influence on adoption of land management technologies in Plateau State, Nigeria. On the other hand, farmers who perceive their soils to be fertile tend to have low adoption of land management practices as observed by Amsalu and De Graaf (2007).

Several other studies have been undertaken with regards to land management issues in Africa including Nigeria. Amao *et al.* (2013) conducted a study on land degradation, soil conservation and poverty status of farmers in Osun State, Nigeria. The study which used probit regression to estimate determinants of poverty among the farmers found that degraded land area, education level, zero tillage and clean clearing increased poverty while, mulching, crop rotation, cover crops, organic manure, inorganic manure and harrowing reduced poverty.

According to Babalola and Olayemi (2013), in a study on determinants of farmers' preference for sustainable land management practices for maize and cassava production in Ogun State, Nigeria, the significant determinants of decision to use a particular choice of land management practice, using logit regression were membership of association, education level, farm size, topography of land and participation in government programmes.

Simon, Ndaghu and Yohanna (2013) assessed crop farmers awareness of sustainable agricultural land management practices in northern part of Taraba State, Nigeria and found that there was high level of awareness of use of sustainable agricultural land management practices among respondents. Raufu (2010) investigated pattern of land use among selected crop farmers in Osun State, Nigeria. Findings showed that intercropping was the major form of land use in the area. Other studies on the pattern of land use, agricultural system and soil degradation were conducted in different parts of Africa using remote sensing, household and field surveys and transect (Olsen, 1996; Breyer, Larsen, and Acen, 1997). The studies found that since the 1950s, almost all land that had been under pasture or wetlands have been converted to cultivation, and most fields are being managed with only short (one rainy season long) fallows and that characteristic land management technologies employed include crop rotation, trash lines, and use of mulch.

Socio-economic factors influencing seasonal fallowing was investigated by Grisley and Mwesigwa (1995). The study revealed that 76 percent of farmers had some cropland under grass fallow. Logit model estimates revealed that intercropping, distance to farm and farm size influenced land fallowing decision. The study recommended the use of capital intensive technologies such as terracing, agro-forestry and use of chemical fertiliser to overcome the problem of land being idle for a long time.

MATERIALS AND METHODS

The study was carried out in Southeast zone of Nigeria. The zone consists of five states namely: Abia, Anambra, Ebonyi, Enugu and Imo States and located between Latitudes $5^0$06'N and $6^0$34'N of the Equator and Longitudes $6^0$38' E and $8^0$08' E of the Greenwich Meridian. According to NPC (2007), the population of Southeast zone of Nigeria was 16,381,729 persons, disaggregated into 8, 306, 306 males and 8,075,423 females. Southeast Nigeria is a rainforest belt of tall trees with dense undergrowth of shorter species dominated by climbing plants. The zone experiences two distinct seasons, namely: rainy season and dry season. The rainy season normally starts in late March and ends in early November, while, the dry season lasts from late November to early march with slight variations. The prolonged rainy season results to high mean annual rainfall range of between 1,800mm - 2,500mm, humidity of above 80% during the rainy season and mean annual temperature range of between 21^0C and 25^0C and promotes growth of perennial trees. The inhabitants of this zone are predominantly farmers cultivating food crops such as cassava, yam, cocoyam, maize and rice and cash crops such as oil palm, cocoa and cashew (Nwajiuba and Onyeneke, 2010).

The population for the study consists of all the small scale farmers in Southeast Nigeria. Multistage random sampling technique was employed in selection of farmers from Southeast Nigeria for the study. In stage one, 3 states (Anambra, Ebonyi and Imo) were randomly selected from the 5 states that makeup the study area. In stage two, 3 agrarian Local Government Areas (LGAs)- one from the Northern part, another from the central part and the third from the southern part of each of the states - were randomly selected from each of the 3 states. This ensured adequate coverage of the states and gave 9 selected LGAs. The third stage involved random selection of 2 communities from each of the 9 LGAs, resulting to 18 communities. A list of small scale farmers in the selected communities were formulated with the aid of village secretaries and extension agents. This list served as the sampling frame, from which 20 small scale farmers were selected at random from each of the 18 communities, giving a sample size of 360 small scale farmers. Data were collected from the respondents from May - July 2017.

Data were collected through use of pre-tested and structured questionnaire that was administered to the respondents. Data were collected on respondents' socio-economic characteristics such as gender, educational level, household size, farm size, age, farm income, farming experience, credit access, extension contact and membership of farming association. Data were also generated on types of land management practices used, rate of land management practices and constraints to use of land management practices. Descriptive statistics such as frequencies, percentages and mean were used to analyse objectives i, ii, iii and v, while ordinary least square (OLS)multiple regression analysis was used to achieve objective iv.

For the multiple regression analysis, the dependent variable was the extent (degree) of use of farmland management practices. Ten (10) most popular and prevalent farmland management practices used by small scale farmers were identified in accordance with Fakoya (2000) thus: tree planting, multiple cropping, crop rotation, water erosion control/zero tillage, alley farming, cover crop planting, use of animal wastes, use of inorganic fertilizer, use of plant origin/organic fertilizer, and mulching. Multiple responses of the structured questions were allowed and farmers were requested to indicate level of use of the farmland management practices on Likert scale graded thus always = 3, often = 2, seldomly = 1 and never = 0.

For each farmland management practice, a score of 0, 1, 2 or 3 was allocated to a farmer depending on level of use. The total score per respondent for the number of practices indicated was expressed as a percentage of the overall score thus:

$$Z = \frac{X}{Y} x \frac{100}{1} \quad \ldots \qquad (1)$$

Where,
Z = level or rate of use of use of farmland management practices by the respondent
X = participatory score of farmers on number of farmland management practices engaged in.
Y = the overall score of all farmland management practices (30).
Based on the respondents Z value, they were categorized or grouped into four distinct groups as follows: a) Environmentally sustainable practice (>70%); b) Environmentally compatible practice (50% to 69%); c) Environmentally unfriendly practice (30% to 49%); and d) Environmentally damaging practice (0% to 29%)

The model of the OLS multiple regression analysis is formulated implicitly thus:
$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9, X_{10}, u)$ … (2)

Where: Y = Rate of use of farmland management practices (%);
X_1 = Age of small scale farmers (years);
X_2 = Gender (Male = 1; female =0);
X_3=Household size (number of people feeding from the same catering arrangement);
X_4= Education level (number of years spent in school);
X_5 = Farming experience (years);
X_6 = Farm income (Naira);
X_7 = Extension contact (Number of visits);
X_8 = Amount of credit accessed (Naira);

X_9 = Farm size (Hectare);
X_{10} = Membership to farmers association (number of farmers' association a farmer belongs); and u = Error term.

Four functional forms of the model (Linear, exponential, double logarithmic and semi- logarithmic) were fitted with the data. The lead equation was selected based on statistical and econometric criteria including number of significant variables, magnitude of the F- ratio, R^2 and the conformity of the variables to *a priori* expectation. The four functional forms are as stated:

RESULTS AND DISCUSSION

Socio-Economic Characteristics of the Respondents

Distribution of the small scale farmers according to socio-economic characteristics is shown in Table 1.

Table 1: Distribution of small scale farmers according to socio-economic characteristics

Variables	**Mean**
Age (years)	48.42
Farm size (hectare)	0.86
Farming experience (years)	14.86
Annual farm Income (₦)	156,870.86
Gender	**Percentage**
Male	56.7
Female	43.3
Level of Education Attained	**Percentage**
No formal education	15.8
Primary school education	27.5
Secondary School education	50.0
Tertiary school education	6.7

Source: Field survey data, 2017

Table 1 shows that the mean age and farming experience of the small scale farmers were 48 years and 15 years respectively. This indicates low participation of youths in farming and agrees with Ajani *et al.*(2015) and Dankyang (2014) assertions that most youths in Nigeria have left agriculture in favour of employment in non-agricultural sector. According to Awoyinka *et al.* (2009) the number of years a farmer puts to cultivating a particular parcel of land could influence the choice of and the ability to use land management practices. The table also shows that mean farm size and annual farm income of the farmers were 0.86 hectare and ₦156,870.86 ($513.74) respectively. The small size of farmland and low farm income could limit the farmers from adopting land management practices.

With respect to gender, 56.7% of the small scale farmers are males, while 43.3% of them are females. This could be as a result of the stress attached to agricultural production activities which the female gender sometimes cannot bear. According to Omojola (2014) agricultural production has many energy demanding activities which makes males who are naturally endowed with abundant strength more suited for farming. The result could also be attributed to the fact that traditionally women in various parts of Nigeria in general and Southeast zone in particular are restricted from owning land (Raufu and Adetunji, 2012; Osondu *et al.,* 2015). Table 1 further shows that 84.2% of the small scale farmers had diverse level of formal education. The level of education attained by a farmer not only increases his/her farm productivity but also enhances ability to understand and evaluate new production technologies (Nwaru, 2001).

Land Management Practices of Smallholder Farmers

Distribution of smallholder farmers according to land management practices is shown in Table 2 below.

Table 2: Distribution of smallholder farmers according to land management practices.

Land management practices	***Frequency**	**Percentage**
Tree planting	66	18.3
Crop rotation	147	40.8
Use of terraces	51	14.2
Use of drainage channels	24	6.7
Minimum tillage	141	39.2
Bush fallow	255	70.8
Cover crop planting	78	21.7
Mulching	87	24.2
Use of inorganic fertilizer	186	51.7
Use of organic fertilizer	198	55.0
Crop residue recycling	93	25.8
Irrigation	48	13.3
Construction of contour ridges	177	49.2

** Multiple responses recorded; n = 360; Source: Field survey data, 2017*

Table 2 shows that some land management practices undertaken by the farmers in decreasing order of frequency are: bush fallow (70.8%), use of organic fertilizer (55.0%) use of inorganic fertilizer (51.7%), construction of contour ridges (49.2%), crop rotation (40.8%) and minimum tillage (39.2%). Bush fallow, organic fertilizer, inorganic fertilizer and crop rotation were used to improve soil fertility and increase crop yields, while, minimum tillage and contour ridges helped to reduce soil erosion. This result compares favourably with findings of Fakoya (2000) and Zulu *et al.* (2011).

Categories of Small Scale Farmers Based on Land Management Practices

Distribution of the small scale farmers based on their use of land management practices is shown in Table 3.

Table 3: Category of small scale farmers based on use of land management practices

Category of land management practice	*Frequency	Percentage
Environmentally sustainable	51	14.2
Environmentally compatible	93	25.8
Environmentally unfriendly	120	33.3
Environmentally damaging	96	26.7

*Source: Field survey data, 2017 * Multiple responses recorded; n = 360*

The table shows that 33.3% and 26.7% of the farmers fell into environmentally unfriendly and environmentally damaging categories respectively based on their use of land management practices, while, 25.8% and 14.2% of them fell into environmentally sustainable and environmentally compatible land management categories respectively. This result implies that 60.0% of the small scale farmers did not use adequate number of land management practices and highlights the fact that most small scale farmers in the study area are not using enough land management practices and are farming crops in an environmentally unsustainable way. The result compares favourable with findings of Fakoya (2000) among farmers in Oyo State.

Factors that influenced Use of Land Management Practices by Small Scale Farmers

The estimate of the factors influencing rate of use of land management practices by small scale farmers is presented in Table 4.

Table 4: OLS Regression Estimates of Determinants of Use of Land Management Practices by small scale farmers

Variables	Linear+	Exponential	Semi log	Double log
Constant	-4.039	2.567***	-32.687***	2.398***
	(-1.121)	(23.854)	(-2.583)	(11.460)
Age	0.632	0.012	2.001	0.030
	(0.726)	(0.478)	(0.633)	(0.578)
Gender	0.732	0.034	3.045	0.086
	(0.664)	(1.040)	(0.800)	(1.360)
Household size	-1.292	0.002	-1.043	-0.025
	(-0.734)	(0.037)	(-0.271)	(-0.398)
Education level	4.113***	0.086***	12.443***	0.281***
	(4.713)	(3.313)	(3.732)	(5.097)
Farming experience	0.176**	-0.001	11.527***	0.090
	(2.496)	(-0.551)	(2.886)	(1.360)
Farm income	-0.581	0.062	-2.649	0.019
	(-0.387)	(1.383)	(-0.818)	(0.349)
Extension contact	5.484***	0.151***	11.667***	0.392***
	(4.334)	(4.005)	(2.640)	(5.372)
Access to credit	-1.304	-0.041	0.587	-0.030
	(-0.813)	(-0.861)	(0.173)	(-0.532)
Farm size	1.296**	0.022	3.365	0.072
	(2.324)	(1.330)	(1.189)	(1.543)
Membership to association	2.351***	0.049**	3.760	0.096*
	(3.013)	(2.083)	(1.249)	(1.930)
R^2	0.751	0.724	0.746	0.750
Adjusted R^2	0.739	0.705	0.769	0.737
F-value	76.494***	47.633***	33.540***	74.335

Source: Field Survey data, 2017. ***, **, * statistically significant at 1.0%, 5.0% and 10.0% alpha levels respectively. Figures in parentheses are t-ratios. + = Lead equation

All the tried functional forms of the regression model were significant at 1.0% alpha level implying that any of the functional forms can be used for predictive purposes. However, the linear functional form gave the best fit to the data having produced highest R^2 value of 0.751, F-value of 76.494 and highest number of significant variables. The R^2 value of 0.751 implies that 75.1% of variations in the dependent variable are caused by changes in the independent variables fitted into the OLS model. Table 4 shows that five out of the ten variables fitted into the OLS model significantly determined rate of use of land management practices by farmers at various alpha levels.

Specifically, education level had a positive coefficient (4.113) that was significant at 1.0% alpha level. The sign of the coefficient indicates that the rate of farmers usage ofland management practices increased with higher educational attainment. Farmers with higher education level will have higher level of planning and better understand the potential benefits inherent in the use of land management practices. According to Ogbe (2009) education raises human capital and significantly increases a farmer's ability to make correct and meaningful choices for farm operations. Education has been shown to be a factor in the adoption of agricultural innovations and is considered an important variable that enhances farmers' adoption of new agricultural technologies (Ijioma and Osondu, 2013; Osondu *et al.,* 2014). This result compares favourably with findings obtained in Abdulazeez *et al.* (2014) and Tsue *et al.* (2014) among farmers in Kwara State and North central Nigeria respectively.

Farming experience had a positive coefficient (0.176) that was significant at $p<0.05$. This implies that increase in farming experience of the farmers' increased their use of land management practices. This is expected because an experienced farmer should have known those land management practices that conserved the ecological configuration of the fragile ecosystem (Tsue *et al.,* 2014). According to Tsue *et al.* (2014), farming experience increased the probability of using adaptation options because experienced farmers had better knowledge and information on environmental conditions and management practices. This result is consistent with the findings of Awoyinka *et al.*(2009); and Tsue *et al.* (2014) but contrasts with the findings of Pender *et al.* (2003).

Extension contact had a positive coefficient (5.484) that was significant at 1.0% alpha level. This implies that rate of use of land management practices by the farmers increases as their number of contacts with extension agents increases. The aim of extension service is to provide farmers with the necessary education, skills and technical information to enable them take effective and efficient farm management decisions for enhanced daily farm practices (Tsue *et al.,* 2014). Tsue *et al.*(2014)further asserted that increased access to extension services increases farmers' awareness of environment change and empowers them with better information on how to adapt to the adverse effects of land degradation. This result compares favourably with finding of Abdulazeez *et al.* (2014).

The coefficient of farm size (1.296) was significant at 5.0% alpha level, implying that farmers' use of land management practices increased as farm size increases. According to Badru (2002) farmers with small farms are more constrained to adopt recommended technologies. The result supports Awoyinka *et al.*(2009) and Babalola and Olayemi (2013) assertions that land management practices are used more when a large hectarage is being cultivated. Farm size has been positively linked to the adoption of land management practices (Hagos, 2003 and Demeke, 2003).However, the result contrasts with finding of Abdulazeez *et al.* (2014) that negatively linked adoption of land management practices with farm size.

The coefficient (1.9011) of membership of farmers' association was significant at 5.0% alpha level. The sign of the coefficient implies that the rate of usage of land management practices by the farmers increases as they belong to more farmers' association. Membership to farmers' association increases farmers access to technology information and credit which could allow them gain access to greater economic opportunities and enhance their technology adoption capability (Ijioma and Osondu, 2013). According to Ijioma and Osondu (2015) membership to farmers association improves a farmer's social capital and collective endeavour allows for better adoption of innovations, inputs supply, extension support, credit facilities, processing and marketing facilities. The result compares favourably with finding of Babalola and Olayemi (2013) among farmers in Ogun State, Nigeria.

Constraints to Use of Land Management Practices by the Small Scale Farmers

Distribution of the small scale farmers according to constraints to use of land management practices is shown in Table 5.

Table 5: Constraints to small scale farmers' use of land management practices

Constraints	*Frequency	Percentage
High cost of labour	138	38.3
Low educational level	93	25.8
High cost of some land management practices	141	39.2
Inadequate extension service	156	48.8
Inadequate credit access	219	60.8
Land tenure	207	57.5
Low farm produce price	201	55.8
Low participation in government land management programmes	98	30.6
Poor government policies	69	19.2
Inadequate knowledge of land management practices	234	65.0
Inadequate capital	261	72.5

*Source: Field survey data, 2017 * Multiple responses recorded; n= 360*

As shown in Table5 inadequate capital, inadequate knowledge of land management practices and inadequate credit access were identified by72.5%, 65.0% and 60.8% of the farmers respectively as constraints to their use of land management practices. Inadequate knowledge of land management practices may be as a result of the poor level of extension contact earlier reported. According to Liniger *et al. (*2011) lack of information and knowledge is one of the major obstacles to reducing land degradation, improving agricultural productivity and facilitating the uptake of sustainable land management (SLM) practices among farmers. Furthermore, even when farmers are aware of available land management practices, they are financially incapacitated to use them, due to inadequate capital and credit access. Meanwhile, 57.5% and 55.8% of the small scale farmers reported being constrained by land tenure and poor farm produce price. According to Tsue *et al.* (2014) farmers are not willing to make necessary investments in land management practices from which they may not be able to reap future benefits. This finding lends credence to Food and Agriculture Organization (2011) assertion that insecure land tenure may underlie land degradation by hampering farmers' incentives to invest in sustainable land management practices. The problem of low farm produce price results to low farm income and inability of farmers to invest properly in

land management. Other problems as reported by the farmers are inadequate extension service (48.8%),high cost of some land management practices (39.2%), high cost of labour(38.3%), low participation in government land management programmes (30.6%), low educational level (25.8%) and poor government policies (19.2%).

CONCLUSION AND RECOMMENDATIONS

From findings of the study it is adduced that although some farmers used various land management practices that are good for sustainable agricultural production, many farmers in the area were not managing land adequately and hence fell into environmentally unfriendly and environmentally damaging categories. Also, educational level, farming experience, extension contact, farm size and membership of farmers' association were significant determinants of rate of use of land management practices by small scale farmers.

There is need for the federal and state governments to make policies aimed at increasing the linkage between extension workers and small scale farmers in the area. This will help to enhance the farmers' use and knowledge of the benefits of land management practices. Also, agriculture should be accorded more priority in youth empowerment schemes of the state governments. This is with a view to encourage the youth to take better interest in agricultural food crops production using sustainable land management practices. Farmers should make concerted efforts to avail themselves of training opportunities on appropriate use of available land management practices. Such training programmes should be used as a springboard for updating the knowledge of experienced farmers on appropriate land management practices for their cropping systems. Farmers should be encouraged and educated by extension workers to belong to cooperative associations so as to enjoy the numerous benefits emanating from being members of agricultural association. Policies should be made by the state governments that would specifically improve farmers' access to credit and training in land management practices. Farmers need to be sensitized on the importance and effect of using land management practices measures. To this effect, seminars on use of land management practices should be held in designated venues in all communities in Southeast Nigeria. Attempts should be made to motivate farmers to attend in mass. There is need for further studies to be carried out to examine the costs of land degradation and the benefits and costs of use of sustainable land management in Nigeria in general and Southeast Nigeria in particular.

ACKNOWLEDGEMENT

I am grateful to Prof. C.I. Ezeh, Prof. C.O. Emerole and Prof. J.C. Ijioma for mentoring and making me part of their research team and to staff of Agricultural Development Programme in Anambra, Ebonyi and Imo States for helping to generate data for this project.

REFERENCES

Abd-Ella, M., Eric, O.H., and Warren, R.D. (1981). Adoption behavior in family farm systems: An Iowa study. *Journal of Rural Sociology,* 46(1), 42-61.

Abdulazeez, M. L., Omotesho, K. F., Adekola, O. F. and Adekunle, D. (2014). Assessment of Land Management Practices in Food Crops Production among Small Scale Farmers in Kwara State, Nigeria. *International Journal of Agricultural Management and*

Development, 4(2), 105-116.

Ajani E.N, Mgbenka R. N. and Onah O. (2015). Empowerment of Youths in Rural Areas through Agricultural Development Programmes: Implications for Poverty Reduction in Nigeria. *Journal of Research in Agriculture and Forestry*, 2(2), 34-41.

Akinnagbe, O. M and Umukoro, E. (2011).Farmers' Perception of the Effects of Land Degradation on Agricultural Activities in Ethiope East Local Government Area of Delta State, Nigeria. *Agriculturae Conspectus Scientificus*, 76(2), 135-141.

Amao J.O., Ayantoye K. and Aluko A.M. (2013). Land Degradation, Soil Conservation and Poverty Status of Farmers in Osun State, Nigeria. *International Journal of Science, Environment and Technology,* 2 (6), 1205-1231.

Amsalu, A. and de Graaff, J. (2007), Determinants of adoption and continued use of stone terraces for soil and water conservation in an Ethiopian highland watershed. *Ecological Economics,* 6: 294-302.

Awoyinka, Y.A., Akinwumi, J.A., Okoruwa, V.O. and Oni, O.A. (2009). Effects of Livelihood Strategies and Sustainable Land Management Practices on Food Crop Production Efficiency in South-West Nigeria. *Agricultural Journal,* 4(3), 135-143.

Ayalew, D., Dercon, S. and Gautam, M. (2005). Land tenure insecurity and investment in Ethiopian agriculture: Evidence from panel data. Mimeo.

Babalola D. A. and Olayemi, J. K. (2013). Determinants of Farmers' Preference for Sustainable Land Management Practices for Maize and Cassava Production in OgunState, Nigeria. Invited paper presented at the 4th InternationalConference of the African Association of Agricultural Economists, September22-25, 2013, Hammamet, Tunisia.

Badru, E.C. (2002). Adoption of Modern Agricultural Production Technologies by Farm Households in Ghana: What Factors influence their Decisions? *Journal of Biology, Agriculture and Healthcare,* 2(3), 8-9.

Bekele, W. and Drake, L. (2003). Soil and water conservation decision behavior of subsistence farmers in the Eastern Highlands of Ethiopia: a case study of the Hunde-Lafto area. *Ecological Economics,* 46: 437-451.

Breyer, J., Larsen, D and Acen, J. (1997). Land Use Cover Change in South West Uganda: International Centre for Research in Agroforestry.

Brown, L. R.and Wolf, E.C. (2005).Reversing Africa decline. World Watch Courier (June) Environmental and Development No 87.

Clay, D., Reardon, T. and Kangasniemi, J. (1998). Sustainable intensification in the highland tropics: Rwandan Farmers' Investments in Land Conservation and Soil Fertility. *Economic Development and Cultural Change*, 45 (2), 351-378.

Dankyang, Y. (2014). Risk sources and management strategies of small scale farmers in Kaduna State, Nigeria. Unpublished M.Tech thesis. Department of Agricultural Economics, Federal University of Technology, Minna.10-37.

Deininger K., Jin, S. and Adenew, B. (2003). Market and non-Market transfers of land in Ethiopia: Implications for Efficiency, Equity, and Non-Farm Development. World Bank Policy Research Working Paper 2992. World Bank, Washington, DC.

Demeke, A.B. (2003). Factors influencing the adoption of soil conservation practices in Northwestern Ethiopia. Discussion Paper 37. Institute of Rural Development, University of Goettingen.

Demeke, A.B. (2003). Factors influencing the adoption of soil conservation practices in Northwestern Ethiopia. Discussion Paper 37. Institute of Rural Development, University of Goettingen.

Doss, C.R. (2006), Analyzing technology adoption using micro-studies: Limitations, challenges, and opportunities for improvement. *Agricultural Economics,* 34: 207–219.

Ebukiba, E. (2010). Economic analysis of cassava production farming in Akwa Ibom State. *Agriculture and Biology Journal of North America* 1(4), 612-614.

Fakoya, E.O. (2000). Farmers use of sustainable Land Management Practices in Oyo State. Ph.D Thesis. Department of Agricultural Extension and Rural Development.University of Ibadan.Pp 20-24.

Fakoya, E.O., Banmeke,T.O.A., Ashimolowo, O.R. and Fapojuwo, O.E. (2010). Cassava Production and Poverty Eradication among Crop Farmers in Ondo State, Nigeria. *International Journal of Sustainable Development,* 2 (5), 67-72.

Food and Agriculture Organization (2009).Country support tool for scaling up sustainable land management in Sub-Saharan Africa. Food and Agriculture Organization of the United Nations, Rome, Italy.

Food and Agriculture Organization (2011). Sustainable Land Management in Practice Guidelines and Best Practices for Sub-Saharan Africa. Food and Agriculture Organization of the United Nations, Rome, 2011.

Global Environmental Facility (2003). Operational Program 15 on Sustainable Land Management.

Grisley, W. and D. Mwesigwa. (1995), Socio- economic determinants of seasonal fallowing: smallholders in SouthWestern Uganda. *Journal of Environmental Management,* 42: 81-89.

Hagos, F. (2003). Poverty, institutions, peasant behavior, and conservation investment in Northern Ethiopia. PhD thesis No. 2003:2. Department of Economics and Social Sciences, Agricultural University of Norway, As.

Hagos, F. (2003). Poverty, institutions, peasant behaviour, and conservation investment in Northern Ethiopia. PhD thesis No. 2003:2. Department of Economics and Social Sciences, Agricultural University of Norway.

Henri-Ukoha, A. (2011). Determinants of Loan Acquisition from the Financial Institutions by Small Scale farmers in Ohafia Agricultural Zone of Abia State, South East Nigeria. *Journal of Development and Agricultural Economics*, 3 (2), 69 – 74.

Ijioma, J. C and Osondu, C.K (2013). Adoption of Improved Rice Varieties in Bende Local Government Area of Abia State, Nigeria. *Journal of Agriculture, Forestry and the Social Sciences*, 11 (2), 204 - 215.

Ijioma, J. C. and Osondu, C. K. (2015). Social capital participation levels and determinants among farm households in Enugu State, Nigeria. *Mycopath,Institute of Agricultural Sciences, University of Punjab, Pakistan,* 13(1), 43 49.

Liniger, H. P., Studer, R. M., Hauert, C., and Gurtner, M. (2011). Sustainable Land Management in Practice–Guidelines and Best Practices for Sub-Saharan Africa. TerrAfrica, World overview of conservation approaches and technologies (WOCAT) and food and agriculture organization of the United Nations (FAO).

Maiangwa, M.G., Ogunbile, A.O., Olukosi, J.O. and Atala, T.K. (2007). Land Degradation: Theory and Evidence from the North-West Zone of Nigeria. *Journal of Applied Sciences,* 7 (6), 785-795.

Marshall, G.R. (2004). From words to deeds: Enforcing Farmers' Conservation Cost-sharing Commitments. *Journal of Rural Studies,* 20: 157-167.

Mulat, D., Ali, S., and Jayne, T. (1997). Promoting fertilizer use in ethiopia: The implications of improving grain market performance, input market efficiency, and farm management. Working Paper 5, Grain Market Research Project, Ministry of Economic Development and Cooperation, Addis Ababa.

National Population Commission (NPC, 2007). Details of the breakdown of the National and State Provincial Population Totals 2006 Census. Federal Republic of Nigeria Official Gazzette, 94(24), 1-26.

Nkonya E. (2002). Soil conservation practices and non-agricultural Land use in the south western

highlands of Uganda. A Contribution to the Strategic Criteria for Rural Investments in Productivity (SCRIP) Program of the USAID Uganda Mission. The International Food Policy Research Institute (IFPRI).

Nwajiuba, C.U. and Onyeneke, R. (2010). Effects of climate on the agriculture of sub-Saharan Africa: Lessons from Southeast Rainforest Zone of Nigeria Paper presented at Oxford Business and Economics Conference Program. St. Hugh's College, Oxford University, Oxford, U.K.

Nwaru, J.C (2001). Stimulating Entrepreneurship in Nigerian Farms through Sustainable Agricultural Extension system, Privatization and commercialization of Agricultural Extension Service delivery in Nigeria, Problems and prospects.7th Annual Conference of the Agricultural Society of Nigeria. Pp 19-27.

Ogbe, S. E. (2009). Determinants of microcredit and microfinance outreach to farmers in Abia State; a case study of National Special Programme on Food Security.MSc Thesis, Department of Agricultural Economics, Michael Okpara University of Agriculture, Umudike.pp. 51.

Okoye, C. (1998). Comparative analysis of factors in the adoption of traditional and recommended soil erosion control practices in Nigeria. *Soil and Tillage Research,* 45: 251-263.

Okunade, E.O. (2006). Factors influencing adoption of improved farm practices among women farmers in Osun State. *Journal of Human Ecology,* 19 (1), 45-49.

Olorunsanya, E.O. (2009). Gender of Household Heads and Relative Poverty among Rural Farming Household in Kwara State. PhD Thesis. Department of Agricultural Economics and Farm Management, University of Illorin, Nigeria.

Olson, J. M. (1996). Initial Results Concerning the Use of Fallow in Kabale District, Uganda. Nairobi: International Centre for Research in Agroforestry.

Omojola, J.T. (2014). Economic efficiency and profitability of yam production in Southwest Nigeria. Ph.D Thesis, Anambra state University, Igbariam campus, Nigeria.

Osondu, C. K. and Ibezim, G.M.C. (2015). Awareness and Perception of Farmers to the Use of Information and Communication Technologies (ICTs) in Agricultural Extension Service Delivery: A Case Study of Imo State, Nigeria.*International Journal of Agriculture Innovations and Research,* 4 (1), 55-60.

Osondu, C. K., Ogbonna, S. I. and Emerole, C. O. (2015). Level and Determinants of Women Farmers Access to Informal Credit in Abia State, Nigeria. *Asian Journal of Agricultural Extension, Economics and Sociology,* 7(1), 1-10.

Osondu, C.K. (2014). Performance of Informal Micro-financing on Poverty of Women farmers in Abia State, Nigeria. M.Sc. Dissertation, Department of Agricultural Economics and

Extension Abia State University Uturu.

Osondu, C.K., Ezeh C.I., Emerole C.O and Anyiro C.O. (2014). Comparative analysis of technical efficiency of small holder Fadama II and Fadama III cassava farmers in Imo State. *Nigeria Journal of Rural Extension and Development*, University of Ibadan, Nigeria. 8(1), 26-37.

Oyekale, A.S. (2008): Land Degradation, Soil conservation Practices and Poverty incidence in South Western Nigeria. *Agricultural Journal,* 3 (6), 482 -487.

Pender, J. and Gebremedhin, B. (2004). Impacts of policies and technologies in dry land agriculture: Evidence from Northern Ethiopia In S.C. Rao (ed.), Challenges and Strategies for Dryland Agriculture. American Society of Agronomy (ASA) and Crop Science Society of America (CSSA) Special Publication 32. Madison: ASA and CSSA.

Pender, J., Gebremedhin, B. and Haile, M. (2003). Livelihood strategies and land management practices in the highlands of tigray, presented at the conference on policies for sustainable land management in the East African Highlands, April 24-26, 2002, United Nations Economic Commission for Africa, Addis Ababa (revised). International Food Policy Research Institute (IFPRI), Washington, DC.

Raufu, M.O. (2010). Pattern of land use among selected crop farmers in Osun State. *Research Journals of Soil and Water management,* 1(1), 1-4.

Raufu, M.O. and Adetunji M.O. (2012). Determinant of Land Management Practices among Crop Farmers in South-Western Nigeria. *Global Journal of Science Frontier Research Agriculture and Biology,* 12 (1), 8-14.

Rezvanfar, A., Samlee, A. and Faham, E. (2009). Analysis of factors affecting adoption of sustainable soil conservation practices among wheat growers. *World Applied Sciences Journal,* 6 (5), 644-651.

Salasya, B., Mwangi, W., Mwabu, D. and Diallo, A. (2007). Factors influencing adoption of stress tolerant maize hybrid (WH 502) in western Kenya. *African Journal of Agricultural Research,* 2(10), 544-551.

Senjobi, B.A. And Ogunkunle O.A. (2010).Effect of Land Use on Soil Degradation and Soil Productivity Decline on Alfisols and Ultisols in Ogun State in South Western, Nigeria. *Agriculturae Conspectus Scientificus*, 75 (1), 9-19.

Shiferaw, B., and Holden, S.T. (1998). Resource degradation and adoption of land conservation Technologies in the Ethiopian Highlands: A Case Study in Andit Tid, North Shewa. *Agricultural Economics,* 18: 233-247.

Simon, B.P., Ndaghu, A.A., Yohanna, I. (2013). Awareness of sustainable agricultural land management practices among crop farmers in northern part of Taraba State, Nigeria. *Journal of Science and Technology*, 3(5), 557-560.

Subair, K. (2009). Environment–Productivity Relationship in the South West Nigeria's Agriculture. *International Journal of Environmental Affairs*, 27(1), 75 – 84.

Teklewold, H. (2004). Risk and time preferences on soil conservation decision in the central Ethiopian Highlands of Ethiopia. M.Sc thesis. Addis Ababa University.

Tenge, A. J., De Graaff, J. and Hella, J. P. (2004). Social and Economic Factors Affecting the Adoption of Soil and Water Conservation in West Usambara Highlands, Tanzania. *Land Degradation and Development,* 15: 99–114.

Titilola, S.O. and Jeje, L.K. (2008). Environmental Degradation and its Implications for Agricultural and Rural Development: The Issue of Land Erosion. *Journal of Sustainable Development in Africa,* 10 (2), 116-146.

Tsue, P.T., Nweze, N.J. and Okoye, C.U. (2014). Effects of Arable Land Tenure and Use on Environmental Sustainability in North-Central Nigeria. *Journal of Agriculture and Sustainability,* 6 (1), 14-38.

Urama, J.C. (2005). Land Use Intensification Environmental Degradation: Empirical Evidence from Irrigated and Rain-fed Farms in South Eastern Nigeria. *Journal of Environmental Management,* 75:199-217

Yila, O. M. and Thapa, G. B. (2008). Adoption of agricultural land management technologies by smallholder farmers in the Jos Plateau, Nigeria. *International Journal of Agricultural Sustainability* 6(4), 277–288.

Zulu, M., Wamulume, M. and Mugisha, J. (2011). Socio-Economic Analysis of Land Management Practices in the Agricultural Highlands of Uganda: A Case of Kabale Highlands. *Research Report Series,* I (5), 5-22.

ASSESSMENT OF CASSAVA PRODUCTION AMONG CO-OPERATIVE AND NON CO-OPERATIVE FARMERS IN ISOKO SOUTH LOCAL GOVERNMENT AREA, DELTA STATE.

Tibi, K.N. and Nwadiolu, R.
Delta State Polytechnic Ozoro
Email: tkentus@gmail.com

ABSTRACT

This study was carried out to assess cassava production among co-operative and non-co-operative farmers in Isoko South Local Government Area, Delta State. Data for the study were obtained from random sampling of fifty (50) co-operative farmers and 50 non-cooperative farmers giving a total of 100 farmers for the study. Data were analyzed using descriptive statistic such as frequency, percentage, and means. Chi-square analysis was used to test the hypothesis. The findings from the study showed that majority of the co-operative and non cooperative farmers were females with an average age of 42 years. Among the cooperative farmers 16 % were found to be single, 86% were married while the non-cooperative farmers, 30% were single and 70% were married. The study also showed that the level of education for the cooperative farmers (60%) was higher than the non cooperative farmers The study further showed that the co-operative farmers have more access to farm inputs than the non-co-operative farmers. The mean output of cassava production for cooperative farmers was about 8.6 tonnes while that of the non cooperative farmers was about 5.3 tonnes. The test of hypothesis with the Chi-square analysis at 0.05 significant levels revealed that the cooperative farmers have statistically significant higher output and income than the non cooperative farmers. It is therefore recommended that farmers should join cooperative societies in order to have access to farm inputs which will enable them increase their output and income.

Keywords: Cassava Co-operative Production Farm Inputs Outputs

INTRODUCTION

International Cooperative Alliance (ICA) defines cooperative as an autonomous association of persons unified voluntarily to meet their common economic, social and culture needs through a jointly – owned and democratically controlled enterprise. It is a business voluntarily owned and control by its member patrons for them and by them on a non-profit basis. Co-operative business may be owned by consumers, employers or government and non-profit organizations.

Arua (2004) viewed co-operative as an important tool of improving the living condition of farmers. According to him co-operatives are specially seen as significant tools for the creation of jobs and for the mobilization of resources for income generation. Levi (2005) asserted that cooperatives employed more than 100 million men and women worldwide. In Nigeria cooperative provide locally needed service, employment and input to firmer, cooperative also provide opportunities to farmers to organize themselves into group for the purpose of providing service which will facilitate output of members. According to Nweze (2002) cooperative societies serve as avenues for input distribution. Through their nation-wide structure, they have developed strong and reliable arrangement for the distribution of foods crops, fertilizers, agro-chemicals, credit, seeds, and seedlings. Recently, the co-operative option comes into focus as a viable way to effectively mobilize farmers groups and pool resources so as to become more effective in agricultural production (Agenyou, 2014).

A major constraint of agricultural development in Nigeria is low access to credit from the financial institution such as banks for farm operation and this has resulted to the need for co-operative societies to access loan for farmers. Onje (2004) stated that co-operative society is a form of organization arrangement which foster co-operation in economic activities such as production market and distribution with a view to enhancing mutual and promoting the economic interest and welfare of participating member, co-operative societies in Nigeria help in providing credit facilities to members and non-member at different interest rate and assist in providing mutual aim.

The drive for loan and credit by farmer in our societies in enhancing agricultural productivity is to eradicate poverty in all ramifications and improving the standard of living of the people. The much needed assistance by farmer has not been seen from government and banks in particular due to the farmer's low asset and lack of collateral. This has constituted a clogged in the wheel of progress in agricultural development in the area.

It is therefore very clear that task of delivering financial service to the rural farmer cannot be left entirely to the government and banks. It is therefore important to encourage co-operation among the people and then promote linkage of their group to the banks. The important role of the group leader(s) cannot be overemphasized. If the leadership is weak and un-coordinated, it will affect the general wellbeing of the societies.

The following specific objectives were achieved: described the socio-economic characteristics of respondents in the study area; determined the output and income of cassava production in the study area and determined the availability of farm inputs to farmers in the study area.

Hypothesis

Ho 1: There is no significant difference in the output of cassava production for co-operative and non-cooperative farming in Isoko South Local Government Area.

Ho 2: There is no significant difference in the income of cassava production for co-operative and non-cooperative farming in Isoko South Local Government

MATERIALS AND METHODS

The study was carried out in Isoko South Government Area; the study area is one of the twenty five Local Government Area created in August 1991. Delta State is located on Southern Nigeria. Isoko South Local Government Area is one of the 25 Local Government Areas in Delta State. Isoko South LGA has its headquarters at Oleh and is one of the major oil producing areas of the state (Aku, 1995). The area is located between latitude 60 51'N to 60 161'N and longitude 60 71'E to 60 121'E.

The target population of the study comprised mainly of co-operative farmers and non-co-operative farmers in Isoko South Local Government Area, Delta State.,Ten communities; Oleh, Irri, Emede, Aviara, Uzere, Olomoro, Umeh, Idheze, Igbide, and Enhwe were randomly selected from the study area. Two co-operative groups were randomly selected from each of the ten communities. Then a random sampling technique was used to select five farmers from each of the 10 cooperatives. Also a random sampling of five non-co-operative farmers selected from each of the ten communities. This gave 50 co-operative farmers and 50 non-co-operative farmers in the study area.

Data for the study were collected from both primary and secondary sources. The primary source was through structure questionnaires. The questionnaires were given to literate farmer both co-operative and non-co-operative. For farmer with non-farmer education, the oral interviewer was

administered by the researcher. The secondary sources was the use of literatures from journals, newspapers, and text books.

Data were analyzed using descriptive statistic such as sample percentage and frequency distribution table. The test of hypotheses was conducted with Chi-square analysis, which is given as;

$$X^2 = \frac{(Oi - Ei^2)}{Ei} \quad \text{.....eqtn 1}$$

Where

X^2 = Chi –square
Oi = Observe value
Ei = Expected value

RESULTS AND DISCUSSION

Socioeconomic characteristics of the farmers.

The distribution of the farmers according to their socioeconomic characteristics is presented in Table 1 below.

Table 1: Distribution of Respondents' Socio-Economic Characteristics

	Co-operative farmers		**Non-cooperative farmers**	
	Frequency	**%**	**Frequency**	**%**
Sex				
Male	20	40	18	36
Female	30	60	32	64
Age in yrs				
21-30	4	8	6	12
31-40	16	32	16	32
41-50	20	40	16	32
51-60	4	8	10	20
61 and above	6	12	2	4
Marital status				
Single	8	16	15	30
Married	42	84	35	70
Educational level				
FSLS	10	20	20	20
SSCE/WAEC/GCE	10	20	15	20
ND/NCE	15	25	7	25
HND/B.SC	15	45	8	35
TOTAL	50	100	50	100

Source: Field survey, 2016

Table 1 indicates that females constitute 60% of cooperative farmers while the males' cooperative farmers were 40%. However, for the non cooperative farmers, the females constituted

64% while the males were 36%. This result implies that the number of females involve in cooperative societies are more than the males in the study area.

The study also showed that out of the 50 cooperative farmers surveyed, 8% were within the age of 21-30, 32% were found to be within the age of 31-40 years, 40% were within the age of 41-50 years and 12% were within the age of 61and above years; while among the non-cooperative farmers 12% were within the age of 21-30 years, 32% were between 31-40 and 41-50 years of age, 20% were within the age of 51-60 years and 4% within the age of 61and above.

The study further showed that out of 50 cooperative farmers 16% were found to be single, 86% were married; while from 50 non-cooperative farmers, 30% were single and 70% were married. Since 85% of the cooperative farmers were married and 75% of non-cooperative farmers were also married, it shows that majority of the farmers are married and as such have little or no problem in their farm labour due to family size.

The result of the study also shows that among the cooperative farmers, 20% had primary school certificate, 20% had secondary school certificate while 60% had tertiary qualification. In the case of the non-cooperative farmers, 40% had primary and secondary school certificate respectively and 10% had tertiary education. This shows that there is high level of education among the cooperative farmers than the non-cooperative farmers.

Table 2: Distribution of respondents according to access to farm inputs

	Co-operative farmers		**Non Cooperative farmers**	
Types of inputs	**Frequency**	**%**	**Frequency**	**%**
Fertilizer	18	36	10	20
Improve seedlings/cuttings	18	36	5	10
Herbicides and chemicals	14	28	12	24
No access to improve farm inputs	-	-	23	46
TOTAL	50	100	50	100

Source: Field survey, 2016

Table 2 shows that out of the 50 cooperative farmers, 36% had access to fertilizer, 36% had access to improve seedlings and 28% also had access to herbicides and chemicals while from the non-cooperative farmers, 20% had access to fertilizer, 10% had access to improve seedlings, 24% had access to chemical and 46% had no access to improved farm inputs. Hence, it means that cooperative farmers have more access to farm inputs than non-cooperative farmers.

Table 3: Distribution of respondents according to the output of cassava

Output (tons)	**Co-operative farmers**		**Non-cooperative farmers**	
	Frequency	**%**	**Frequency**	**%**
< 2	5	10	17	34
	7	14	15	30
2.5- 5	15	30	13	26
	13	26	5	10
5.5-10	5	10	-	
10.5-15				
15.5-20				
Total	50	100	50	100

Source: Field survey 2016

From Table 3 the mean output of cassava production for cooperative farmers was about 8.6 tonnes while that of the non cooperative farmers was about 5.3 tonnes. This result shows that the output of cassava production for cooperative farmers is higher than the non co-operative farmers.

Table 4: Distribution of respondents according to income obtained per annum

Income	**Co-operative farmers**		**Non-cooperative farmers**	
	Frequency	**%**	**Frequency**	**%**
< 100,000	5	10	17	34
	7	14	15	30
110,000-200,000	8	16	13	26
	20	40	5	10
210,000-300,000	5	10	-	-
310,000-400,000	5	10	-	-
410,000-500,000				
Above 500,000				

Source: Field survey, 2016

From Table 4 above it shows that out of the 50 cooperative farmers studied, 60% of them has their income per annum ranging from N310,000 to above N500,000 and the other 40% had N300,000 and below while for none cooperative farmers only 10% of them had their income between N310,000 to N 400,000 and the remaining 90% of them had N300,000 and below.
Therefore, this implies that, the output and income of the co-operative farmers is higher than the non-cooperative farmers.

Table 5: Test of the mean differences in output and income between cooperative and non co-operative farmers

Variable	Co-operative farmers	Non co-operative farmers	Mean difference	Chi-square test
Output (kg)	140.23	128.47	11.76	4.12***
	(10.40)	(9.73)	(0.67)	
Income value (N)	71.480	69.860	1.623	1.38
	(2170.24)	(631.70)	(1.538)	

Source: Field survey 2016

Note: figures in parentheses are the standard errors.

*** Significant at 5% level.

The results from Table 5 above reveal that the cooperative farmers have statistically significant higher output and income than the non-cooperative Farmers.

CONCLUSION

Since the cooperative farmers have higher output and income than the non cooperative farmers they should be encouraged to join cooperatives in order to increases their chance of getting more access to farm inputs as well as loan which will enable them to increase their farm output and income. The task of delivering financial service to the rural farmer cannot be left entirely to the government and banks, it is therefore important to encourage co-operation among the people and then promote linkage of their group to the government and banks .

RECOMMENDATIONS

1 .Cooperative farming should be encouraged so that farmers output and income can be increased

2 Farmers should join cooperative societies so that each individual farmer can have more access to farm inputs for agricultural production.

3. Since a reasonable number of cooperative members are illiterate, effort must be made to design a training programme for members to upgrade their educational level to enable them read and write and also to adopt new innovations in agriculture

REFERENCES

Agenyour, I.Y. (2014). Farmers co-operative and agriculture development in Kwali Area Council Federal Capital Territory Abuja.

Arua, E.O. (2004). Comparative co-operative system. Unpublished departmental Mimeograph. Department of Agriculture Economics, University of Nigeria, Nsukka.

Chibedelu, S.A.N.D. (1986). Diffusion of co-operative Mode of Production Small Holder Farmers of Nigeria “in Okoro Okereke (ed). Co-operative and The Nigeria

Levi, Y. (2005). A cooperative perspective, Ireland: International Co-operative Research Instituted.

Nweze, N.J. (2002). Rural Development in Nigeria: Past approaches, emerging Issues and strategies for the future. *Nigeria Journal of co-operative Studies.* 2(1), 73-89.

Onje, S,O. (2003). *Introduction to co-operatives Studies.* Lokoja: Howard Publishers. Pp 68.

Onouha, E. (2002). A critique of the drafts of co-operative policy for Nigeria. *Nigeria Journal of co-operative Studies*, 2(1), 10-17.

DETERMINING REPRODUCTIVE EFFICIENCY, USING FRUIT PRODUCTION RELATIONSHIPS AMONGST FLORAL PARAMETERS OF *IRVINGIA GABONENSIS* IN TWO SITES OF SOUTHERN NIGERIA

Gloria Chinwe Ujor

Nigerian Environmental Study Action Team (NEST), Ibadan, Oyo State
gloriacujor@gmail.com

ABSTRACT

Native or indigenous tree crops of Nigeria have been seen to transcend from providing complementary dietary nutrients for communities living in their vicinities, to becoming commodities of fruit security across urban areas, national and international markets. The popularity of these species has increased due to proven facts of having needed nutrients to improve the nutrition levels of the populace, implying that they should be reckoned with in food security and food policy drives. The reproductive efficiency of Irvingia gabonensis, which is one of such indigenous tree species was investigated in two different geographic locations in Nigeria. Simple description statistics of mean and frequency tables were initially used to examine the relationships of different flowering parameters of I. gabonensis. Simple and multiple regression analyses models were then applied mainly to define the discrepancies observed in the mean values amongst the floral parameters during initial fruit production (fruit set after flower drop). From the results, site difference was not found to be significant at the level of 5% probability. Incipient fruiting efficiency average value of 37.27% for the two sites showed that harvesting of I. gabonensis fruits, can be reckoned with while planning for food security and food policy drives which will involve indigenous food sources, in Nigeria.

Keywords: Fruiting efficiency, indigenous fruit crops, regression analysis, nutrition, food security.

INTRODUCTION

To address food security and food policy drives in Nigeria, various sources of nutritive foods should be harnessed. This is because the forest resource of the country, is replete with valuable species which provide and has been providing complementary and main sources of food and nutrients of the local population in particular. Furthermore it is observed in the International Food Policy Research Institute (IFPRI) report of 2016, that the global food policy drives have been exploring how the global food system can best contribute to further reductions in hunger, malnutrition and poverty generally. It is also reported that tropical fruit trees constitute important biological resources in the global agro-biodiversity context, pointing to the fact that in Africa about 1,200 species have been identified in comparison with 1,000 species in the Americas and 500 species in Asia, Awodoyin, Olubode, Ogbu, Balogun, Nwawuisi and Orji (2015). In addition, Ouya (2013) reported that an attribute of the indigenous fruit trees is that they produce even when staple crops fail (eg. during drought) etc., and in this way they bridge the 'hunger gap' during times of food shortage.

Investigating the extent of derivable nutrients from these local sources especially in terms of the number of fruits to be expected from particular tree sources in a season or seasons is important. This should be reckoned with in planning for availability of both food and nutrients as contribution to the developmental programmes for food security and policy drives both in the urban and rural areas of Nigeria. Reports abound of both hunger and malnutrition cases in Nigeria. Thus where there is food, it is consumed without savouring the opportunities offered by both domestic and wild sources for nutrients, as highlighted in IFPRI (2017). Also highlighted was the alarming revelation of malnutrition cases in Nigeria, and stressing the importance that less recognized or non-conventional

agricultural food crops be programmed into the current food value chains development on-going in the Ministry of Agriculture.

This study follows suit by indicating that more interest be shown in exploring the indigenous tree species as well as their further multiplication, with a view to ensuring that their products contribute accordingly to the food value chain program of the nation's Ministry of Agriculture.

Irvingia gabonensis (Aubrey Lecompte Ex O'Rorke Baill.), the object of this study, is an indigenous fruit tree of West and Central Africa, and is one of such species. It is reported to have about 20 economic values, (Okpala, 2016). These include edible, medicinal, nutritional, livestock fodder and environmental (erosion control) values. *I. gabonensis* is also reported to be ranked as an indigenous species with 'Lower Risk' (near threatened) in Nigeria (Brown 2013). The economic potentials of this indigenous food/fruit tree have been in discourse since the 1970s, and attention was increased when the food nutrient value of the seed cotyledon, as was for example earlier reported by Oke and Umoh, (1978), to give 19.2 % carbohydrate, 10.6 % protein and 55 % oil/fat. And up till recently (Ouya,2013), information on the macro-nutrients (protein, carbohydrate and fat) of the indigenous fruit trees, are readily available. In addition, the availability of *I. gabonensis* fresh fruits and cotyledons in local markets, and the cotyledons mainly in international markets, has opened wider the need to continue to assess some of its potentials. Recent survey, (fourth of March 2018), of a local market in Karu, about 10 kilometres to Abuja showed that about 20 half cotyledons sold for N160.00 (about one half United States dollars), thus x-raying the economic potentials of *I. gabonensis,* particularly its cotyledon . The edible fruit which is a drupe is consumed as fresh fruit.

This study investigated the initial fruiting efficiency (fruit set after flower drop), of *I. gabonensis* trees, sourced from two sites that show some ecological differences, in southern Nigeria. The analysis threw some insights into the level of fruit production of the species.

MATERIALS AND METHODS

Two sites, Onne and Enugu were selected for this study due to their remarkable ecological differences. Enugu is the capital town of Enugu state, in the south-east geopolitical zone of Nigeria. It lies on lat 6º 32' N and longitude 7º 41' E, and on an altitude of 393 metres above sea level. The mean annual rainfall is 1829 mm (NIMET, 2015), and the soil is ferralitic in nature. The vegetation zone in Enugu is Derived Savanna/Southern Guinea Savanna. Onne is a community lying within the vicinity (about 60 km) of Port Harcourt in Rivers state, in the south- south geopolitical zone of Nigeria. It lies on latitude 4º 79' N and longitude 7º 11' E, at an altitude of about 5 meters above sea level. According to NIMET (2015), the mean annual rainfall is 2479 mm. The soil is sandy loam. Ecologically, the vegetation is Mangrove Swamp.

Trees and Inflorescences Selection

Three trees of flowering *I. gabonensis* were randomly selected in their natural stands per site. This tree selection was based on accessibility to the tree species identified. Other parameters for tree selection included accessibility to inflorescences in the flowering branches and twigs to be monitored.

From the trees selected, inflorescences were also randomly selected and labeled across the lower, middle and upper strata. To aid better assessment, ten inflorescences were chosen per stratum, giving 30 inflorescences per tree. The services of tree climbers were used to get to the strata in most cases.

For each inflorescence, the length of the inflorescence axis, the number of flowers and the number of fruits produced were measured and recorded.

Determination of the Fruiting Efficiency of *Irvingia gabonensis*

To examine the fruiting efficiency of *I. gabonensis*, frequency tables were used to show fruit production against class group of flowers per inflorescence class group. This was done for each tree per site. Mean values were also obtained for each site and the sites compared.

Relationship Between the Number of Fruits Produced and Flower Density

The number of flowers produced per inflorescence class group was arranged into four classes of 0-10, 11-20, 21-30 and > 31 for convenience of monitoring. Simple linear regression was used to investigate the relationship between the number of fruits produced under the respective class group of flowers per inflorescence, using the analysis model;

$Y = a + bx,$

where Y is the number of fruits produced, x is the number of flowers per inflorescence, a is constant and b is the coefficient of x.

Relationship between inflorescence characters and fruit production

The parameters compared here were the number of flowers produced and inflorescence length on the one hand, and the number of fruits set on the other, in various combinations. Both multiple and simple regression analyses, using the stepwise option, as described by Cryer and Miller (1991) were applied to study the relationships. Three relationships studied using the parameters of numbers of flowers produced, inflorescence length and the number of fruits set were;

- Fruit production as a function of inflorescence length and number of flowers,
- Fruit production as a function of the length of inflorescence, and
- Fruit production as a function of the number of flowers.
  Since two sites are being considered, there were six analyses in all.

RESULTS AND DISCUSSION

Fruiting Efficiency Estimation in *I. gabonensis* Using Two-Way Frequency Tables in two Sites

The class group of the number of fruits produced per respective group of flowers per inflorescence is shown in Tables 1a and 1b for the two sites respectively.

Table 1a. Proportion of Fruits produced per respective class group of the number of Flowers per inflorescence of *Irvingia gabonensis* for three Trees in Onne

	Number of Flowers per Inflorescence Class Group					
Fruit class group	0-10	11-20	21-30	>31	Total	Proportion

Tree1						
0-5	2	4	2		8	26.87
6-10		7	5		12	40.00
11-15				1	8	26.63
>16				2		6.66
Total	2	11	14	3	30	100
% proportion	6.66	36.66	46.60	10.0	100	
Tree 2						
0-5	5	4	2		11	36.67
6-10		4	6	1	11	36.66
11-15			3	3	6	20.0
>16				2	2	6.67
Total	5	8	11	6	30	100
% proportion	16.67	26.67	36.66	20	100	
Tree 3						
0-5	2	2	2		6	20.00
6-10		8	4	3	15	50.00
11-15			6	1	7	23.33
>16				2	2	6.67
Total	2	10	12	6	30	100
% proportion	6.67	33.33	40.0	20	100	

Source: Field survey

Table 1b. Proportion of Fruits produced per respective class group of the number of Flowers per inflorescence of *Irvingia gabonensis* for three trees in Enugu

	Number of Flowers per Inflorescence Class Group					
Fruit class group	0-10	11-20	21-30	>31	Total	Proportion
Tree1						
0-5						0.00
6-10	6	9			15	50.00
11-15		11	2	1	14	46.67
>16				1	1	3.66
Total	6	20	2	2	30	100
Proportion	20	66.66	6.67	6.67	100	

Tree 2						
0-5		1			1	3.33
6-10	2	4	1		7	23.33
11-15		11	3		14	36.67
>16			5	3	8	26.67
Total	2	16	9	3	30	100
% proportion	6.67	53.33	30	10	100	
Tree3						
0-5	2	5			7	23.33
6-10		9	7		16	53.33
11-15			1	3	4	13.33
>16				3	3	10.0
Total	2	14	8	6	30	100
%proportion	6.67	46.66	26.67	20.0	100	

Source: Field survey

Results from the 3 trees per site showed that the proportion of fruits set in the inflorescence class group of 21-30 were consistently higher in trees 1, 2 and 3, in Onne, while in Enugu, the proportion of fruits set was higher in class group 11-20, though not for all the trees. It can be inferred that the trees at Onne had the tendency to sustain fruit development with higher density of flowers, implying that nutrient sources are available to the trees for optimal growth and development.

Comparison of Means of Fruiting Related parameters of *I. gabonensis* Between Sites

Mean values for the length of inflorescence, number of flowers and the number of fruits set for the 30 inflorescences per tree per site compared between sites are shown in Table 2.

Table 2. Comparison of Means of Fruiting Related Parameters of *I.gabonensis* between two sites

Parameters	Sites	Mean	T-cal(P=0.05)	Remark
Inflorescence length	Enugu	3.24	0.063	NS
	Onne	3.16		
Number of flowers	Enugu	20.3	1.574	NS
	Onne	18.8		
Number of fruits	Enugu	6.8	1.377	NS
	Onne	7.75		

NS= Not significant
Source: Field computation

From Table 2, the comparison of the means of the length of inflorescence, the number of flowers and the number of fruits set/produced, did not show significant difference between the 2 sites studied at 5 % probability. Thus as observed in the frequency distribution of class groups of fruits produced against class groups of number of flowers in Tables 1a and 1b above, discrepancies between the two sites may be due to inherent factors surrounding the trees in the two sites. Already a non-discrepancy

between sites was reported for *Persea americana* (Avocada), which showed mean fruiting efficiency of 0.70 % and 0.79 % respectively for the sites of Ekpoma and Onne, both in the Niger Delta region of Nigeria (Omokhua & Chima, 2009a). From the observations in this study, it could be inferred that the ecological difference recorded between Onne and Enugu has no significant impact on the physiological production processes within the tree species. However Enugu and Onne lie within the greater forest zone which starts from the mangrove/lowland humid forest to the derived savanna/southern guinea savanna ecological zones, to which *I. gabonensis* belong. Further calculation of the percentage fruit set for the two sites from the mean values, gave 33.49 % for Enugu and 41.05 % for Onne. But it appears that this discrepancy in percentage values is also not significant at 5 % probability. And the average value of percentage fruit set (after flower drop) for the two sites from this study is 37.27%.

Fruit Production in *I. gabonensis* in Relation to Flower Density.

The prediction equations based on the regression analyses of the number of fruits produced against respective class group of number of the flowers per inflorescence are shown in Table 3, using 0-10, 11-20, 21-30 and >31 class groups of flowers.

Table 3. Prediction Equation of the Regression Analysis of the Number of Fruits Produced per Respective Class Group of flowers per Inflorescence in the two sites

Site	Classgroup	Prediction Equation	R^2 value
Onne	0-10	y=-4.5+0.916666x	0.217625
	11-20	y=0.397791+0.489831x	0.224524
	21-30	y=-17.7483+1.254993x	0.394441
	>31	y=36.66435-0.50173x	0.169188
Enugu	0-10	y=-0.03293+0.310878x	0.286504
	11-20	y=1.928680+0.239519x	0.88115
	21-30	y=8.026145+0.056488x	0.004210
	>31	y=-1.76622+0.410718x	0.263060

Source: Desk computation

From Table 3, the correlation of fruit production in relation to flower density is most explained in the class group 21-30 for the species in Onne (39%) and in class group 0-10 for the species in Enugu (28%). It could be argued that high flower density give room for greater number of fruits to start developing as in the case for the Onne site, whereas in Enugu (drier environment) the density was not a factor as to the number of fruits initially developed. It is reported that fruit set for some species like *Dacryodes edulis*, which is also an indigenous fruit tree of Nigeria, could be low or very low due to some factors of pollen viability, pollination and fertilization failures, as well as competing sinks for photosynthates during flowering (Omokhua and Koyejo, 2009). Thus other factors apart from the apparent physical site factors could have played roles in the level of fruit emergence after flowering.

Relationship between Inflorescence Characters and Fruit Production

The regression analyses summaries between different flowering parameters during fruit production in *I. gabonensis* are presented in Table 4.

Table 4. Summary of Regression Analyses between different Flowering Parameters and Fruit Production in *Irvingia gabonensis*

Site	Prediction Equation	Correlation coefficient	R^2	Standard error
Fruit production as a function of inflorescence length and number of flowers				
ON	$Y = -3.80358 + 3.59199V_1 + 0.065262V_2$	0.890526	0.793037	1.57868
EN	$Y = -3.75515 + 1.36744V_1 + 0.307664V_2$	0.748465	0.5602	1.41291
Fruit production as a function of inflorescence length				
ON	$Y = -3.78668 + 3.18975V_1$	0.889418	0791064	1.5576
EN	$Y = -2.46175 + 2.85285V_1$	0.726447	0.527725	1.43776
Fruit production as a function of number of flowers				
ON	$Y = -1.8683 + 0.43853V$	0.81059	0.657056	1.99554
EN	$Y = -4.0088 + 0.538498V$	0.733328	0.537769	1.42239

ON = Onne, EN = Enugu

In Table 4, the prediction equations, correlation coefficients, R-square values and the standard errors of the estimates are presented for each regression analysis per location.

In the multiple correlation of fruit production as a function of inflorescence length and number of flowers, the independent variables explained 56% to 79% of the variation in the dependent variables. The higher value for such explanation was for the trees in Onne where the R^2 value is 0.790, while the lower value was for the trees in Enugu with the R^2 value being 0.560. In the simple correlation relationship of fruit production as a function of inflorescence length, the independent variable explained 52.8% to 79% of the variation in the dependent variable. The higher value for such explanation was for the trees in Onne where the R^2 value was 0.791, while the lower value was for the trees in Enugu with R^2 value of 0.527. Regarding fruit production as a function of the number of flowers simple correlation relationship, the independent variables explained 53.7% to 65.7% of the variation in the dependant variables. The higher value for such explanation was for the trees in Onne where the R^2 value was 0.657, while the lower value was for the trees in Enugu with R^2 value of 0.537.

Already in Onne, flower density of 21-30 showed higher explanation of fruits set in Table 3. Positive tendency is therefore observed with respect to initial fruit set in *I. gabonensis* based on the quantity of flowers produced, from the analyses. Other studies in the fruiting efficiency of the indigenous fruit trees show positive tendencies in the fruiting efficiency of the species, though it could be low, as recorded in *Pentaclethra macrophylla* to be 0.061 % and 0.063 % respectively for the sites of Ekpoma and Onne, Omokhua and Chima, 2009b. For *I. gabonensis,* it was already reported that an evaluation of the yield of *I. gabonensis* in traditional and compound farming systems showed the mean fruit yield to be 76,880 per hectare and 105,400 per hectare respectively, Ukoima & Aiyeloja (2012). This result points to the fact that *I. gabonensis* gives a promising fruiting potential which can be reckoned with both for agroforestry development and for food security.

CONCLUSION

From this study, it is observed that the floral parameters of *I. gabonensis* ordinarily showed positive relationships with fruit production. This is a welcome development for a tree species that is expected to contribute its fruit and food values for addressing food security. Furthermore, the regression analyses summaries of the relationships between fruit production on the one hand, and other parameters associated with fruit production in *I. gabonensis*, were positive in all cases of the associations. Since there was no difference between the two sites used in the study, according to the analyses, it was inferred that site specific characteristics, did not play much role in determining the physiological performance of the species with respect to fruit production. It is therefore expected that for any flowering tree of *I. gabonensis*, a level of fruit production is expected. This study further showed that initial fruit set is encouraging and positive in all cases of the associations. This implies that the species has good potential for contributing to food security and wealth creation. Meanwhile, to this study, is recommended that further investigation to the later part of fruiting efficiency can be complementary.

Information from this study has therefore pointed out that *I. gabonensis* should be reckoned with in the food policy and food security programs in Nigeria due to the potential demonstrated in fruit yield.

REFERENCES

Awodoyin, R.O, Olubode,O.S., Ogbu, J.U., Balogun, R.B., Nwawuisi, J.U. and Orji, K.O. (2015). Indigenous Fruit Trees of Tropical Africa: Status, Opportunity for Development and Biodiversity Management. Agricultural Sciences,(6)1, 10 . Article ID:53011, 104236/as.2015.61004.

Brown D. (2013). Medicinal Plants as a Forest Resource. In: E. Okon, D. Brown & A. Isichei (Eds) Nigerian Forests, Protection and Sustainable Development. JABU Environment Symposium Series. Joseph Ayo Babalola University, 2013: 235-249.

Cryer, J.D and Miller, R.B. (1991). Statistics for Business: Data Analysis and Modeling. PWSKENT Publishing Company, Boston pp. 537 – 649.

International Food Policy Research Institute (IFPRI) (2016). 2016 Global Food Policy report. A Synopsis. March 2016.

International Food Policy Research Institute (IFPRI). (2017). The Determinants of Chronic Malnutrition in Northern Nigeria, with a focus on Bauchi and Kebbi States. Feed the Future Nigeria Agricultural Policy Project. Policy event organized by IFPRI. Transcorp Hilton hotel, Abuja, May 2017.

Nigeria Meteorological Agency (NIMET) (2015). Drought and Flood Monitoring Bulletin. Monthly Hydromet Analysis of Standardized Precipitation Index. *Nigeria Meterological Agency,* Abuja. Volume 5, 2015.

Oke, O.L and Umoh, I.B. (1978). Lesser Known Oilseeds: A preliminary note on their nutritive value as determined by *in vitro* digestion. *Ecology of Food and Nutrition*, 4: 87-89 1978.

Okpala B. (2016). 20 key benefits of Ogbono, *Irvingia gabonensis*. Blog publication https//globalfoodbook.com. Culled 12th February 2018.

Omokhua, G.E. and Chima, U.D. (2009a). Fruiting Efficiency of Avocado (*Persea americana* Mill): A Case Study in Ekpoma and Onne, Niger Delta, Nigeria. *Nigerian Journal of Agriculture, Food and Environment* (NJAFE), 5 (2-4), 16-19 2009. njafe.org/currentissue/NJAFESITE. Culled 13th February 2018.

Omokhua, G.E. and Chima, U.D. (2009b). Fruiting Efficiency of *Pentaclethra macrophylla* Benth: A Case Study in Ekpoma and Onne, South-South Nigeria. *African Research Review*, 3(4) 2009. http//dx.doi.org/10431/of rev.v3i4.47559

Omokhua, G.E and Koyejo, A.O. (2009). Fruiting Efficiency in *Dacryodes edulis* (G. Don): A Case Study in Ekopma, South-South, Nigeria. *African Journal of Biotechnology*, 8 (8) (2009). http://www.ajolinfo

Ouya D. (2013). The Little Understood Indigenous African fruit Trees. World Agroforestry Centre. blog.worldagroforestry.org

Ukoima, H.N. and Aiyeloja, A.A. (2012). Fruits and Seeds Production of *Irvingia gabonensis* (O'Rorke) and its Economic Importance in Edo Central, *Nigerian Journal of Agriculture and Social Research* (JASR), (12)1. http//www.researchgate.net/publication1278848637. Culled 15th February 2018.

AWARENESS AND PRACTICES OF ORGANIC FARMING AMONG RURAL FARMERS IN AKINYELE LOCAL GOVERNMENT AREA OF OYO STATE, NIGERIA

A.O. Awoyemi[1]*, M.O. Ajayi[1], G.B Adesiji[1] and A.O Kayode[1]
[1] Department of Agricultural Extension and Rural Development, University of Ilorin
*Corresponding author: awoyemi.oa@unilorin.edu.ng

ABSTRACT

This study examined the awareness and practices of organic farming among rural farmers in Akinyele Local Government Area of Oyo state, Nigeria. The study made use of interview schedule, which was administered to a sample of one hundred and twenty (120) rural farmers. The data collected were subjected to both descriptive (such as percentages, frequency, and means) and inferential statistics such as Pearson Product Moment Correlation (PPMC) and Chi-square. Findings showed that mean age of respondent was 52 years, majority were males (73.3%), married (88.3%) and had primary school education (51.7%). Majority of the respondents were aware of organic farming practices while mixed cropping (MS=3.92) had the highest level of usage. The most used source of information on organic farming practices was radio (75%), other farmers (80.8%), extension agents (65.0%), friends and relatives (70.0%). The major constraint to organic farming practices was lack of financial support (MS=3.83). There was significant relationship between socio economic characteristics of the respondents (such as education (r=0.243, p=0.008), farm size (r=0.204, p=0.051), contact with extension agents (r=0.212, p=0.020) and membership of cooperative (r=0.183, p=0.044) and the usage level of organic farming practices. There was also a significant association between awareness and usage level of practices (such as improved varieties (X^2=41.994, p=0.000), minimum tillage (X^2=27.772, p=0.034) and crop rotation (X^2=44.824, p=0.000). The study concluded a high rate of awareness on organic farming practices but a low level of use of organic farming practices. The study recommends that government should consider granting incentives to the farmers in form of credit; extension agent should work towards increasing the knowledge of the farmers on the importance, benefits, and use of organic farming practices.

Keywords: Awareness, practices, organic farming

INTRODUCTION

Organic farming is a growing trend in agricultural practice, philosophy and business in many parts of the world that has been gaining strength since the 1980s. It is said to be an agricultural system that sustains and enhances health, ecology and fairness in a precautionary and responsible manner (International Federation of Organic Agriculture Movement [IFOAM], 2007). It is a production system whose objective is to sustain agricultural productivity by avoiding or largely excluding synthetic fertilizers and pesticides (Altieri and Nicholls, 2005).

The growing consciousness and awareness about health, safety and environment by consumers, has influenced the consumption of, and demand for, organic products due to the belief that organic products not only satisfy safety and environmental issues, but also have better qualities than conventional products in terms of taste, colour, freshness and nutritive value (Bourn and Prescott 2002). As a result of this increased demand for organic products, organic farming is found to be one of the fastest growing agricultural production systems in the world today, Nigeria inclusive.

In Nigeria, the practice of organic farming in an organized manner is relatively new, with less than fifteen years of practical existence (Abdullahi and Kutama, 2012). As at 2007, Nigeria had 3, 154

hectares under organic agriculture, of which 50 ha were fully converted (Willer and Kilcher, 2009). Practitioners are still few despite the great potential for organic agriculture with major stakeholders like: Dara/ Eurobridge Farm, Organic Agriculture Project in Tertiary Institutions in Nigeria (OAPTIN), Olusegun Obasanjo Centre for Organic Agriculture Research and Development (OOCORD), Nigerian Organic Agriculture Network (NOAN), Organic Farmers Association of Nigeria, Organic Fertilizer Association of Nigeria, World Wide Opportunities on Organic Farms (WWOOF).

The growing demand for organic farming products in the advanced countries paves way for developing economies for potential export market for organic farming products, not to mention the immense health advantage of consuming organically farmed products and the cheaper expense incurred while practicing organic farming unlike inorganic faming.

The main objective of this study was to determine the awareness and practices of organic farming among rural farmers in some selected areas of Akinyele Local government area of Oyo state, Nigeria. Specifically, the study was intended to: describe the socio-economic characteristics of respondents; determine the rate of awareness of organic farming among respondents in the study area; assess the level of usage of organic farming among respondents in study area; determine the sources of information on organic farming available to the farmers in the study area and identify the constraints to organic farming practices among respondents.

Hypotheses of the Study

H_{O1}: there is no significant relationship between socio economic characteristics of rural farmers and their usage level of organic farming practices.

H_{O2}: there is no significant difference between awareness and the usage level of organic farming practices by the farmers in Akinyele local government area of Oyo state, Nigeria.

MATERIALS AND METHODS

This study was carried out in Akinyele Local Government Area (LGA), Oyo State, South-western Nigeria. Akinyele LGA is a predominantly agricultural, which is located between geographical coordinates of latitudes range 7° 29´N to 7° 40´N and longitude range 3° 45´ to 4° 04´. It is bordered in the north by Afijio Local Government Area, in the north-east by Iwo Local Government Area of Osun State, in the east by Lagelu Local Government Area, in the south by Akinyele North Local Government Area and in the west by Ido Local Government Area (Ajadi, Olaniran, Alabi and Adejumobi 2012). With a total land area of about 219.2 km^2, Akinyele LGA is made up of about 54 towns/villages, which are organized into 12 political (electoral) wards.

The population of the study consists of all farmers in Akinyele local government area of Oyo state, Nigeria. List of registered farmers under the agricultural development programme (ADP) was used to randomly select 3% from the 4,000 registered farmers in Akinyele local government area of Oyo state, Nigeria. A total sample size of 120 was used for this study.

Data were collected using structured interview schedule and the data were subjected to both descriptive and inferential statistical analysis. Simple descriptive statistics involving the use of frequency counts, percentages, charts, mean and standard deviation was used to present the findings from the study. The Pearson's Product Moment Correlation (PPMC) and Chi-square were used to test the hypotheses of the study.

RESULTS AND DISCUSSION

The result on socioeconomic characteristics of the farmers is presented in Table 1 below.

Table 1: Socio-Economic Characteristics of Farmers

Variables	Frequency	Percentage	Mean (std Dev.)
Age (years)			
21 – 40	28	23.3	
41 – 60	50	41.7	51.29(13.051)
61 – 80	40	33.3	
81 and above	2	1.7	
Sex			
Male	88	73.3	
Female	32	27.7	
Religion			
Christianity	55	45.8	
Islam	63	52.5	
Traditional	2	1.7	
Marital Status			
Single	7	5.8	
Married	106	88.3	
Divorced	2	1.7	
Widowed	5	4.2	
Educational level			
No formal education	7	5.8	
Adult education	3	2.5	
Quranic education	5	4.2	
Primary education	62	51.7	
Secondary education	40	33.3	
Tertiary education	3	2.5	
Farm Size (hectares)			
1 – 5	67	55.8	
6 – 10	32	26.7	6.03 (4.996)
11 – 15	16	13.3	
16 – 20	5	4.2	
Farming experience (years)			
1 – 10	52	43.3	
11 – 20	35	29.2	18.15 (12.705)
21 – 30	20	16.7	

31 – 40	12	10.0
41 and above	1	0.8
Primary occupation		
Farming	90	75.0
Otherwise	30	25.0
Contact with extension agents		
Yes	78	65.0
No	42	35.0
Cropping system		
Mixed cropping	118	98.3
Mono cropping	2	1.7

Source: Field Survey, 2018.

The result in Table 1 revealed that majority (65%) of the respondents were between 21 and 60years of age in the study area with their mean age as 51.29 with a standard deviation of 13.051 and this agrees with the findings of Solomon (2008) that that older people were involved in organic farming activities more than the younger ones which implies that youths are not involved in the practices of organic farming to any appreciable extent. As a result, the older farmers may not have enough energy to effectively carry out some labour-intensive activities in organic farming. Also, the adoption of any innovation on organic farming may not be as high as expected, as adoption can vary inversely with age (Ogunyemi, 2005). Majority (73.3%) of the respondents were males, suggesting that farming in this area were mostly practiced by males, as was also found by Dipeolu, Bello and Akinbode (2006) and Solomon (2008). In this part of the country, females are usually engaged in post harvesting operations such as transportation, processing and marketing of agricultural produce. Married (88.3%) and more than half of them (51.7%) had primary education. This implies that learned people are involved in farming, which is in support of Solomon (2008) who stated that the majority of present-day farmers had some formal education. High literacy among the respondents may enhance adoption of innovations that are related to organic farming.

This is also in line with the finding of Daramola and Aturamu (2000) who reported that contacts with extension agents as well as acquisition of formal education exposes the farmers to the availability and technical know-how of innovations and increases their desirability for acquiring them. While almost all of the respondents (91.7%) had farming as their primary occupation, farm size of about 1-5 acres with their mean farm size as 6.03. The implication of this result showed that most of the farmers are small scale farmers and it agrees with the finding agrees of Omohan (1996) that small farm holdings constitute most of the farming activities in Nigeria. This is also in agreement with results of other research that shows small scale production (less than or equal to 5 ha) is predominant in developing countries (IFOAM 2005). and farming experience of between 1 and10years (43.3%), this means that the respondents had been practicing farming for a long period of time. Findings of this study revealed that majority of the respondents were not involved in any cooperative society (88.3%) and majority had contacts with extension agents (65%) while most of the respondents were involved in mixed cropping (98.3%). This agrees with the view of Youdeowei and Akinwumi (1999) that most farmers practice mixed cropping in Nigeria as it produces high total

yields. This also agrees with the findings of Awoyinka (2009) who noted that most farmers in South-west Nigeria practice mixed cropping.

Rate of Awareness of Organic Farming among Respondents

Table 2: Distribution of respondents according to awareness of organic farming practices in the study area.

Organic Farming Practices	**Frequency**	**Percentage**
Crop rotation	118	98.3
Mixed cropping	120	100
Use of green manure	77	64.2
Use of compost	94	78.3
Inter cropping	113	94.2
Use of organic manures	118	98.3
Minimum Tillage	92	76.7
Use of leaves as mulching materials	95	79.2
Integrated pest management	78	65.0
Improved varieties	115	95.8
Alley cropping	88	73.3

Source: Field Survey, 2018. Multiple Responses.

The result in Table 2 showed that all the respondents were aware of mixed cropping(100%), majority of the respondents were aware of crop rotation (98.3%), inter-cropping(94.2%), use of organic manures(98.3%), improved varieties (95.8%) and less than majority of the respondents were aware of green manure(64.2%), use of compost (78.3%),minimum tillage(76.7%),use of leaves as mulching materials (79.2%), integrated pest management (65.0%) and alley cropping (73.3%).
This implies that majority of the respondents were aware of organic farming practices in the study area and the finding is in agreement with the observation of Akinbile and Odebode (2002) who reported that majority of these farmers are aware of these sustainable agricultural practices and even more.

Level of use of Organic Farming Practices

Table 3: Distribution of respondent according to their level of use of organic farming practices in the study area

Organic Farming Practices	**Never** Freq. (%)	**Rarely** Freq. (%)	**Often** Freq. (%)	**Very Often** Freq. (%)	Mean (Std Dev.)	Remark	Rank
Crop rotation	2(1.7)	5(4.2)	41(34.2)	72(60.0)	3.53(0.661)	High	2nd
Mixed cropping	2(1.7)	1(0.8)	2(1.7)	115(95.8)	3.92(0.441)	High	1st
Use of green manure	35(29.2)	63(52.5)	16(13.3)	6(5.0)	1.94(0.792)	Low	9th
Use of compost	30(25.0)	20(16.7)	52(43.3)	18(15.0)	2.48(1.029)	Low	6th
Inter cropping	14(11.7)	14(11.7)	16(13.3)	76(63.3)	3.28(1.070)	High	3rd
Use of organic manures	8(6.7)	16(13.3)	44(36.7)	52(43.3)	3.17(0.901)	High	4th
Minimum Tillage	28(23.3)	42(35.0)	38(31.7)	12(10.0)	2.28(0.936)	Low	8th
Use of leaves as mulching materials	23(19.1)	39(32.5)	45(37.5)	13(10.8)	2.39(0.938)	Low	7th

Integrated pest management	77(64.2)	30(25.0)	10(8.3)	3(2.5)	1.49(0.756)	Low	10th
Improved varieties	24(20.0)	24(20.0)	17(14.2)	55(45.8)	2.86(1.204)	High	5th
Alley cropping	89(74.2)	20(16.7)	2(1.7)	9(7.5)	1.43(0.857)	Low	11th

Field survey, 2018

The result in Table 3 revealed that mixed cropping was ranked first with highest mean score of 3.92, crop rotation was ranked second with mean score of 3.53 while inter cropping was ranked 3rd with mean score of 3.28 which also have a high level of usage of organic farming. However, alley cropping was ranked lowest with a mean score of 1.43. The non-use of the organic farming practices could be because of the ignorance of the farmers of the efficacy of these practices as sustainable agricultural strategies. Findings revealed that every farmer applied at least one organic farming practice or the other. This implies that farmers wish to maintain the fertility of their farms by using these practices

Sources of Information on Organic Farming Practices

Table 4: Distribution of respondents according to the sources of Information used on organic farming practices

Sources	Frequency	Percentage
Bulletin	13	10.8
Television	26	21.7
Radio	90	75.0
Other farmers	97	80.8
Extension agent	78	65.0
Friends and relative	84	70.0
Seminar	23	19.2
Cooperative Society	14	11.7
Internet	3	2.5

Source: Field Survey, 2018.

The result in Table 4 showed that radio (75%), friends and relative (70.0%), other farmers (80.8%) and extension agents (65%) were the most used sources by which respondents in the study area get information on organic farming. Ajayi (2003) also found that radio was the most frequently used media by farmers in South-West Nigeria to obtain agricultural innovations. This partly supports the findings of FAO (1989) who observed that radio was among the electronic media used successfully in rural areas. The low use of cooperative society (11.67%) as a source of information isn't surprising as majority of the respondents were not in a cooperative society. Bulletin (10.8%) and internet (2.5%) were not significant sources of information used by the respondents in the study area and this could be attributed to the low level of education attained by the respondents. Television (21.7%), Seminar (19.17%) were also not frequently used sources of information by the respondents in the study area.

Constraints to Organic Farming Practices

Table 5: Distribution of respondents according to the Constraints faced on Organic Farming Practices

Constraints	**Strongly Disagree** Freq. (%)	**Disagree** Freq. (%)	**Agree** Freq. (%)	**Strongly Agree** Freq. (%)	Mean (Std Dev.)	Remark
1 Inadequate Supporting Infrastructure	37(30.8)	29(24.2)	35(29.2)	19(15.8)	2.30(1.074)	Not severe
2 Lack of Financial Support	0(0.0)	0(0.0)	21(17.5)	99(82.5)	3.83(0.382)	Severe
3 More labour intensive when compared to the use of chemicals	3(2.5)	19(15.8)	79(65.8)	19(15.8)	2.95(0.646)	Severe
4 Low Production	25(20.8)	45(37.5)	41(34.2)	9(7.5)	2.28(0.881)	Not severe
5 Lack of appropriate Agriculture Policy	0(0.0)	6(5.0)	35(29.2)	79(65.8)	3.61(0.584)	Severe
6 Unavailability of Organic Inputs	6(5.0)	17(14.2)	37(30.8)	60(50.0)	3.26(0.884)	Severe
7 Consumers are yet to appreciate the difference between the produce of the two farming system	104(86.7)	12(10.0)	3(2.5)	1(0.8)	1.18(0.496)	Not severe
8 Output Marketing Problem	64(53.3)	27(22.5)	18(15.0)	11(9.2)	1.80(1.009)	Not severe
9 Lack of effective training by extension agents	87(72.5)	30(25.0)	3(2.5)	0(0.0)	1.30(0.512)	Not severe
10 High Input Cost	56(46.7)	26(21.7)	33(27.5)	5(4.2)	1.89(0.951)	Not severe
11 It is not appreciated therefore no benefit	116(96.7)	4(3.3)	0(0.0)	0(0.0)	1.03(0.180)	Not severe

Field survey, 2018

The result in Table 5 revealed that the most severe constraint to organic farming practices in the study area were lack of financial support (MS= 3.83), Lack of appropriate agriculture policy (MS= 3.61), unavailability of organic input (MS= 3.26) to the practice of organic farming and this agrees with the earlier submission of Kumata, Abdullahi, Umar, Binta, and Ahmad (2013), opined that the available organic materials to farmers are inadequate due to other competitive needs on the farm while others are subject to destruction by termites. In addition, it is labour intensive when compared to the use of chemicals (MS= 2.95).

TEST OF HYPOTHESES

$H0_1$: There is no significant relationship between socio-economic characteristics and the usage level of organic farming practices of farmers.

Table 6: Pearson product moment correlation analysis relationship between Socio-economic characteristics of the respondents and the usage level of organic farming practices

Variables	Pearson Correlation (r-value)	Sig. (2-tailed) (p-value)	Decision
Age	0.180	0.100	Not significant
Sex	0.076	0.489	Not significant
Religion	0.009	0.931	Not significant
Marital status	0.177	0.105	Not significant
Education	0.243**	0.008	Significant
Farm size	0.204*	0.051	Significant
Membership of cooperative	0.183*	0.044	Significant
Contact with extension agents	0.212**	0.020	Significant

Data Analysis, 2018

Note: * Correlation is significant at the 0.05 level and ** Correlation is significant at the 0.01 level

The result in Table 6 showed that education (r=0.243, p=0.008), farm size (r=0.204, p=0.051), membership of cooperative (r=0.183, p=0.044) and contact with extension agents (r=0.212, p=0.020) had significantly positive relationship with the usage level of organic farming practices.

Findings of the study also revealed that crop rotation (X^2=44.824, p=0.000), minimum tillage (X^2=27.772, p=0.034) and improved varieties (X^2=41.994, p=0.000) had positive significantly association to the rate of farmer's awareness on organic farming practices in the study area. This finding implies that improvement in educational status, increase farm size, increase level of participation as members of cooperative and increase number of extension agents will increase the usage level of organic farming practices.

$H0_2$: There is no significant difference between awareness and usage level of organic farming practices of farmers.

Table 7: Chi-square Test of the difference between awareness and usage level of organic farming practices

Variables	Chi-square value	Df	Asmp. Sig (2-sided)	Remark
Crop rotation	44.824	16	0.000	Significant
Mixed cropping	6.156	16	0.986	Not Significant
Use of green manure	18.604	16	0.290	Not Significant
Use of compost	9.878	16	0.873	Not Significant
Inter cropping	13.270	16	0.653	Not Significant
Use of organic manures	7.797	16	0.955	Not Significant
Minimum Tillage	27.772	16	0.034	Significant
Use of leaves as mulching materials	16.327	16	0.430	Not Significant

Integrated pest management	10.960	16	0.812	Not Significant
Improved varieties	41.994	16	0.000	Significant
Alley cropping	15.948	16	0.457	Not Significant

Field Survey, 2018
Note: Significant at 0.05 levels

Result in Table 7 shows the association between awareness and the usage level of organic farming practices. Findings of the study revealed that crop rotation (X^2=44.824, p=0.000), minimum tillage (X^2=27.772, p=0.034) and improved varieties (X^2=41.994, p=0.000) had positive significantly association to the rate of farmer's awareness on organic farming practices in the study area. This finding implies that increase level of awareness on organic farming practices of such were directly related to the increase use of improved varieties, minimum tillage, and crop rotation in the study area. However, mixed cropping (X^2=6.156, p=0.986), use of green manure (X^2=18.604, p=0.290), use of compost (X^2=9.878, p=0.873), inter cropping(X^2=13.270, p=0.653), use of organic manure (X^2=7.797, p=0.955), use of leaves as mulching materials (X^2=16.327, p=0.430), integrated pest management(X^2=10.960, p=0.812) and alley cropping(X^2=15.948, p=0.457) were not significantly associated to the level of farmer's awareness on organic farming practices in the study area.

CONCLUSION

The study concluded a high rate of awareness on organic farming practices but a low level of use of organic farming practices in the study area. The study also concluded a low involvement in membership of cooperative society but a high contact with extension agents. In addition, the study concluded that radio, friends and relative, extension agents and other farmers were the most used sources of information used by the respondents to get information on organic farming practices. Furthermore, the study concluded that the most severe constraint to the practice of organic farming in the study area was lack of financial support.

RECOMMENDATIONS

Based on the findings and conclusion from the study, the following recommendations were made;

1. There should be government agricultural policies that support and encourage farmers to adopt organic farming practices for farmers to be more involved in these practices.
2. The government should consider granting incentives and assistance to the agricultural sub-sector and to the farmers in form of credit as these would enable them to be more involved in organic farming practices.
3. Extension agent should work towards increasing the knowledge of the farmers on the importance, benefits and use of organic farming practices.
4. Extension agents should encourage membership of cooperative society by the farmers as this had a significant relationship to the usage level of organic farming.
5. In addition, more youths should be encouraged to be involved in organic farming practices as this study revealed that more adults and aged are involved in organic farming practices.

REFERENCES

Abdullahi, M. A. and Kutama, A. S. (2012). Revamping the Nigerian Agricultural sector: An indispensible Tool for National Development and food security. *International Journal on Development studies,* 5(4): 113-120.

Ajadi O. K., Olaniran D. H., Alabi M. F. and Adejumobi O. D. (2012). Incidence of Malaria among Various Rural Socio-economic Households. *Greener Journal of Medical Sciences,* Vol. 2(3):51-63.

Ajayi, M.T. (2003). Analysis of Mass Media Use for Agricultural Information by Farmers in Egbeda Local Government of Oyo State, Nigeria. *Journal of Extension Systems,* 19(2): 45-55.

Akinbile, L. A. and Odebode, S. O. (2002). Determinants of Farmers Use of Sustainable Conservation Practices in Osun State, Nigeria. Challenges of Organic Farming and Sustainable Land Use in the Tropics and Subtropics.

Altieri, M.A. and C.I. Nicholls (2005). *Agroecology and the search for a Truly Sustainable Agriculture.* University of California, USA. 1st Edition. pp 263 -264.

Awoyinka, Y. A., Akinwumi, J. A., Okoruwa, V. O. and Oni, O. A. (2009). Effects of Livelihood Strategies and Sustainable Land Management Practices on Food Crop Production Efficiency in South-West Nigeria. *Agricultural Journal* 4(3):135-143.

Bourn, D. and Prescott, J. 2002. A comparison of the nutritional value, sensory qualities, and food safety of organically and conventionally produced foods. *Critical Reviews in Food Science and Nutrition* 42: 1–34.

Daramola AG, Aturamu OA (2000). Agro forestry policy options for Nigeria: Assimilation study. *J. Food Agric. Environs.* 3:120- 124

Dipeolu, A. O.; K. A. Bello and S. O. Akinbode 2006. *Comparative economic analysis of organic and inorganic vegetable production in Ogun State, Nigeria.* Proceedings of the 2nd National Conference on Organic Agriculture, University of Ibadan, Ibadan, Nigeria 27 – 29 November, 2006. pp. 24.

Food and Agriculture Organization (FAO) 1989. Guide-lines on communication for rural development: A brief for development planners and project for-mulators. In:
IFOAM (2005) Organic Agriculture for Food Security in Africa. [online]. Available from <http://www.ifoam.org/organic_facts/food/pdfs/Africa-Food-Security.pdfcited> [10 April 2008]

Kutama, A. S.; Abdullahi, M. A.; Umar, S.; Binta, U. B. and Ahmad, M. K. (2013). Organic farming in Nigeria: Problems and Prospects. *Global Advanced Research Journal of Agricultural Science.* 2(10):256-262.

Ogunyemi, O. M. 2005. Principles and Practice of Agricultural Extension.Deen-Lat Lithoprint and Publishers, Ado, Nigeria. Pp.56.

Omohan, D. A (1996). Diffusion of Innovation" *Faculty of Social Sciences Quarterly Journal*, Edo State University, 1(1), 24 - 31.

Solomon, O. 2008. Small scale oil palm farmers perception of organic agriculture in Imo State, Nigeria, *Journal of Environmental Extension*. 7: 67-71.

Youdeowei, A and Akinwumi, J.A (1999). Importance of agriculture in tropical ountries. In Youdeowei, A, Ezedima, F.O.C. and Onazi, c.o. (Eds): Introduction to Tropical Agriculture, Longman Limited, London: pp. 1-3.

Willer, H. and L. Kilcher, 2009. The world of organic agriculture –Statistics and emerging Trends. IFOAM, Bonn, FiBL, Frick and ITC, Geneva.

ASSESSMENT OF PEPPER PRODUCTION IN ISOKO NORTH LOCAL GOVERNMENT AREA, DELTA STATE, NIGERIA

Adaigho Dennis and Nwadiolu R
Department of Agricultural Extension & Management, Delta State Poly, Ozoro
e-mail adaighodennis@gmail.com 08105294885

ABSTRACT

This study examined the profitability of pepper production in Isoko North Local Government Area, Delta State. Purposive sampling technique was used to select 50 farmers out of the population of pepper farmers. Structured questionnaire were used to collect the relevant information. Data collected were analyzed with help of descriptive statistics and gross margin analysis. The result of the study revealed that 44% of the pepper farmers fall within the age of 40-49 years and 54% had no formal education. The household size ranged from 6-10 persons, while about 72% of pepper farmers do not belong to any cooperative society. The pepper producers were mostly small scale farmers and 50% of them have a farming experience of 6-10years. The result gotten from the gross margin analysis revealed a total cost per acre of ₦61,300 and the returns per acre was ₦95,000. An average sampled farmer had a gross margin of ₦33,700. The rate of returns 1.5 shows that for every investment by pepper farmer a profit of ₦1.50 was realized. The study identified some constraints of pepper producers to includes, lack of access to credit, price instability, pest and diseases, lack of irrigation facilities among others. Based on the finding, the study recommends that farmers should be encouraged to form cooperative societies. Moreso, government should assist pepper farmers with farm inputs and credit with low interest rate and organize training for pepper farmers on modern practices.

Keywords : Pepper farming, production, profitability, Problems and Potential, Delta State

INTRODUCTION

Pepper (Capsicum spp) is one of the varied and widely used spices in the world. Capsicum spp is a highly value crop that is grown for cash by farmers all over the World (Aliyu et al. 2012). Nigeria has a good soil and weather that can readily support the growth and productivity of pepper. Nigeria is known to be one of the major producers of pepper in the World accounting for about 50% of Africans production (Mohammed et al, 2013). ln Nigeria, pepper is massively produced from the Northern States even though that it grows well in the South West States and to a lesser extent in the South Eastern States. China is the largest producer of pepper with 10million tons. It is followed by Mexico with 1.9tons and Turkey occupying the third place with 1.5million tons. Nigeria and Ghana top tropical production with 715,000t and 270,000t respectively as largest producers. Vietnam, lndia, lndonesia and Brazil are largest suppliers to the global market, while the United State, Europe, Japan and Australia are the major destinations of pepper exports. Pepper grown in Nigeria is in high demand, because of its pungency and good flavor. Investing in pepper production is one of the ways of curbing unemployment, income generation and sourcing for foreign exchange in recent years. Pepper has achieved major economic significance in the global market due to increased World-wide interest and demand (International Pepper, 2012). Pepper can readily be dried, grounded and packaged for export. Apart from the potential of this commodity to generate foreign exchange for Nigeria, their common use in confectionary, medicinal and culinary purpose is on the increase. Pepper is use for production of spice blends and red pepper. lndustrial users also require the moderately pungent chilies (Nigerian type) for use in the pharmaceutical industries (Suleiman and lsah, 2010) .

In Nigeria, Capsicum frutescens is third among the cultivated vegetables being utilized in the dry state as spice. Capsicum spp contains an alkaloid (digestive stimulant) and is used in ointment for leaf of arithritic and neuropathic pains (Ayorinde, 2011). ln Nigera no dish seems to be complete without pepper. Apart from serving as spices, pepper is used to decorate food, to give it flavor or colour. Fresh pepper is found to be a good source of Vitamin C and calcium (Amoke, 2016). Experts believe that pepper has properties that provide relief for many ailments. For instance, it is said to offer relief from colds, sore throats, fevers, enhances blood circulation for cold hands and feet. It also regulates blood sugar and fights prostate cancer. Pepper is believed to act as heart stimulant that regulates blood flow. It is also useful raw material in preparing creams meant for lessening pains, inflammations and itching as well (Amoke, 2016). According to Central Bank of Nigeria (1995), the economics of pepper is characterized by wide and frequent changes in price. Pepper prices vary greatly within a season and between years. Most of the price variation within season is caused by weather effects and acreage on production (Esendugu, 2005)

Nigeria still imports pepper, thus indicating that there is high demand for pepper locally despite the good weather, soil and numerous potential of pepper in Nigeria not to talk of the export. Pepper yield in Nigeria have been very low compared to Western Europe. The low yield in pepper production in Nigeria could be attributed to some production challenges which include disease, pest and poor management practices (Jaliya and Sani, 2006). Pepper production in Nigeria has once been reported to be a lucrative business (Ajibefun and Daramola, 2003). Scarcity of resources has led to production economists think about the reallocation of existing resources to have more output with a given level of input combinations or to produce a prescribed level of output with the minimum cost without changing the production technology. Similarly, the measurement of the productive efficiency in agricultural production is an important issue because it gives pertinent information for making sound management decision in resource allocation. There are shortages of research information that dwell on the pepper production profitability, problems and potentials in Nigeria for future development. Considering the above facts, the study was designed to analyzed the level of profitability in pepper production among producing farmers in Isoko North Local Government Area, Delta State. Specifically, the study focused on socio- economic characteristics of pepper farmers, costs and returns of pepper production and problems/potentials militating against pepper production in Isoko North Local Government Area, Delta State

MATERIALS AND METHODS

The study was conducted in Isoko North Local Government Area, Delta State. The local government area is located in Delta South senatorial zone and the choice of this local government area was made because of the reasonable numbers of Capsicum spp farmers in the area. Delta state is one of the nine states in the Niger Delta region of Nigeria. It is located approximately between longitude 5^0 00' and 6^0 45' east and latitude $5^0$00' and $6^0$30' north of the equator (lnoni and Oyaide, 2007). Isoko North Local government is located at the rain forest belt in Nigeria with latitude 5^0 0'N and longitude 5^0S and 6^0S. The annual rainfall of the area is about 1800mm per annum and average temperature of about 31^0c (lnoni and Oyaide, 2007).

Primary and secondary data were used for this study. The interview method of data collection with the aid of structured questionnaire was used to obtain relevant information from the selected farmers in the study area. Data collection was centered on socio-economic characteristics of the farmers such as age, gender, household size, educational level, farming experience amount of credit, access to

extension service cooperative membership, farm size, quantities and prices of various production inputs used by the farmers and problems affecting pepper producers.

A two- stage technique was employed to select the respondents for the study. Firstly, five (5) communities were selected randomly from the study area out of the fourteen communities that make up lsoko North local government. The communities selected include, Ozoro, Owhelogbo, Iyede and Ofagbe and Okpe lsoko. Secondly, fifty (50) pepper farmers were selected in all through purposive method based on the size of their farms and predominance across the chosen communities.

Descriptive statistics such as frequency percentage and gross margin analysis were used in the analyses of data.

Table 1: socio economic characteristics of pepper farmers (50 Farmers)

Variables	Frequency	Percentage (%)
Age (years)		
20-29	10	20
30-39	22	44
40-49	18	36
50 and above		
Sex Gender		
Male	5	10
Female	45	90
Educational status		
No formal education	27	54
Primary education	15	30
Secondary education	8	16
Tertiary education	-	-
Household size		
1-5	15	30
6-10	27	54
11-15	6	12
16-20	2	4
Farming experience		
1-5	10	20
6-10	25	50
11-15	8	16
16-20	7	14
Sources of capital		
Informal	49	98
Formal	1	2
Membership of cooperative		

Yes	14	28
No	36	72
Extension visit		
No visit	30	60
1-2 times	15	30
3 & above times	5	10

Source: field survey, 2018

Table 1 revealed that majority (44%) of the pepper farmers are between the ages of 40-49 years with a mean age of 46.9. This implies that most of the farmers are within the active age of farming which could give rise to high productivity of pepper in the area. This result is in agreement with the finding of Obeta and Nwabo (1999) that states younger farmers are more flexible in accepting new ideas and taking risk, hence they tend to adopt innovations more readily than older farmers. The result in Table 1 shows that majority (90%) of pepper farmers are females, while only 10% are males. This implies that most of pepper producers in the study area are females.

The majority (54%) of pepper farmers had no formal education, while 30% of the respondents attained between 1-6 years of education. Thus the illiteracy level could affect negatively ability to welcome extension training as well as adopt high level of innovation and improved practices of pepper production.

On the household size, the result in Table 1 shows that majority (54%) of the respondents had household size of between 6-10 persons. The average household size was 7.5 persons. This implies that there is appreciable number of family labour supply to accomplish various farm operations. Moreso, the result in table 1 shows that majority (50%) of the pepper farmers had between 6-10 years of farming experience with average farming experience of 9.2 years. This is implies that the farmers in the area had enough farming experience in pepper production. The result is in support of the finding of Mohammed et al, (2015).

The result in Table 1 revealed that majority (98%) of the pepper farmers derive their capital from informal sources such as personal savings relatives and friends, while the remaining 2% got their capital from formal sources such as commercial Bank and Bank of Agriculture etc. This implies that the farmer's access to credit is usually low due to inability of the pepper producers to receive grants or financial support from government. This result is in line with finding of Ekong (2003) that asserted that credit is a very strong factor that is needed to develop any enterprise. The result of membership of cooperative revealed that majority (72%) of pepper farmers do not participate in cooperative society, while 28% of farmers belong to cooperative society. The reasons for the low level of membership of cooperative could be associated with lack of awareness on the part of farmers. The resultant effect is that most of pepper producers will not enjoy the benefits that accrue to cooperators through pooling together of resources for a better expansion, efficiency and effective/ management of resources and profit maximization. Table 1 shows that most (60%) of the pepper farmers had no access to extension agents during the farming season. The result shows that 30% and 10% of them were visited 1-2 times and 3 and above times respectively. The implication of this is that most of the pepper farmers may not have been exposed to the desired information and right knowledge on improved inputs and modern production techniques in pepper farming.

Summary of Inputs and yield of pepper per an acre

Table 2: Summary of production inputs and yield of pepper production per area

Variables	Unit	Mean
Nursed seedlings	Kg/Acre	14000 stands
Poultry droppings	Kg/Acre	400
Agrochemical (Insecticides and Herbicieds)	Litre/Acre	2
Labour	Mandays/Acre	9
Yield	Kg/Acre	350

Source: Field survey, 2018

Table2 shows the estimated production inputs and yield of pepper in the study area. Table 2 reveals that nursed pepper seedlings are procured from small scale farmers that nursed the seeds early enough in different locations beside water logged farmlands that are fertile. Table 2 also shows that an average farmer in the study area makes use of about 400kg of poultry droppings to manure an acre of pepper, while about 9 man-days is expected to conveniently cater for an acre of pepper farm. A total yield of 350kg of pepper could be realized per acre of pepper farming, while a farmer needs about 2 litres of Agrochemical to prevent pest and diseases infestation. Most of the farmers were into mixed cropping.

Costs and returns per One (1) Acre pepper production.

Table 3: Average cost and return per acre of Pepper production:

Variables	Kg/Acre	Value/Acre (Naira)	Percentage contribution (%)
A; Average Revenue (TR)	450	120,000	
B. Variable Cost			
i) Growing seedlings(14,000stands		6,500	
ii) Land clearing/ preparation		7,000	
iii) Fertilizer/poultry dropping		6,000	
iv)labour for weeding(Man-days)		19,000	30.1
v) lnsecticides		3,000	
v) labour for other activities		4,500	
vi) Total Variables Cost (TVC)		61,300	
C. Fixed Cost			
i) Renting of land		8,000	
ii) lnterest rate on capital		5,000	
iii) Depreciation of tools		2,300	
iv) Total Fixed cost		15,300	
D. Total Cost (TC)		76,600	
E. Gross Margin (TR-TC)		43,400	

F. Return per naira investment (TR/TC)	1.6

Source: Field survey, 2018

Table 3 shows the average cost and returns of pepper production. The gross margin of pepper production in the study area was N43,400. Table 3 also revealed that labour constituted about 30.1% of the total cost of production. The rate of return on pepper investment by farmers in the study area was 1.6. This implies that for every ₦1.00 investment in pepper production, ₦1.60 is realized. This indicates that pepper production is profitable in the study area. This finding is in agreement with research work by Mohammed et al (2013) and Ajibefun (2002) that reported a rate of return on investment of 2.28 and also recorded the highest benefit cost ratio of 3.90 carried out in Kaduna state versus at firm-level evidence in Nigeria respectively.

Constraints in Pepper Production

Table4:Distribution of farmers according to the constraints in pepper production.

Constraints	Frequency	Percentage (%)
Price instability	10	20
Pest and disease attack	10	20
Lack of irrigation facilities	2	4
Difficulty of accessing credit	18	36
Lack of market	10	20
Total	50	100

Source: field survey, 2018.

The constraints that affect yield and profit of pepper production are presented in table 4. The most prevalent constraints to pepper production identified by the study area are Lack of access to credit, price instability, pest and disease attacks and lack of market.

Conclusion and Recommendations

The study assessed the level of profitability of pepper production among farmers in Isoko North Local Government. Based on the findings from the study it can be concluded that pepper production business contribute significantly to income, job creation, poverty alleviation and improvement of food security among pepper producers since pepper production is a viable or profitable enterprise. The constraints militating against pepper production in the study area include, difficulty of accessing credit, price instability, pest and diseases attacks, lack of irrigation facilities and lack of market. The study therefore recommends as follows;

1. Pepper farmers should be encourage to form farmers cooperative group so as to enjoy the benefits that accrue to cooperators from government, such as provision of subsidize agrochemicals, fertilizer, quality seeds/seedlings and tractor for purpose of attaining increase productivity.
2. Government should assist pepper farmers with credit at low interest rate so as to motivate pepper farmers to increase the scale of production.

3. Delta state Agricultural Development projects (ADPs) should improve on the monitoring of the extension officer with a view to bringing modern technology and right information to the door step of pepper farmers and also organizing a training workshop for pepper farmers.

REFERENCES

Ajibefun I.A and Daramola A.G (2003): Determinants of technical and allocation efficiency of micro - enterprises. Firm-level evidence from Nigeria African Development Bank Vol 4: 353-395

Amoke C (2016): Pepper Farming: Another Cash Cow Agribusiness, Independent Newspaper, November 14th 2016 .

Ayorinde I.O (2011) Growth and yield of hot pepper (Capsicuni Frutescens) as influenced by bed width and within row spacing. Submitted to the Department of Horiticulture College of Plant Science and Crop Protection, University of Agriculture Abeokuta, Ogun State Nigeria.

Ekong. E.E (2003); Rural Sociology. An introduction and Analysis of rural Nigeria, Uyo. Dove Educational Publication

Esengudu, G.E (2005) Economic Analysis of pepper production mrketing and Management in Georgia. The cooperative extension offers educational programs. The University of Georgia, College and Agricultural & Environmental Sciences and Ft University State AGECON-05-106, http://www.agecon. Uga.edu or http://www.ces.uga.edu/Agriculture/ageco.html.

International Pepper (2012):International Pepper Proceeding of 21st conference Florida, U.S.A Jaliya, M.M and Sani B,M (2006): Pepper production under irrigation National Agricultural Extension Research Liaison Services, Ahmadu Bello University, Extension Bulletin No. 206, Agricultural Engineering Series.

Inoni O.E and Oyaide W.J (2007) Socio-Economic Analysis of Artisanal Fishing in the South Agro-Ecological Zone, Delta State, Nigeria. *Agricultura Tropica Et Subtropical*Vol 40 (4)

Mohammed, A.B, Ayanlere, A.F Ekenta C.M and Mohammed, S.A (2013): Cost and Return Analysis of pepper production in Ethiope West Local Government Area, Delta State, Nigeria. *International Journal of Applied Research and Technology*, 2 (2), 3-7.

Suleman A, and Isah S.I (2010) Spatial Integration of selected markets of dried chilli pepper and ginger in Northern Nigeria. *Savannah Journal of Agriculture* Vol. 5, Pp29-37

RESOURCE USE EFFICIENCY IN COCOYAM PRODUCTION IN ISIALA NGWA NORTH LOCAL GOVERNMENT AREA, ABIA STATE, NIGERIA.

Ndubueze-Ogaraku, Mercy.E*, Ekunwe, Peter. A & Nwogu, Fortune C
Department of Agricultural Economics & Extension, Faculty of Agriculture, University of Port Harcourt, Rivers State, Nigeria.
*Corresponding address: mercy.onu@uniport.edu.ng

ABSTRACT

Resource use efficiency in cocoyam production was conducted in Isiala Ngwa North Local Government Area of Abia State. Specifically, the study; described the socio-economic characteristics of cocoyam farmers in the study area, estimated the technical efficiency of cocoyam farmers and determined the level of farm resources utilized by cocoyam farmers in the study area. The analytical tools such as descriptive statistics (frequency, mean and percentage), stochastic frontier production function model and the Marginal Analysis Approach were used in the analysis of the generated data. Results indicated that the mean age of the cocoyam farmers was 43 year and were females accounting for 51% of the sampled population. Most of the farmers had a farm land size which was less than or equal to 0.40 hectare (63.26%). MLE estimates indicated that coefficients of labour and planting materials were significant at 5% and 1% respectively. The mean technical efficiency of cocoyam farmers in the study area was 71%, indicating an allowance of 29% for improvement of efficiency. Marginal analysis approach indicated that resources were inefficiently used or sub-optimally in the production of cocoyam in the study area. This confirms the hypothesis that resources such as land, planting materials, labour and other fixed assets were all under utilized in the cocoyam farms. The major constraints were shortage of labour, high cost of land, high cost of farm inputs, incidences of pests and diseases, difficulty in accessing improved variety, etc. Recommendations amongst others include need for policy options that would enable farmers to employ more of the resources that were under-utilized.

***Keywords**: Resource use, efficiency, cocoyam, production*

INTRODUCTION

Agricultural productivity has become the main concern to Nigerian government following the considerable increase in food prices over the last two years that follows decades of low food price (Conradie, Piesse & Thirle, 2009). Among several authors that reported about food crisis in Nigeria, is the assertion made by Akinsanmi (2009), stating that Nigeria is one of the worst hit countries globally given her unprecedented levels of food shortage and its accompanying ravaging malnutrition. The country though endowed with vast expanse of arable land for crop production and fresh waters for fisheries, is yet to produce food crops her population requires and had thus been depending on food importation to meet her domestic demands (Adepoju & Awodumuyila, 2008). There is worsening food insecurity even with massive food importation as evidenced by the food import bill (Okoye, Asumugha, Okezie, Tanko & Onyeweaku, 2008). The low farm productivity may not be unconnected with high food prices in Nigeria. Low yield could result from the manner and in the use of farm resources. Farm productivity depends on how factors are efficiently used in the production process. Cocoyam is an important staple food in Nigeria which ranks third in importance after cassava and yam amongst the root and tuber crops cultivated and consumed (Echebiri, 2004) & (Okoye *et al*., 2008). The two varieties mainly cultivated in Nigeria according to Edet & Nsikak (2007); and the National Root Crop Research Institute (NRCRI) are *Colocasia esculenta* (L) Scott also known as 'taro', and *Xanthosoma sagittifolium* (L) Scott also known as 'tannia'.

As a food crop, cocoyam has some inherent characteristics which make it attractive to consumers in Nigeria. It has multiplicity of end users. It is an alternative source of carbohydrates for most of the people in West Africa and the Pacific. Its corms, cormels and leaves are eaten after boiling, roasting or baking, and meals and flours are prepared. Cocoyam leaves are very nutritious since they contain about 20% protein on dry weight basis. In West Africa, the starchy cormels or tubers of Xanthosomonas are preferred to Colocasia

as they are more suitable for making fufu, a traditional West African dish which is prepared by pounding boiled tubers in a wooden mortar (Nnoung, Mbassa, Acquah, Mboua, & Nganje., 1994). It has also been observed that production of 'tannia' is on the increase particularly in West Africa because of their greater resistance to Phytophthora blight compared to 'taros' and because less exacting conditions are required for their cultivation. Nigeria, Ghana and Japan are the world's leading producers of cocoyam (Xanthosoma). It is a staple crop in West and Central Africa, grown mainly in Cameroon, Gabon and Ghana. The starchy cormels and tender leaves, consumed in various ways, are excellent sources of carbohydrates, minerals and vitamins (Opoku-Agyeman, Bennett-Lartey & Markwei,, 2004).

Cocoyam has more crude protein than other roots and tubers and its starch is highly digestible because of the small size of the starch granules. Its contents of calcium, phosphorus, vitamins A and B are reasonable (Ojinnaka, Akobundu & Iwe, 2009). It can be used for making starch, soup, flour, confectioneries and so on. In addition to its being consumed in various form, its available all year round either on ground storage or post-harvest storage making it preferably the best substitute for the highly priced yam and follower cassava (Okoye *et al*.,2008). Cocoyam is also resistant to drought pests and diseases, tolerant to a variety of climatic and soil conditions (Ogunniyi, 2008). It also plays a significant role in bridging the food gap between time of plenty and time of scarcity, with all its vegetative parts being used as food in one form or the other.

In spite of the high nutritional benefit of cocoyam and its economic importance in the economy of the rural farm households, research especially on efficiency of production of this wonder crop is still very low. It is important to note here that resource use in farm productivity is necessary in evaluating the level of performance of farm activities. For resources to be used efficiently in the production of cocoyam, they have to be economically efficient. Economic efficiency is attained when the resources used in the production process (for example; land, capital, labour, etc.) are technically and allocative efficient. According to Ogunsunmi (2005), resources are said to be allocated efficiently when the value of marginal product of each resource used in the production process is equal to the price. On the other hand, technical efficiency is the ratio of total output to total inputs; the larger the amount of inputs per unit of output the smaller the size this ratio becomes (Ohajianya & Onyenweaku, 2001). A production process may be technically efficient if it produces maximum output from a given bundle of inputs (resources used in the production process) and is therefore operating above its stochastic production frontier (Hazarika & Subramanian, 1999).

Production requires the use of resources (inputs) to obtain output and these resources could be aggregated into, land, labour, capital and entrepreneurship in agriculture. The concept of efficiency goes back to the pioneering work of Farrel (1957) who distinguished between three types of efficiencies: technical efficiency (TE), allocative or price efficiency (AE), and economic efficiency (EE). Technical efficiency in production is the physical ratio of product output to the factor input. Therefore, the greater the magnitude of technical efficiency, the greater the ratio. Technical efficiency in production is defined as the ability of the farmer to produce at the maximum output (frontier production), given quantities of inputs and production technology. While allocative efficiency is concerned with choosing optimal sets of inputs. A firm is allocatively efficient when production occurs at a point where the marginal value product is equal to the marginal factor cost. Economic efficiency is a situation where there are both technical and allocative efficiencies.

Resource use refers to the allocation of resources including land, labour, capital and management between competing alternative uses. The term 'resource use efficiency in agriculture' may be broadly defined to include the concepts of technical efficiency, allocative efficiency and environmental efficiency. An efficient farmer allocates his land, labour, water and other resources in an optimal manner, so as to maximize his income at least cost, on sustainable basis. However, there are countless studies showing that farmers often use their resources sub-optimally.

Theoretically, inefficiency in resource use with particular reference to agriculture may be due to endogenous or exogenous factors (Olayide & Heady, 1982). Some of these factors include the inability of

producers to choose optimum combinations of inputs consistent with relative factor prices, the existence of technical inefficiencies resulting from inability to produce the best level of output with available resources given technology level. It is imperative that this study estimates the level of resource use in the production of cocoyam in Isiala Ngwa North Local Government Area of Abia State. Specifically the study; described the socio economic characteristics of cocoyam farmers in the study area, estimated the technical efficiency and inefficiencies of cocoyam farmers in the study area, determined the level of farm resources utilized by cocoyam farmers in the study area and lastly identified the constraints of cocoyam production in the study area.

MATERIALS AND METHOD

This study was conducted in Isiala Ngwa North Local Government Area of Abia State. It is among the 17 LGA's in Abia State, Nigeria. The LGA lies between latitude $5^{0}25^{'}$N and longitude $7^{0}30^{'}$E. It has an area of 283km^2 and a population of 153,734 at the 2006 population census (NPC, 2006). Isiala Ngwa North LGA comprises mainly of seven (7) major communities or districts with numerous villages under them. The people of the area are mainly agrarian in and cultivates the following crops; yam, cassava, cocoyam, egusi, okra and vegetables. The livestock reared here are mainly small and medium sized livestock (pigs, goats, poultry and sheep)

The study employed a simple random sampling technique in the selection of cocoyam farmers from the following 7 communities; Ngwa-Ukwu, Ama-Asa, Umuoha, Ihie, Amasa-Ntigha, Amapu-Ntigha and Nsulu.in Isiala Ngwa North Local Government Area of Abia State. The second stage was the a random selection of one village from each community giving a total of seven (7) villages. 7 cocoyam farmers were finally chosen from each from village making a total sample size of forty-nine (49) cocoyam farmers.

Data were collected from both primary sources and secondary sources. The primary data ~~was~~ were generated from the questionnaire and information such as; output of the cocoyam farmers, unit prices of their agro products, quantity produced (kg), prices and quantities of various input used in the production process like; land, labour, capital, planting materials were asked. Farmers' socio-economic characteristics such as; farm size, level of education, gender, age, household size, experience level, marital status, and revenue earned from cocoyam enterprise, were embedded ~~into~~ in my primary source of data. The information obtained from internet, journals, books, e-library, etc. were the secondary sources of data collection.

Descriptive statistics such as percentage, means and frequency distribution while Cobb-Douglas (stochastic frontier production function was used to determine the technical efficiency of cocoyam farmers in the study area. Marginal analysis approach was employed to estimate the resource use efficiency in cocoyam production.

The stochastic frontier production model is specified as follows.
$Y_i = F(X_i; \beta) \exp(V_i - U_i)$; =1, 2, - -n
Where,
Y_i = denotes output of the $_i$th farm
X_i = is a vector of functions of actual input quantities used by the $_i$th farm
β = is a vector of parameters to be estimated
$V_i - U_i$ = is the composite error term (Aigner et al., 1977, Meeusen and van den Broeck, 1977)
Where,
V_i and U_i = are assumed to be independently and identically distributed.
V_i = is a random error, which is associated with random factors not under the control of farmers.
U_i = is a non-negative random variable, associated with technical inefficiency in production

The functional form of this model used in estimating the level of technical efficiency was the Cobb-Douglas type (Bravo-Ureta and Evenson, 1994)

$\text{Ln } Y_i = \beta_0 + \beta_1 \text{ Ln } X_1 + \beta_2 \text{ Ln } X_2 + \beta_3 \text{ Ln } X_3 + \beta_4 \text{ Ln } X_4 + Vi - Ui$

Where,

Ln = represents the natural logarithm

The subscript i represents i^{th} sample farmer

Y_i = Cocoyam output in kg of the i^{th} farm

X_1= Farm size measured as total land area in hectares

X_2 =Labour, in man-days used in production

X_3 = Quantity of cocoyam corm planted in kg

X_4 = Depreciation on capital inputs (in naira)

β_0 = intercept.

β_1 -β_4 = coefficients estimated

V_i= random error affecting the input quantities.

U_i = technical inefficiency.

The determinant of technical inefficiency is defined by:

$U_i = \delta_0 + \delta_1 \text{Ln}\alpha_1 + \delta_2 \text{Ln}\alpha_2 + \delta_3 \text{Ln}\alpha_3 + \delta_4 \text{Ln}\alpha_4 + \delta_5 \text{Ln}\alpha_5 + \delta_6 \text{Ln}\alpha_6$

Where:

Ui = technical inefficiency effects

δ_0 = constant

δ_1-δ_6 = Parameters to be estimated.

α_1 = gender of farmer (dummy;1=male, female =2)

α_2 = age (years)

α_3 = marital status (dummy; married=1, single=2)

α_4 = household size (number of people)

α_5 = level of education (years of schooling)

α_6= farming experience (years of participation)

Marginal Analysis Approach

The economic efficiency of resource use was determined by computing the ratio of the Marginal Value Product and the Marginal Factor Cost.

$r = MVP \div MFC$

Where:

MVP= Marginal Value Product

MFC= Marginal Factor Cost

Resources are efficient when MVP=MFC or when the ratio of MVP and MFC is equal to one and resource is maximized, i.e., r=1.

$MVP = MPP \times P_y$

MPP_i= coefficient or elasticity of i^{th} input

P_y = price of cocoyam output

MFC= Unit price or the market price of the i^{th} input (P (x_i))

If, r = 1, it implies the cocoyam farmers are efficient in the use of the particular resource.

r < 1, implies that cocoyam farmers are inefficient (underutilizing resources) in resource use.

r > 1, implies that cocoyam farmers are inefficient (over-utilizing resources.

RESULTS AND DISCUSSION

The result of the socioeconomic variables of farmers are presented in Table 1.

Table 1 Socioeconomic characteristics of cocoyam farmers in the study area

Variables	Frequency	Percent
Gender		
Male	24	49
Female	25	51
Age in years		
11-20	0	0
21-30	4	8
31-40	13	26
41-50	25	51
51 and above	7	14
Marital Status		
Single	6	12
Married	29	59
Divorced /separated	3	7
Widowed	11	22
Household size in person		
1-5	23	47
6-10	18	37
11-15	7	14
16-20	1	2
21 and above	0	0
Farming experience in years		
<5	4	8
5-10	12	24
11-15	13	26
16-20	8	16
21-25	4	8
>25	8	16
Cropping pattern		
Mono cropping	33	67
Mixed cropping	16	33
Cooperative membership		
Yes	16	33
No	33	67
Land ownership		
Ownership right	24	49
Rented of leased	25	51
Land size in hectares		
0.01-0.40	31	63
0.41-0.80	12	24
0.81-1.20	3	6
1.21-1.60	1	2
>1.60	2	4
Total	49	100

Source< Field survey, 2016

The result in Table 1 indicated that most of the farmers were between the age ranges of 41-50 years with 51%, implying that most of the cocoyam farmers in the study area are in their productive active years. The findings agrees with Adepoju & Awodunmuyila, (2008) who reported that farmers who were involved in cocoyam production in Ekiti State in their active age. The result also showed that 51% of the farmers were females while 49% were males. This implies that cocoyam is mostly cultivated by women in the study area, which disagrees with Ugbajah & Uzuegbona, (2012) who observed that there were more males involved in cocoyam production than females. The result also show that married people dominated the farming population with 59%, whilst their unmarried counterparts (single, separated/divorced, widowed) made up 41%, implying

that most cocoyam farmers in the study area were married. Household size ranging from 1-5 had a percentage of 47%, followed by 6-10 persons (37%), and also followed by those between 11-15 persons (14%) and 16-20 persons (2%). The findings of Effiong (2005), Idiong (2005) and Dimelu *et al*, (2009) that a relatively large household size enhanced the availability of labour agrees with this study since the average household size was 7persons. Again, 8% of the cocoyam farmers had less 5 years and between 21-25 years of farming experience. The result indicated that 16% of the farmers have spent between 16-20 years and more than 25 years of farming experience in cocoyam farming.

Also, the result showed that the mean farming experience was 16 years of farming experience. The result on the crop mix of the farmers indicated that 61% of the cocoyam farmers were engaged in mixed cropping while 39% practiced mono cropping. 67% of the cocoyam farmers were not members of a cooperative while 32.7% belonged to cooperative societies. 51% of the cocoyam farmers grow their cocoyam on the inherited land while 49% cultivated cocoyam on leased land.

Technical Efficiency of the Cocoyam Farmers

The result of stochastic production function in cocoyam farms is presented in Table 2 below.

Table 2: OLS Estimate of the stochastic production frontier function in cocoyam production

Production factor	Parameter	Coefficient	Standard error	t-value
Constant	βo	4.8759	1.5690	**3.1076*** **
Farm Size (Ha)	β1	0.3149	0.1533	**2.0545** **
Planting materials (kg)	β2	0.3680	0.1318	**2.7928*** **
Labour (Man day)	β3	-0.02310	0.3384	-0.6826
Depreciation(naira)	β4	0.0448	0.4810	0.9609
Diagnostic statistics				
Sigma-squared	σ2	1.0381		
Gamma	γ	0.5900		

Source: Computed from frontier 4.1 OLS/survey data,2016

Note: *** significant at 1%, ** significant at 5%

The result in Table 2 shows the OLS estimates of cocoyam production in the study area. The coefficients planting materials and farm size were positive significant at 1% and 5% respectively. Planting materials with elasticities of 0.368 implies that increasing planting materials use by 10 percent will lead to about 3.68% percent increase in output in cocoyam. The result is consistent with the findings of Kebede (2001) who reported that the variables labour and depreciation on the fixed assets used in the production of cocoyam were not significant.

Estimate of Technical Efficiency in Cocoyam Production in Isiala Ngwa NorthLGA.

Result of MLE estimates of technical efficiency in cocoyam production is presented in Table 3 below.

Table 3: MLE Estimate of technical efficiency in cocoyam production in Isiala Ngwa North LGA, Abia State.

Production factors	Parameter	Coefficient	Standard error	t-value
Constant	β_o	2.346	0.9946	**2.7493*** **
Farm Size (ha)	β_1	0.1819	0.1370	1.3280
Planting materials (kg)	β_2	0.3755	0.1141	**3.2908*** **
Labour (Man day)	β_3	0.6336	0.2807	**2.2256** **
Depreciation	β_4	0.0448	0.4810	0.9609
Inefficiency factors				
Gender	α_1	-1.4892	0.6546	**2.2749*** **
Age	α_2	-2.3057	0 0398	-0.5788

Marital status	α_3	-0.4388	0.5438	-0.8070
Household size	α_4	0.2274	0.1207	**1.88401***
Years of schooling	α_5	-0.1862	0.0814	**-2.2869****
Farming Experience	A 6	0.0258	0.0454	0.5689
Diagnostic statistics				
Sigma-squared	σ^2	0.6365	0.2365	**2.6904*****
Gamma	Γ	0.5560	0.2039	**2.7262*****
Log likelihood function = -45.2402				
LR test of the one-sided error= 27.3337				

Source: Computed from frontier 4.1 MLE/Survey data, 2016 Note: *** significant at 1%, ** significant at 5%,* significant at 10%

The Maximum Likelihood Estimates technical efficiency and technical inefficiency of the sampled cocoyam producers in the study area are presented in Table 3. The results show that coefficients of labour and planting materials were significant at 5% and 1% respectively. Farm size and depreciation were not significant. Labour appears to be the most important variable with elasticity of 0.63. It implies that increasing labour use by 1% will lead to about 6.3 percent increase in output in cocoyam. The sum of the elasticity (1.235) indicates that, the cocoyam farmers were operating in the increasing return to scale region which is in stage 1 region of production. The gamma γ value was 0.5560 and significant at 1%. This is an indication that 55.6 percent (%) variation in output of cocoyam is attributed to technical inefficiency. It also confirms the presence of the one sided error component in the model, thus rendering the use of the Ordinary Least Squares (OLS) estimating technique inadequate in representing the data. The sigma-square (σ^2) on the other hand was 0.6365 and significant, indicating the correctness of the specified assumptions of the distribution of the composite error term.

From the Table 3, the determinants of technical efficiency otherwise known as inefficiency effects analyzed showed that; gender had a negative coefficient and is significant at 1%, which implied that women were less technically efficient than their male counterparts. Household size was significant at 10%, and had a positive coefficient, implying that, increase in household size will lead to a reduction in technical efficiency at the same time increasing the inefficiency level. Years of schooling was significant at 5%, and had a negative coefficient, which implied that the greater number of schooled years, the less technical efficiency. This finding disagrees with (Kadurumba, Mbanasor, & Ezeh, 2010) whose report showed that education might be regarded as a factor for increased efficiency.

Frequency distribution of technical efficiency in cocoyam farms.

Result of technical efficiency level is presented in Table 4.

Table 4: Distribution of technical efficiency level of cocoyam farmers in the study area

Efficiency class	Frequency	Percentage
90-100	7	14
80-89	19	39
70-79	9	18
60-69	6	12
50-59	1	2
40-49	2	4
30-39	1	2
20-29	3	6
10-19	1	2
Mean	71	
Total	49	100

Source: Field survey 2016

The results in Table 4 revealed that the mean efficiency of the cocoyam farmers was 71%, which implies that the farmers were producing near the frontier. However, there is about 29% allowance to reach 100% efficiency level. The study also revealed that about 85% of the farmers were producing above 50% of the frontier, whilst only 14 % of them produced below 50% frontier level. The result further revealed that an average farmer is operating at 71% frontier region. It is implied that cocoyam farmers are technically efficient.

Resource Use Efficiency

The result of resource use efficiency in cocoyam farm is presented in Table 5.

Table 5: Resource use efficiency indicators

Factor	P_y	MVP(P_Y×coefficient)	MFC(p_{xi})	r=MVP÷MFC	Remarks
X_1(planting material)	68	25.53	100	0.2553	Over-utilized
X_2 (labour input)	68	43.1	700	0. 061	Over-utilized
X_3 (farm size)	68	12.37	213098	5.8×10^{-5}	Over-utilized
X_4 (depreciation)	68	3.04	1000	0. 003	Over-utilized

Source: Frontier 4.1 MLE Result, 2016

Table 5 showed the values of all factors (planting materials, labour, farm size and fixed assets) used in the production of cocoyam in the study area which indicated 'r' values of 0.2553, 0.061, 5.8×10^{-5} and 0.003 respectively. Since the values of 'r' for all estimated variables were less than 1. It means that all resources used by farmers in cocoyam production in the study area were not used efficiently rather being over-utilized. Therefore, the null hypothesis that resources in cocoyam production are not efficiently utilized is accepted.

Constraints faced by cocoyam farmers in the study area

Result of constraints faced by farmers in cocoyam production is presented in Table 6.

Table 6: Constraints faced by the cocoyam farmers

Constraints	**Mean**	**Standard Deviation**	**Remarks**
High cost of land	1. 857	.84163	Minor constraint
Shortage of labour	2.571	.67700	Major constraint
High cost of labour	1. 857	.70711	Minor constraint
Inadequate capital	2.120	.68450	Minor constraint
Difficulty in accessing improved variety	2.300	.71309	Minor constraint
Incidences of pests and diseases	2.180	.56544	Minor constraint
Difficulty access to markets	2.796	.61168	Major constraint
High cost of farm inputs	1. 816	.56544	Minor constraint

Source: Field survey 2016

Note: mean>2.5= major constraint, mean <2.5= minor constraint

Results in Table 6 revealed that the major constraints in cocoyam production were shortage of labour and difficulty of access to markets which showed 2.571 and 2.796 respectively. This is not surprise because there is serious problem of farm labour availability in the rural areas because migration of young people to city for search of better jobs and livelihood opportunities. Secondly the faming population are aging. This therefore, has resulted to high demand on farm labour while there is low supply and scarcity farm labour

mainly due to high price. High cost of land, high cost of farm inputs, incidences of pests and diseases, inadequate capital, difficulty in accessing improved variety were listed as minor constraints. These problems appeared to exist, but they are not posing serious problems in cocoyam production.

CONCLUSION

The study concludes that cocoyam farmers were mainly females who constituted of the sample population. MLE estimates indicated that coefficients of labour and planting materials were significant influenced cocoyam yield. The elasticity value of implied that cocoyam farmers were operating in the increasing return to scale region. Mean efficiency of cocoyam farmers in the study indicated an allowance for improvement in technical efficiency level. Farm resources in cocoyam farms were all over utilized. High cost of farm inputs, incidences of pests and diseases, inadequate capital, difficulty in accessing improved variety were constraints faced by the farmers.

RECOMMENDATIONS

1 Farmers are advised to use resources efficiently in cocoyam production in order to make profit.
2 There is need for increase extension visits to cocoyam farmers for advice on how efficiently resources should be used to achieve greater revenue.

REFERENCES

Adepoju, A. A., & Awodumuyila, D. J. (2008). Economics of Cocoyam production and marketing in Ekiti East LGA, Ekiti State, Nigeria. *Research Journal of Applied Sciences, 3*(2), 95-98.

Akinsanmi, G. (2009). *Nigeria: Food Security-Transforming Potentials to Empowerment.* September 16. Retrieved May 20, 2016, from Thisday National Daily: http://www.allafrica.com/nigeria/

Aigner, D, Lovell, C.A.K. & Schmidt, P. (1977). Formulation and estimation of stochastic frontier production function models. *Journal of Econometrics.* 6, 21-37

Conradie, B. P. (2009). District-level total factor productivity in agriculture. *agricultural economics, 40*(3), 265-280.

Conradie B, Piesse J & Thirle C. (2009). District-level total factor productivity in agriculture: Western Cape Province, South Africa, 1952-2002.. Agricultural Economics.;40(3):265-280.

Dimelu, M.U., Okoye, A.C., Okoye, B. C., Agwu, A. E., Aniedu, O. C., & Akinpelu, A. O. (2009): "Determinants of gender efficiency of small-holder cocoyam farmers in Nsukka agricultural Zone of Enugu State, Nigeria." *Scientific Research and Essay* 4(1): 28-32.

Echebiri, R. (2004). *Nigerian Journal of Sustainable Tropical Agricultural Research, 9*: 9-73.

Edet, J. U., & Nsikak, A. A. (2007). *Cocoyam farmers in Akwa Ibom State,Nigeria.* Retrieved April 12, 2016, from A Stochastic Production Frontier Approach: http://www.verypdf.com

Effiong, E. O. (2005). Efficiency of production in selected livestock enterprises in Akwa-Ibom State, Nigeria. *Unpublished Ph.D Dissertation*. Umuahia, Abia, Nigeria: Department of Agricultural Economics, Michael Opara University of Agriculture,Umudike.

Farrell, M. J. (1957). The Measurement of productive efficiency. *Journal of the Royal Statistical Society*, ACXX(3), 253-290

Hazarika, C & Subramanian, S.R (1999). Estimation of technical efficiency in the stochastic frontier production function model: An application to the tea industry in ASAM. Indian J. Agric. Econ. 54(2): 201-211.

Idiong, I. C. (2005). Evaluation of technical allocative and economic efficiencies in rice production system in Cross River State, Nigeria. *An Unpublished Ph.D Thesis*. Ibadan, Oyo, Nigeria: University of Ibadan,Nigeria.

Kadurumba, C., Mbanasor, J. A., & Ezeh, C. I. (2010). Technical efficiency of traditional oil palm marketing in Mbaise, Imo State. *Journal of Farm Manangement Association of Nigeria, 1*: 17-21.

Kebede, T.A. (2001). Farm Household Technical Efficiency: A Stochastic Frontier Analysis. A Study of Rice Producers in Mardi Watershed in The Western Development Region of Nepal. A Masters Thesis in The Department of Economics and Social Sciences. Agricultural University of Norway.

Meeusen, W. & Van den Broeck, J. (1977). Efficiency estimation from Cobb- Douglas production functions with composed error. *International Economic Review 18, 435-444*

National Population Commission (NPC)(2006). Legal notice on publication of 2006 census final results. *Federal Republic of Nigeria Official Gazette*, Abuja 2 (96), 1 - 42

Nnuoung, A., Mbassa, A, Acquah, E.T, Mboua, C & Nganje, W.E. (1994). A descriptive analysis of root and tuber crop based food cropping systems with particular reference to cocoyam (Xanthosoma sagittifolium L. Schott) in Cameroon. In Proceedings of the Fifth Triennial Symposium of the International Society for Tropical Root Crops – Africa Branch held at Kampala,22-28 November 1992. ed M.O. Akorodo pp 247-256.

Opoku-Agyeman, M.O., Bennett-Lartey, O & Markwei, C. (2004). Agro-morphological and sensory characterization of cocoyam (Xanthosoma sagittifolium (L) (Scott) germplasm in Ghana. Ghana.
Journal of Agricultural Science, 37, 23-3

Ogunniyi, L. T. (2008). Profit efficiency among cocoyam producers in Osun State, Nigeria. *International Journal of Nigeria.Journal of Human Ecology, 25*(1), 5-8.

Ogunsunmi, L. (2005). Resource use pattern and farmers productivity in South West Nigeria. *Journal of Central European Agriculture, 6*(2), 195-202.

Ohajianya, D. O., & Onyenweaku, C. E. (2001). Gender and relative efficiency in rice production systems in Ebonyi State, Nigeria: A profit function analysis. *Journal of Sustainable Agriculture and Environment., 3*(2), 384-391.

Ojinnaka, MC Akobundu, E.N.T. & Iwe, M.O. (2009). Cocoyam Starch Modification Effects on Functional, Sensory and Cookies Qualities. *Pakistan Journal of Nutrition* 8, (5), 558-567

Olayide, S.O & Heady, E.O (1982). Introduction to Agricultural Production Economics University of Ibadan Press, Ibadan, Nigeria

Okoye, B.C., Asumugha, G.N., Okezie, C.A., Tanko. L. & Onyenweaku, C.E. (2008). Econometric Assessment of the Trend in Cocoyam Production in Nigeria,1960/1961-2003/2006. *Agricultural Journal, 3*(2), 99-101.

Ugbajah, M.O. & Uzuegbuna,C.O. (2012).Causative factors of Decline in Cocoyam production in Ezeagu Local Government Area of Enugu state: implications for sustainable food security. *Journal of Agriculture and Veterinary Sciences*, 4: 35-44