

AGRICULTURAL ECONOMICS AND EXTENSION

ASSESSMENT OF COMMUNITY DRIVEN DEVELOPMENT APPROACH TO
FARMERS' ACCESS TO INPUTS, INFRASTRUCTURE AND SERVICES UNDER FCT
FADAMA III PROJECT ABUJA, NIGERIA

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ABSTRACT

The study assessed the Community Driven Development approach of Fadama III Project in relation to farmers' access to inputs in the Federal Capital Territory Abuja, Nigeria. The population was 8,242 beneficiary User groups of Fadama III. The groups were stratified according to Area Councils and beneficiaries' groups were randomly selected. The total sample size was 446. The study adopted survey method using structured questionnaire in a standardized paper and pencil procedure for collection of primary data. The analytical tools were Descriptive Statistics (Frequency distribution, Percentage and Likert scale). The socio-economic characteristics of the respondents showed 63% males while 37% females. The average age of the respondents was 46.1 years while the mean experience in farming of the respondents was 24.8 years. Majority of the respondents 88.60% were married with the mean household size of 9 persons and mean farm size of 3.3 ha. There was near uniform spread with 32.3% each for respondents with no formal education and those with primary education, while 29.8% of the respondents had post primary education. The major occupation of the respondents was crop farming (61.9%), while livestock husbandry and agro-processing followed with 24.4% and 9.6% respectively. The result revealed more than 90% of the respondents accessed all services offered by the project but capacity building and rural infrastructure 99.1% and 94.8% respectively were the most accessed services. Crop farming inputs were the most accessed by the respondents with 31.4% knapsack sprayers and 30.9% each for fertilizer, herbicides and insecticides. Poultry production inputs such as feeders/drinkers and drugs/supplements were accessed 15.9% each while fish supplement and scooping nets each accessed 11.2% by the respondents. The result further revealed that 68.60% of the respondents paid for the inputs/services through contribution by all member groups only 31.4% acquired inputs and services through support from some philanthropists and from Fadama III 100 % grants. Capacity building and advisory services were top ranked by the respondents as the major factors that influenced meeting their development goals. The study concluded that CDD demand driven approach by Fadama increased farmers' access to inputs and services that resulted in increased productivity, income and general well-being of the participating farmers. The study therefore, recommended; that we emphasis should be put on the capacity building process of target beneficiaries, accompanied with advisory services before they are allowed access to inputs, assets and infrastructure

Keywords: Community, Driven, Development, Inputs, Infrastructure.

INTRODUCTION

Community Driven Development (CDD) approach aims at empowering communities and

local governments with resources and the authority to use those resources, thus taking control of their development through the expansion of assets and capabilities of poor people to participate in, negotiate with and hold

accountable institutions that affect their lives (World Bank, 2019).

It means giving people access to voice and information, greater social inclusion and participation, greater accountability, and organizational strength. CDD focus on improvements in welfare, income and related matters of the farmers through the formation of farmer groups to be able to have voice, capacity to negotiate and participate actively in execution of programs to better their livelihood. CDD program operate on the principles of transparency, participation, accountability, and enhanced local capacity. Experience has shown that when given clear and transparent rules, access to information, and appropriate technical and financial support, poor communities can effectively organize to identify community priorities and address local problems by working in partnership with local governments and other institutions to build small-scale infrastructure and deliver basic services (Uddin, 2019).

The community-driven development approach has become a key strategy used by both government and development assistance programs (Mansuri & Rao, 2013). Fadama programme employed the principle of CDD to support the growth of non-oil sectors through the development of productive infrastructure that will enhance agricultural productivity and the diversification of livelihoods. It involves building participating communities' social capital and their capacity to provide rural services to the poor. Fadama means the seasonally flooded or floodable plains along major savannah rivers and or depressions adjacent to seasonally or perennially flowing streams and rivers. Fadama as a program involves development of flooded or floodable plains and low-lying areas underlined by shallow aquifers found along Nigeria's River systems otherwise known in Hausa as Fadama (World Bank, 2013).

The Third National Fadama Development Project (NFDP III) was established to guarantee all-year round growing of crops and promotion of simple

and low-cost improved irrigation under the World Bank financing. Food crops grown on the Fadama include rice, leafy vegetables, okra and maize to mention but a few.

Fadama project aimed at reducing poverty and increasing farm productivity and income of farmer participants (Bello, 2008). Funding is by World Bank contributing 55.6%, Federal Government of Nigeria, 5.1%; participating States and Local Governments contributing 17.1% and 8.9% respectively, while the project beneficiaries contributed the balance of 15.30% under the various categories including productive assets, advisory services/inputs, small scale community owned rural infrastructure either in cash or in kind. The program strategy included investing in public infrastructure, asset acquisition using matching grants and advisory services on best ways of improving group management mechanisms to avoid and resolve conflict(s) within participating groups. In this regard project facilitators had been deployed to participating communities to provide training and technical support to all categories of Fadama resource users.

However, studies on how the CDD approach employed by Fadama III to farmers' access for inputs and services from the project has not been empirically carried out. The objective of this research therefore is to assess performance of community demand driven approach to farmers' access to inputs and services - a case study of the Fadama III FCT.

The Specific objectives of the study are to assess:

- i. Socio- economic characteristics of the farmers in Fadama III Project in the study area.
- ii. Inputs/services acquired by farmers through Fadama III Project in the study area.
- iii. How the farmers acquired inputs/services used in Fadama III Project in the study area.

METHODOLOGY

Study Area Description

The study area is the Federal Capital Territory (FCT) Abuja, Nigeria. FCT, Abuja lies within latitude 8° 25" and 9° 25" North of the equator and Longitude 6° 45" and 7° 45" East of Greenwich Meridian (Ajah and Nmadu, 2013). It is bordered by four states namely; Niger to the West, and North West, Nasarawa to the East, Kogi to the South and Kaduna to the North (AbdulMalik, Oyinbo, & Sami 2013). FCT covers an area of 713 km² (Anjorin, Jolaoso, and Golu., 2013) and has six Area Councils, namely, Abaji, Abuja municipal, Bwari, Gwagwalada, Kuje and Kwali. FCT Abuja has two distinct climatic seasons (rainy and dry seasons) and temperature ranges between 30.41°C and 35.1°C. Crops and livestock produced in the FCT include; maize, rice, sorghum, yam,

leafy vegetables, cassava and large and small ruminants as well as poultry and fish among others.

Sampling Procedure

The population for the study was eight thousand two hundred and forty - two (8,242) groups that benefitted from the Fadama III Project intervention. FCT was chosen purposively being among the states that participated in Fadama III Project. A total of 600 FUGs/FCAs were targeted for the study, 100 each from the 6 area councils in the FCT representing 7.3% of the total population. The 600 FUGs/FCAs were randomly selected from the population and each group was issued with one questionnaire. Four hundred and forty six (446) groups representing 74.3% of the target groups responded

Table 1: Distribution of Fadama III Beneficiaries in Abuja by Area Councils

S/NO.	Area Council	No. of Beneficiaries FUGs	No. of Questionnaire issued	(Questionnaires Returned out of 100)	% Returned
1	Abaji	1406	100	90	90
2	Abuja Municipal	1239	100	51	51
3	Bwari	597	100	51	51
4	Gwagwalada	2250	100	90	90
5	Kuje	1182	100	90	90
6	Kwali	1542	100	94	94
	Total	8242	600	446	74.3

Sources: FCT Fadama Coordination Office Survey 2013.

Method of Data Collection

This study adopted a simple random survey method in data collection. A standardized paper and pencil questionnaire that asked predetermined questions as well as focus group discussion, adopting structured interviews with small groups of like-minded individuals using standardized questions, follow up questions, and exploration of

other topics that arise to better understand the participants.

Data Analysis Methods

Descriptive statistics such as frequency counts, percentages and means were used as well as Likert scale/ANOVA and chi square test realized using SPSS version 23 and EXCEL programs.

RESULTS AND DISCUSSION

Socio – Economic Characteristics of Respondents

The socio-economic characteristics of the respondents used in this study are presented in Table 2. The gender of the respondents revealed that 283 (63%) of the total respondents were males while 163 (37%) were females. This implies that the number of males involved in Fadama III project was higher than that of female as expected, however, the female population had met the minimum percentage of 35% set by the project for women participation. The age distributions ranged from a minimum of 22 years and a maximum of 105 years with less than 4% of the respondents (3.8 and 3.4%) within the age range of 20-29 years and above 70 years respectively, while about 23.6% and 39.0% of the respondents were within 30-39 years and 40 – 49 years respectively. 20.6% and 9.6% of the respondents were within the age range of 50-59 years and 60 to 69 years respectively, while the average age of the respondents is 46.1 years. This agrees with Hayrolet *et al.* (2009) who revealed that the average age of farmers in developing countries is in excess of 46 years. About 70.6% of the respondents were 50 years and below revealing that greater number of respondents is within the productive age while youth less than 35 years constitutes 12.8%, this indicates a challenge to continued replacement of population in agricultural production. The farming experience of the respondents is quite vast, ranging from 1 to 50 years. About 12.10 and 37.30% of the respondents had farming experience of 1 – 10 and 11 – 20 years respectively, while 27.10% of the respondents had farming experience of 21 -30 years. Only 8.00% of the respondents fall within the farming experience of more than 40 years. The mean experience in farming of the respondents is 24.8 years implies that the respondents had a significant farming experience which may likely contribute to the awareness/familiarity and adoption of new innovations and technologies as suggested by

Farah *et al.* (2013). Majority of the respondents 88.60% were married, while singles, widows and divorced constitutes 1.60%, 9.00% and 0.90% respectively. This implies that the married are more involved in production than the singles, widows and divorced. This result conforms to the findings of Ayoola, *et al.* (2011) who suggested that majority of the respondents had stable family which would enrich decision-making process. About 78.5% of the respondents had a household size of 1-10 members which was fairly large though good for farm family labour, 19.3% had within 11- 20 household size and 2.2% had within 21-30 household members. The mean household size of the respondents is 9. This result corresponds with the findings of Mustapha *et al.*, (2012) in which majority of the household size fell within 6-10 members. Large household size could be as a result of polygamous nature of the rural farmers (Olumba (2014) citing Onu 2005) and for the fact that large household size is a good and economical way of maximizing farm returns by using family labor. Majority (89.0%) of the respondents had between 1 – 5 hectares, 10.30% had 6 – 10 hectares, while only 0.7% of the respondents had 11 and above hectares. The mean farm size was 3.3 ha suggesting that farmers in the study area were mainly smallholder/small scale farmers as was earlier reported by Fasasi (2010), and in conformity with Project target of assisting resource poor rural farmers. A uniform spread was observed with respect to the level of education of respondents; 32.3% each for respondents with no formal education and those with primary education, while 29.8% of the respondents had post primary education. Only 5.6% had post-secondary education. The result show that majority of the Fadama III farmers 62.10% had at least, primary education level which means that most of the respondents had one form of education or the other. The result agrees with the findings of Ukaejiofo and Gao (2013) that even though farmers have low level of education, it is expected to enhance adoption of farming techniques. The

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major occupation of the respondents was crop farming (61.90%), while livestock husbandry and agro-processing were the most alternative occupations 24.40% and 9.60% respectively. Produce marketing was the least major occupation engaged by the Fadama farmers (4.00%). The

minor occupations involved by Fadama 111 farmers were artisans (18.2%), civil servants (10.80%), transporters (14.3%) and the majority 56% mainly engaged in some form of part time jobs such as security guards and petty trading.

Table 2. Socio – Economic Characteristics of Respondents of Fadama III in FCT

VARIABLES	PERCENTAGE	MEAN
GENDER		
Male	63.45%	
Female	36.55%	
AGE (Years)		
20 – 29	3.81%	
30 – 39	23.55%	
40 – 49	39.01%	46.1 Years
50 – 59	20.63%	
60 – 69	9.64%	
70 – Above	3.36%	
EXPERIENCE IN FARMING(Years)		
1 –10	12.11%	
11 – 20	37.22%	
21 – 30	27.13%	24.8 Years
Above 30	23.54%	
MARITAL STATUS		
Married	88.57%	
Single	1.57%	
Widow	8.97%	
Divorced	0.90%	
HOUSEHOLD SIZE		
1 – 10	78.50%	
11 – 20	19.30%	9 No
21 – 30	2.20%	
FARM SIZE(Ha.)		
1 – 5	89.01%	
6 – 10	10.32%	3.3 Ha
Above 10	0.67%	
LEVEL OF EDUCATION		
No formal Education	32.29%	
Primary Education	32.29%	
Post Primary Education	29.82%	
Post - Secondary Education	5.60%	
MAJOR OCCUPATION		
Crop farming	61.88%	
Livestock farming	24.44%	
Agro-processing	9.64%	
Produce Marketing	4.04%	
MINOR OCCUPATION		
Artisan	18.16%	
Civil Servant	10.77%	
Transporter	14.35%	
Other	56.72%	

Source: Field data analysis, 2020

Fadama III Services Acquired by the Respondents.

Table 3 shows that more than 90% of the respondents accessed all services offered by Fadama III project. Capacity building and rural infrastructure (99.1% and 94.8%) respectively

were the most accessed services by the respondents. This is in line with Fadama III project approach which relied on facilitation for demand-driven investments and empowerment of local community groups to improve productivity and land quality (PAD, 2008).

Table 3. Distribution of Fadama III services access by the respondents

Services	Frequency	Percentage
Capacity Building	442	99.1
Advisory Services	419	93.9
Input Support	409	91.7
Production Asset Acquisition	406	91.0
Rural Infrastructure	423	94.8

Source: Field Data Analysis, 2020

Fadama III Input Support Accessed by the Respondents

Table 4 shows the result of Fadama III inputs acquisition by the respondents. Crop farming having the majority of the respondents acquired most 31.4% knapsack sprayers and 30.9% each for fertilizer, herbicide and insecticides. While improved seeds, water pumps, and tractor services for land preparations acquired by the respondents recorded 30.5, 28.5 and 26.9% respectively. Poultry production inputs acquisition by the respondents recorded 15.9% each for feeders/drinkers and drug/supplements while poultry feed recorded 15.7% level of acquisition by the respondents. Fish supplement and scooping

nets each recorded 11.2% level of acquisition by the respondents while fish feed acquisition by respondents stood at 11.4%. Acquisition of grain milling machine, small ruminants, large ruminants and bee keeping by the respondents recorded 19.7%, 9.0%, 9.4% and 0.2% respectively. The result revealed that Fadama III project motivated farmers by giving them an open-ended selection of legitimate inputs and services to be acquired by them based on preset funding arrangements. This is in line with Community Driven Development makes development more inclusive; Empower poor people, build social capital, and strengthen governance; and Complement market and public-sector activities (Dongier *et al.*, 2003; van Domelen, 2007; Baird, McIntosh & Ozler, 2009; Binswanger *et al.*, 2010).

Table 4: Types of Inputs/Services Acquired by Respondents of Fadama III. Abuja

S/No	Input/Services	Frequencies	Percentage (%)	Ranking
1	Knapsack Sprayers/PPE	140	31.4	1
2	Fertilizers	138	30.9	2
3	Herbicides	138	30.9	2
4	Insecticides	138	30.9	2
5	Improved Seeds	136	30.5	3
6	Water Pumps	127	28.5	4
7	Tractor Service	120	26.9	5
8	Grain Milling Machines	88	19.7	6
9	Poultry Feeders/Drinkers	71	15.9	7
10	Poultry Drugs/Supplements	71	15.9	7
11	Day old Chicks	71	15.9	7
12	Poultry Feeds	70	15.7	8
13	Fingerlings	51	11.4	9
14	Scooping Nets	50	11.2	9
15	Fish Supplements	50	11.2	9
16	Fish Feeds	51	11.4	9
17	Large Ruminants	42	9.4	10
18	Small Ruminants	40	9	11
19	Cassava Cuttings	1	0.2	12
20	Bee Keeping	1	0.2	12
21	Others	1	0.2	12

Source: Field data analysis, 2020

How Respondents acquired Inputs from FadamaIII

Table 5 shows how beneficiaries acquired Fadama III inputs. More than two thirds (68.60%) of the respondents paid for the inputs/services through contribution by all member groups, while 31.4% of the respondents acquired Fadama III input and services through support from some philanthropists and from Fadama III 100 % grants to vulnerable and marginalized persons' and groups, such as aged persons, physically challenged, youth/women and widows. The study revealed that majority of the respondents were willing to pay for inputs and services offered by Fadama III. Acquisition of inputs and services

under the Fadama III is the discretion of the participating group members to freely choose from

available legitimate inputs and service that will add value to their production activities. This is in line with the Community Driven Development (CDD) approach of concede project initiation, planning and implementation to the benefiting communities with the assistance of facilitators (Project Implementation Manual vol. 1. [Fadama III], 2009). The menu offered to the beneficiaries is open and dependent on the beneficiaries' capacity to satisfy the funding arrangement that eventually translates to the beneficiaries making financial contribution towards the cost of the chosen inputs and services. The beneficiaries were also given the benefit of picking from the

identified suppliers/dealers to be engaged contractually and once the contract is executed, payment is effected by the two parties.

Farmers Rating of Fadama III Services: Table 6 shows farmers rating of Fadama III services to meeting their development goals. Capacity

provision of rural infrastructure were rank second, third and fourth respectively. This is in line with CDD projects features of Empowerment of the local

Table 5: How Respondents Acquired Inputs/Services in Fadama III

S/NO	How Inputs and Services were Paid for: (Beneficiary Contribution)	Frequency	Percentage (%)
1	Payment of Beneficiary contribution by all Members of group	306	68.6
2	Payment of Beneficiary contribution by sponsors – support by well - meaning citizens, relatives, exemption by project	140	31.4
3	Payment of Beneficiary contribution through credit from financial service providers (commercial banks, MFIs, development banks)	Nil	Nil
4	Payment of Beneficiary contribution through Credit from Input Dealers	Nil	Nil

Source: Field data analysis, 2020

building and advisory services rank were top ranked as the major factors that influenced respondents meeting their development goals. While input support, asset acquisition support and

communities and Demand-driven design approach to addressing the problems of Fadama farmers (Dongier et al., 2003; Labonne, Biller, & Chase, 2007).

Table 6. Results of Rating of Fadama III Services in Meeting Farmers' developmental goals/needs

Variables	Weighted Sum	Weighted Mean	Rating
Capacity Building	2230	5.0	1
Advisory Services	2230	5.0	1
Input Support	2191	4.9	2
Productive Asset Acquisition Support	2122	4.8	3
Rural Infrastructure	2041	4.6	4

Source: Field Data Analysis 2020

Very Well = 5, Well = 4, Moderately Well = 3, Poor = 2, Very Poor = 1.

CONCLUSION

It is obvious that Fadama III Farmers and groups in FCT had a good perception of CDD especially demand driven approach to addressing their individual, groups and community needs. The beneficiary farmers and groups experiences, increased access to input and services which resulted in increased productivity, income and general well-being of the participating farmers. The overwhelming of achievement of CDD/Fadama III program in FCT is the positive perception of the participating farmers and their group to continue to use resources and knowledge gained from the project even after the project period ends.

RECOMMENDATIONS

Capacity building and advisory services for potential beneficiaries of any poverty reduction/social investment program have emerged as the quintessential ingredients for successful achievement of set goals, thus, must be integral parts of program design and program implementation.

Access to quality inputs and assets should be based on clearly defined goals placed on adequate capacity with a good link to appropriate advisory services.

Trained input and asset providers/suppliers should be properly matched to prospective beneficiaries of the intervention to ensure a fruitful marriage of convenience for mutual benefits.

Community – owned small scale infrastructure that support/enhance production and productivity need to be put at the disposal of rural communities for sustainable development

and enhanced livelihood of the resource poor persons.

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PROFITABILITY ANALYSIS OF SUGARCANE PRODUCTION IN MAKARFI LOCAL GOVERNMENT AREA OF KADUNA STATE, NIGERIA

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ABSTRACT

This paper assessed the profitability of sugarcane production in Makarfi Local Government Area of Kaduna State, Nigeria. The population of the study was all sugarcane farmers in Makarfi local Government Area of Kaduna State. Multi-stage sampling procedure was used to select 210 sugarcane farmers used for the study. Data were collected with aid of questionnaire and analysed using descriptive statistics and Gross margin analysis. The results revealed that the mean age of the sugar cane farmers was 40.49 years, majority of the farmers are married, attended Qur'anic school, had average of 12.6. years of farming experience and average family size of 8 persons. The total fixed cost (TFC) was estimated to be ₦209,009. The net farm income (NFI) was ₦201,391 while the gross margin was ₦243,641/ha. Institutional support for sugarcane production was generally low. Major constraints associated with sugarcane production were inadequate capital and credit facilities, scarcity of agricultural land, and poor pricing of the products. This paper concludes that sugarcane production in the study area was profitable. It was recommended that Government should provide adequate support in form of subsidized inputs for sugarcane production in order to expand the profitability margin.

Keywords: Profitability, Sugarcane production, Makarfi LGA.

INTRODUCTION

Sugarcane belongs to the grass family Poacea which includes wheat, maize, millet rice and sorghum, and many forage crops. Sugarcane has three main products namely: sugar, bagasse and molasses. It is a tropical crop that usually takes between 8 and 12 months to reach complete maturity. Matured cane may be yellow, reddish, purplish, or green. The sugar industry is responsible for the production of refined granulated brown or cubed or raw sugar from sugarcane which is consumed as a basic food item. Sucrose is then extracted from the raw sugar and

refined in specialized mill plants. It is fermented to produce ethanol or used as raw materials in the food industry. Sugarcane serves as a raw material for a variety of products such as confectionaries, brewing beer, pharmaceuticals and soft drinks (Nasir, 2015).

Sugarcane is the largest crop by production quantity in the world, with 174.3 million tonnes produced in 2016. Brazil accounted for 41% of the total world production in 2012. The Food and Agriculture Organization estimated that sugarcane was cultivated on about 26 million Hectares (64 million acres), in more than 90 countries of the

globe (FAO, 2015). However, despite steady increase in sugar production worldwide from 153.4 million MT in 2009 to 177.58 million MT in 2014, the production fell to 164.8 million MT by 2015. Similar trend in decreasing sugarcane production is observed from 2017 to 2019 (Statistica Atlas, 2020) (Table 1).

Table 1: Total Sugarcane production worldwide from 2009 to 2019

Year	Production in million metric tonnes
2019	166.19
2018	179.66
2017	194.5
2016	174.03
2015	164.87
2014	177.58
2013	175.89
2012	177.84
2011	172.4
2010	162.2
2009	153.4

Adapted from Statista Atlas (2020)

Sugarcane is grown in over 200 countries of the world and in 2008, an estimated 158.5 million tonnes of sugarcane was produced worldwide (FAO, 2009). The top global sugarcane producer is Brazil. In 2017 Brazil tops the list of sugarcane producers with a production of 739 thousand metric tonnes (WorldAtlas, 2017). Brazil and India together were responsible for 57% of the world's sugar production while Africa contributed only 5% to global sugarcane production, of which 83% occurred in sub-Saharan Africa. Whereas most sub-Saharan African countries grow sugarcane in 2014, six countries accounted for more than half of the total production: South Africa (23%), Kenya (8%), Sudan (7%), Swaziland (7%), Zambia (5%) and Nigeria (5%) (Hess *et al.* 2016). Nigeria is one of the most important producers of sugarcane with a land potential of over 500,000 hectares of suitable cane

field capable of producing over 5.0 million metric tonnes of sugarcane, of which, when processed, would yield about 3.0 million metric tonnes of sugar (NSDC, 2013).

In Nigeria, sugarcane is one of the industrial crops available locally before 1982. It contributed to elevating the Nation's GDP through the agricultural sector. The industrial processing of sugarcane started in early 1960's in Nigeria (Amodu *et al.* (2011). Commercial farming of sugarcane did not start until 1950 while industrial production of refined sugar started in the early 1960s with the creation of the Nigeria Sugar Company (NISUCO) at Bacita, in Kwara State in 1964 and Savannah Sugar Company (SSCL) Numan, Adamawa State in 1980. The joint installed capacity of these mills is about 120,000 metric tons of processed granulated white sugar per annum. Conversely, the whole domestic production of sugarcane has varied between 16,000 Metric tonnes and 50,000 tonnes yearly, which can meet just 5 percent of the total domestic demand for sugar (Misari, in Girei *et al.*, 2013).

Over the years, the government has carried out policies aimed at boosting sugarcane production in the country. Some of the policies are: 50% tariff on importation of white sugar, 5% levy on imported raw sugar, 5-year tax waver to sugar refineries and privatization of the major sugar firms in the country, as well as the Nigeria's sugar expansion programme in collaboration with the African Development Bank and African Development Fund in 1989 and 1991 respectively. These packages were meant to stimulate local production and increase productivity as well as capacity utilization in the sub sector. In spite of these provisions, Nigeria sugar imports (i.e. the white and semi-refined sugar) have continued to rise reaching above 95% of domestic consumption (Girei and Giroh, 2010).

Despite the laudable government policies and the increase in sugarcane area harvested in Nigeria,

the annual sugarcane production and yield in 2018 was 1.42 million tonnes at a decreasing rate of 1.42 percent from 1.49 million tonnes produced in 2017, meanwhile the annual production of sugarcane in 2012 was 1.09 million tonnes which had an upsurge rate of 44.06 percent from 2011 production of 755,805 tonnes (Knoema Atlas, 2018). In the first seven months of the year 2017 Nigeria spent \$227million (N88.53billion) on sugar importation, this makes Nigeria the largest importer of sugar in sub-Sahara Africa (Nairametrics, 2016).

The trend of industrial sugar consumption in 2018 shows that soft-drinks sub-sector is the leading consumer of industrial sugar in Nigeria using 344,417 metric tonnes which represent about 33% of total sugar consumption by industries. Food and Beverages sector followed with a consumption figure of 273,749 metric tonnes representing about 26% of total sugar consumed by industries (NSDC, 2018). As reported from the survey carried out by the National Sugar Development Council (NSDC) in 2018, bakery and Confectionery came third with a consumption figure of 202 million metric tonnes while Pharmaceutical sub-sectors accounted for 195,262metric tonnes representing 19% and 18% of total industrial sugar consumption respectively. The least industrial consumer was the Dairy sub-sector which had a consumption figure of 41,890 metric tonnes representing just 4% of total industrial sugar consumption in 2018 (NSDC, 2018).

Nigeria imported over 750,000 thousand metric tonnes of raw sugar worth of ₦120 billion in 2018 (This Day, 2018). Furthermore, the stated policy of the government is to move Nigeria quickly from dependence on imports to at least 70 percent self-sufficiency in domestic sugar production (NSDC, 2018). Sugarcane can be cultivated almost in all the states locally, but commercially the top producers are

Katsina, Taraba, Kano, Adamawa Jigawa, Kebbi, Sokoto and Kaduna States. The total “Fadama” area in Kaduna state is estimated to be 80,000 ha out of this only 11,000 ha have been put under cultivation. The crops cultivated are mainly vegetables and among the cash crops is sugarcane. The state produces over 40,000 MT of sugarcane every year. Makarfi LGA accounts for about 39% (15,500MT) of the total annual state production (KADP, 2013).

The report of agricultural production survey conducted by KADP showed that the annual quantity of sugarcane production in the state declined from 18.9 tonne per hectare in 2010 to 18.02 tonne per hectare in 2018. Meanwhile NSDC ranked Kaduna state as the sixth highest sugar consumer in Nigeria with 18,022 metric tonnes consumed in 2018 (NSDC, 2018). This decline in production underscores the need to conduct empirical research to ascertain the profitability of sugarcane production in Makarfi LGA of Kaduna State.

OBJECTIVES OF STUDY

The general objective of this study is to estimate the profitability of sugarcane production in Makarfi Local Government Area of Kaduna State.

The specific objectives of the study are to:

- i. describe the socio-economic characteristics of sugarcane farmers in the study area;
- ii. determine the profitability of sugarcane production;
- iii. examine the institutional support for sugarcane production; and
- iv. identify the constraints to sugarcane productions.

METHODOLOGY

This research work was conducted in Makarfi Local Government Area of Kaduna State, Nigeria. The of Makarfi Local Government Area lies between U° 22N longitude and 7°52E latitude. The Local Government has the total of ten wards namely; Danguziri, Dandamisa, Gubuchi, Gwanki, Gimi, Gazara, Nasarwa doya, Sabon garin Makarfi, Makarfi, and Mayare. The Makarfi Local Government Area of Kaduna its headquarters is in the town of Makarfi. It has an area of 541km² and a population of 146, 259 as at 2006. Using the 3% annual population growth, the population is estimated at 203,300 people in 2019. Agriculture is the major economic activities in Makarfi LGA. Major crops produced are sugarcane, maize, sorghum, rice and vegetables. There are two distinct seasons in the local government area namely: wet and dry. The rainy season generally begins in April and ends in October, while dry season falls between October and March. The average rainfall is about 1,482 mm, while temperature ranges from 35°C to 36°C during the humid period to as low as 10°C, 23°C during the winter periods of November to February.

Makarfi area is blessed with fertile and with number rivers which favours crop farming including sugarcane. In Makarfi market day, many merchants of sugarcane do come and transport it to other parts of the country and even beyond the Nigerian borders. Estimate land area cultivated for sugarcane production was about 2500 hectares yielding about 30-40 tie (bundles) (about 75000-100,000) of sugarcane per hectare (KADA, 2016).

Sampling Procedure and Sample Size

Sugarcane farmers in Makarfi local Government Area of Kaduna constitute the population of this study. For this study, multi-stage sampling technique was employed. In the first stage,

Gwanki, Mayere, Gubuchi, Gazara, and Makarfi Wards were purposively selected due to their prominence in sugarcane production in the Local Government Area (KADP, 2015). In the second stage, ten villages were purposively selected (two from each of the selected Ward). In the third stage, only 20% of the total number of sugarcane farmers in each of the ten villages were randomly selected for this study. This represented a sample size of 210 respondents (Table 2).

Interview schedule was used to collect primary data for the study. The instrument was validated by experts from National Agricultural Extension and Research Liaison Services (NAERLS) and Department of Vocational and Technical Education, Ahmadu Bello University, Zaria Nigeria.

Table 2: Sample distribution of sugarcane farmers

Ward	Village	Total № of farmers	Sample size (20%)
Gwanki	Dorayi	121	24
	Tafida	130	26
Gazara	Gangara	99	20
	Gazara	110	22
Gubuchi	Gubuchi	109	22
	Sabon Gari	89	18
Mayere	Meyere	75	15
	Durum	101	20
Markarfi	Kwaleji	111	22
	Doka	105	21
Total		1,050	210

Data Analysis

Descriptive statistics, which include percentage and frequency were used to analyze objectives i, iii and iv, while Net Farm Income (NFI) was also used to determine the objective ii.

The formula of NFI is expressed thus:

$$\text{NFI} = \text{TR} - \text{TC} \dots\dots\dots (1)$$

$$\text{TR} = \text{GFI} = \text{TVP} = \text{TPP} \cdot \text{Px} \dots\dots\dots (2)$$

$$\text{TC} = \text{TVC} + \text{TFC} \dots\dots\dots (3)$$

$$\text{GM} = \text{GFI} - \text{TVC} \dots\dots\dots (4)$$

$$\text{GFI} = \text{TVP} = \text{TPP} \cdot \text{Px} \dots\dots\dots (5)$$

Where:

NFI = Net Farm Income (₦)

TR = Total Revenue (₦/ha)

GFI = Gross Farm Income (₦/ha)

TVP = Total Value of Production (₦/ha)

TPP = Total Physical Product (Kg/ha) and

Px = Unit market price of the product (₦/kg)

TC = Total Costs (₦)

TFC = Total Fixed Cost (₦)

TVC = Total Variable Cost (₦/ha)

GM = Gross Margin (₦/ha)

RESULTS AND DISCUSSION

Socio-economic characteristics

Result in Table 3 reveals the socio-economic characteristics of the respondents. On the basis of gender, 77.14% was male while 22.84% was female. This is in line with Haruna and Kushwaha (2012) that majority of farmers in the wetland or Fadama areas of Bauchi state were male. The mean age of the sugarcane farmers was 40 years

with majority falling into the age group of 31-40 years. This could be considered as productive age bracket (Haruna and Kushwaha, 2012). Based on marital status, 63.81% were married, 21.9% were single, 5.23% were widowed while 9.04% were divorced. This confirms the findings of Haruna and Kushwaha (2012) which reported that this high proportion of marriage indicates greater responsibilities for catering to their family needs.

Also, with respect to educational qualification, 38.9% attended Qur'anic school. Babalola *et al* (2017) found similar result of low education among sugarcane farmers in Jigawa State. On farming experience of the respondents, the mean farming experience of the farmers was 13 years. The mean farm size was 1ha. This result conforms to the assertions of FAO, (2007) that the largest proportion of total farm holdings in Nigeria is small scale holdings below 5.0 ha. Furthermore, on visitation by extension agents, 32.85% indicated that they were visited by extension agents while 67.15% indicated that they had not been visited by extension agents. On the basis of frequency of visitation, Table 3 also reveals that 75.36% were visited monthly while 24.64% were visited fortnightly. Also, 69.1% indicated farming as their primary occupation while 30.9% indicated business.

Profitability Analysis of Sugarcane Production

Table 3: Socio-economic characteristics of respondents (n=210)

Socio-economic characteristics	Frequency	Percentage	Mean ($\bar{x}$)
Gender			
Male	162	77.14	
Female	48	22.86	
Age (years)			40.49
20-30	44	20.95	
31-40	74	35.23	
41-50	52	24.74	
51-60	25	11.9	
>60	15	7.14	
Marital status			
Married	134	63.81	
Single	46	21.9	
Widowed	11	5.23	
Divorced	19	9.04	
Highest Educational Qualification			
Qur'anic	80	38.09	
Primary	48	22.85	
Secondary	50	23.80	
Tertiary	32	15.52	
Farming Experience (years)			12.6
1-10	126	60	
11-20	44	20.95	
>20	40	19.05	
Family size			8
1-5	84	40	
6-10	61	29.1	
>10	65	30.9	
Farm size (ha)			1.37
<1	23	10.95	
1-2	173	82.3	
>2	14	6.66	
Visitation by extension agent			
Yes	69	32.85	
No	141	67.15	
Frequency of visitation by extension (n=69)			
Fortnightly	17	24.64	
Monthly	52	75.36	
Primary Occupation			
Farming	145	69.1	
Business	65	30.9	

Source: Field Survey (2019)

Table 4: Cost and Return of Sugarcane

Input	Cost (₦/ha)	Percentage of Total Cost
a. Variable Cost		
Cost of seed	29,420	14.08
Cost of land preparation	23,390	11.19
Cost of fertilizer application	37,579	17.98
Cost of irrigation	20,225	9.68
Cost of weeding	22,470	10.75
Cost of harvesting	25,673	12.28
Cost of agrochemicals	8,002	3.83
Total Variable Cost (TVC)	166,759	79.79
b. Fixed cost		
Cost of land	42,250	20.21
Total Fixed Cost	42,250	20.21
Total Cost of Production	209,009	
c. Return		
Unit price	1,200	
Total output	9666 ties	
Average output	342 ties	
Total revenue	410,400	
Net Farm Income	201,391	
Gross margin	243, 641	

Source: Field Survey (2019)

Cost and Return of Sugarcane Production

Result in Table 4 shows the cost and return of sugarcane production per hectare which consist of both the total variable cost (TVC) and total fixed cost (TFC) estimated to be ₦209,009. The total fixed cost and variable cost used in the analysis were defined to include inputs such as cost of seed, cost of land preparation, cost of fertilizer application, cost of irrigation, cost of weeding, cost of harvesting, and cost of agrochemical.

These inputs are referred to as variable input while cost of land was considered as the fixed input. From this analysis it was observed that the estimated total revenue in the study area was ₦41,0400 per hectare. This was obtained by multiplying the average sugarcane output by the

unit price. The total variable cost was ₦166,759. The total fixed cost was ₦42,250; that is the cost

of land. By subtracting total variable cost and total fixed cost (i.e. total costs) from the total revenue

respectively, the net farm income of sugarcane farmers in the study area per hectare was realized to be ₦201,391 while the gross margin was ₦243, 641/ha by subtracting the total revenue from total variable cost as presented in Table 4. Hence, it is vivid to say sugarcane production in the study area was profitable. Girei and Giroh (2012^b) found similar result.

Result in Table 5 revealed that 51.9% indicated that they belong to sugar cane farmers association while 48% indicated they did not belong to any sugar farmers association.

Profitability Analysis of Sugarcane Production

Result in Table 6 revealed that 21.11% indicated that the kind of benefit they gained from sugarcane farmers association is skills, 24.77% indicated capital benefit, 29.35% indicated experience while another 24.77% indicated other benefits.

Institutional Supports for Sugarcane Production

Result in Table 7 shows responses on the institutional supports received by sugarcane farmers. Institutional support for sugarcane production was generally low. Majority (73.3%)

received support from cooperatives. Only 22% of the farmers received support of private organizations. Fertilizer was received by 33.8%. There was no certainty that the fertilizer was actually meant for sugarcane production. Majority 67.6% of farmers did not receive extension support. Only produce buying recorded 35% support. This could have been by organizations that require the produce for industrial use. The majority (84.7%) got ≤ ₦50,000 credit support in the previous year.

Table 5: Membership of sugarcane association

Membership	Frequency	Percentage (%)
Yes	109	51.9
No	101	48

Source: Field Survey (2019)

Table 6: Benefits derived from sugarcane farmers' association (n=109)

Benefits derived from membership of association	Frequency	Percentage (%)
Skills	23	21.11
Capital (input subsidy)	27	24.77
Experience	32	29.35
Others	27	24.77

Source: Field Survey (2019)

Table 7: Institutional supports for sugarcane production

Variables	Frequency	Percentage
Institution*		
Government	41	19.5
ADP	31	14.8
International donor agency	24	11.4
NGO	26	12.4
Research Institutes	30	14.3
Private organization	48	22.9
Banks	42	20.0
Cooperative	154	73.3
Types of support		
Inputs*		
i. Planting material	64	30.5
ii. Fertilizer	71	33.8
iii. Agrochemical	42	20.0
Extension & training (in the last one year)		
i. Not at all	142	67.6
ii. Once in a while	61	29.1
iii. Regular	7	3.3
Marketing*		
i. Linkage	32	15.2
ii. Produce buying	75	35.7
iii. Price support	29	13.8
iv. Value addition	25	11.9
v. Provision of market information	33	15.7
vi. Provision of market logistics	29	13.8
Credit/finance (₦)		
i. ≤50,000	178	84.8
ii. 51,000-100,000	22	10.5
iii. >100,000	12	5.7

*Multiple responses indicated

Table 8: Constraints associated with sugarcane production

S/№	Constraints	Total score	Weighted mean	Rank
1	Inadequate capital and credit facilities	586.8	4.08	1st
2	Scarcity of agricultural land	821	3.91	2 nd
3	Poor pricing of products	816.9	3.89	3 rd
4	High cost of fertilizer	783.3	3.73	4 th
5	Inadequate extension agents	761.7	3.63	5 th
6	Scarcity of fertilizer	730.8	3.48	6 th
7	Inadequate information	682.5	3.25	7 th
8	High cost of labour	674	3.21	8 th
9	Low demand of crop	653	3.11	9 th
10	High cost of transportation	588	2.8	10 th

Constraints Associated with Sugarcane Production

Result in Table 8 shows that the major constraints associated with sugarcane production in the study area was inadequate capital and credit facilities (weighted mean=4.08). Wayagari *et al.* (2003) found similar result in the Central Zone, Nigeria. Land scarcity (weighted mean=3.91) ranked 2nd while poor pricing of products (weighted mean=3.89) ranked 3rd. This finding conforms with that of Dlamini (2009), who found inadequate inputs and facilities as major constraints to sugar production in Kaduna State. Wada *et al.* (2017) also found high cost of transportation as a major problem of sugarcane production in Northern Nigeria.

CONCLUSION AND RECOMMENDATIONS

From the findings of this study, it is concluded that sugarcane production in the study area was profitable despite the constraints associated with its production. The sugarcane production in the study area is profitable with a net farm income (NFI) of ₦201,391 and gross margin of ₦243,641/ha. Generally, there was low institutional support for sugarcane production.

Based on the study, the following recommendations were made:

- i. Government and non-governmental organizations should give adequate supports in terms credit/finance, inputs to the sugar farmers since inadequate credit and inputs are the major challenges facing the farmers in the study area.
- ii. The farmers should form a formal and strong sugarcane farmers association that would represent their interest. This would help them to have better access to institutional supports, enhance their linkages and command good prices for their produce.

iii. An effective system should be put in place where farmers should be linked with service providers such as financial institutions, insurance companies as well as other private community money lenders.

iv. Government should provide adequate infrastructure such as construction of good roads and repairing the bad ones so as to ease the movement of farmer's goods from the farms to the market.

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SOCIO-ECONOMIC FACTORS INFLUENCING FARMERS' PARTICIPATION IN COCOA FARMER FIELD SCHOOL TRAINING PROGRAMME IN ABIA STATE, NIGERIA

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ABSTRACT

The study analyzed the socio-economic factors influencing farmers' participation in Cocoa Farmer Field School (FFS) training programme in Abia State, Nigeria. The study specifically described the socio-economic characteristics of the respondents; ascertained the levels of cocoa farmers participation and perception of cocoa farmers on the training programme. Purposive and multistage random sampling procedures were used to select 180 respondents. Data were collected with the aid of a structured questionnaire and analyzed using both descriptive and inferential statistics (multiple regression analysis). The results showed that mean age of participating cocoa farmers was 50.1 years, 45.0% had secondary education, mean annual farm income of ₦394,225.80 with cocoa mean output of 23,706kg. Results also showed that the cocoa farmers had high participation ($\bar{X}=3.8$) and positive perception ($\bar{X}=3.4$) in Farmer Field School training programme. The multiple regression analysis result showed that coefficients of age, education and income, farming experience and cocoa output influenced respondents' participation in Farmer Field School training programme in the study area. Policies aimed at providing affordable education for the beneficiaries and farm inputs were advocated for increased participation in the programme.

Key words: Socio-economic, factors, participation, FFS, cocoa farmers

INTRODUCTION

Cocoa (*Theobroma cacao* L.) is an important tree crop that has played significant role in Nigeria economy, especially in providing jobs and income to farmers, raw materials for the industry and foreign exchange for the country (Alamu, 2013). West Africa has been the largest producer of cocoa (World Cocoa Foundation, 2015). In Nigeria, the types of cocoa distributed to farmers are the West African Amelonado, Amazon cocoa and hybrid cocoa. Nigeria has fourteen cocoa belts and the cocoa producing States are grouped into three categories, according to their levels of production (Cocoa Research Institute of Nigeria (CRIN,

2010). According to Adegun, (2014), after the discovery of oil, there was a shift in focus from agriculture to oil exploration. Oseni, (2011) asserted that after the decline in Nigerian agricultural production in late 1970's, and subsequent decline in cocoa annual output, various strategies to revive the agricultural sector have been tested by stakeholders particularly in cocoa production. Most of the cocoa farms in Abia State were established over 40 years ago. Each cocoa farm has an average of 2-6 hectares, with distribution between 0.5 to 2.0 hectares scattered in 2 to 7 different locations, with production output of 5,000 metric tonnes annually, in the seventies (Abia National Cocoa Report, 2009).

In order to boost production, organized cocoa farmer groups were promoted as a useful entry point through implementation of food security programme and other community development projects at all levels. Unfortunately, group approach to a large extent was unable to address the complex problems associated with cocoa based farming system in Nigeria (Liverpool-Tasie, 2012; Nwaobiala *et al.*, 2019). The effects of excluding stakeholders in group formation were not seriously considered and farmer's input into the innovation generation and dissemination processes were largely neglected (Mulema, 2012; Nwaobiala and Odoemelam, 2013).

Several agricultural extension approaches from top-down to more participatory extension service have been tried in Nigeria and other countries of the world including Nigeria (Nwaobiala, 2015). The Farmer Field School (FFS) approach emerged out of the need to solve a concrete immediate problem. The FFS is bottom-top participatory extension approach for technology validation and dissemination which aim to empower farmers to improve their agricultural output (Akinmusola, 2016). Thus, application of participatory approach in research improves farmers' capacity for research, innovation and informed decision-making and stimulates farmers to become facilitators of their own research and learning process. This ultimately makes research recommendations not only accessible, but also position farmers as the originator of research with meaningful impact on their livelihood. The non-involvement in innovation generation and dissemination process greatly influences their decision and hence resulting in low participation of farmers in the programme research recommendation (Adeloye, 2015; Nwankwo *et al.*, 2010).

In Abia State, non-beneficiaries of Farmer Field School did not participate in the Integrated Crop and Pest Management (ICPM) training programme and Pest Control is still a major

problem in their farm management. To this effect, Ministry of Agriculture mounted serious advocacy, for knowledge sharing among the beneficiaries, and non-beneficiaries of Farmer Field School Training Programme (FFS) (Abia State Ministry of Agriculture, 2009). The acquired innovations by participants of (FFS), does not diffuse well to other community members, without the explanatory activities that are the key ingredients of the FFS approach, may convey to the participants. The follow up of farmer to farmer informal communication cannot be relied upon the diffuse the knowledge to others in the community. Since farmer's participation has been demonstrated in various donor sponsored agricultural development programmes, it is therefore expedient to understand the factors influencing cocoa farmers' participation in farmer Field School Training programme in Abia State, Nigeria.

The specific objectives were to;

Describe socio-economic characteristics of Farmer Field School (FFS) farmers

Ascertain levels of farmers' participation in the cocoa programme training technologies

Assess farmers' perception about the cocoa programme training technologies; and

Research Hypothesis

H₀: There is no significant relationship between socio-economic characteristics of the respondents and their participation in Cocoa Farmer Field School (FFS) training programme

METHODOLOGY

Study Area

The study was conducted in Abia State. Abia State is located in the South-East agro-ecological zone of Nigeria. According to National Population Commission, (2017) census report, Abia State has

an estimated population of 3,727,300 people. Abia State lies within Longitude $7^{\circ} 23'E$ and $8^{\circ} 2'E$ and Latitude $4^{\circ} 47'N$ and $6^{\circ} 12'N$. The State shares common boundaries on its North and North East, by Anambra, Enugu and Ebonyi States. Cross River and Akwa Ibom States are in the East and South-East, while it shares its borders at the South with Rivers State, which is demarcated by Imo River. Abia State is made up of 17 Local Government Areas and three agricultural zones namely, Aba zone, Ohafia zone and Umuahia zone. The six major cocoa belts in Abia State are Ikwuano, Bende, Ohafia, Arochukwu and Umuahia North and Umuahia South Local Government Area respectively (Abia State National Cocoa Day Report, 2009).

Sample Size and Data Analysis

Purposive and multi-Stage random procedure was adopted in the study. First, six (6) Local Government Areas (LGAs) were purposively chosen (Ikwuano, Bende, Umuahia North, Umuahia South, Ohafia, and Arochukwu) because they were the major cocoa producing area of the State that participated in the Cocoa Farmer Field School Programme. Second, 2 (two) participating autonomous communities were selected using simple random method, from each of the selected LGAs that gave a total of twelve 12 autonomous communities. From the selected communities, 15 (fifteen) cocoa farmers were randomly selected which gave a sample size of 180 participants. The objectives were realized with descriptive statistics such as frequency counts mean scores and percentages, while the hypothesis was tested using multiple regression analysis.

Measurement of variables

The level of cocoa farmers' participation in the Farmer Field School trainings was realized and rated on a 5- point Likert type scale of always (5), often (4), occasionally (3), seldom (2), and never (1). The bench mark was obtained thus;

$5+4+3+2+1 = 15$ divided by 5 to give 3.0. Mean participation scores of 3.0 and above implied participation and otherwise no participation.

Perception of cocoa farmers of FFS training programme was realized using a 5 point, likert-type scale of strongly agree = 5, Agree = 4, undecided = 3, disagree = 2 and strongly disagree = 1. The bench mark was obtained thus; $5+4+3+2+1 = 15$ divided by 5 to give 3.0. Mean perception scores of 3.0 and above implied positive perception and otherwise negative perception.

Model Specification

Multiple regression analysis was used determine socio-economic characteristics of cocoa farmers and their participation in Farmer Field School trainings. The four functional forms of regression model viz: linear, semi-log, exponential and Cobb-Douglas were tried. The best fit was chosen as the lead equation based on its conformity with econometric and statistical criteria such as the magnitude of R^2 , F-ratio and number of significant variables.

The four functional forms are expressed as follows:

- i, Linear Function

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + e_i$$
- ii, Semi – log function

$$Y = L_n \beta_0 + \beta_1 L_n X_1 + \beta_2 L_n X_2 + \beta_3 L_n X_3 + \beta_4 L_n X_4 + \beta_5 L_n X_5 + \beta_6 L_n X_6 + \beta_7 L_n X_7 + \beta_8 L_n X_8 + \beta_9 L_n X_9 + e_i$$
- iii, Exponential function

$$L_n Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + e_i$$
- iv, Cobb Douglas Function

$$L_n Y = L_n \beta_0 + \beta_1 L_n X_1 + \beta_2 L_n X_2 + \beta_3 L_n X_3 + \beta_4 L_n X_4 + \beta_5 L_n X_5 + \beta_6 L_n X_6 + \beta_7 L_n X_7 + \beta_8 L_n X_8 + \beta_9 L_n X_9 + e_i$$

Where;

Y = participation of famers in the programme trainings (mean scores)

β_1 = age (years)

β_2 = sex (male = 1, otherwise = 0)

β_3 = marital status (1 = married, 0 = single)

β_4 = household size (number of persons)

β_5 = education level (Number of years spent in school)

β_6 = farmers experience (years)

β_7 = farm size (hectares)

β_8 = cocoa output (kg)

X_9 = cocoa output (kg)

e_i = error term

RESULTS AND DISCUSSION

Selected socio-economic characteristics of respondents

The socio-economic characteristics of respondents are shown in Table 1. The result showed that mean age of farmers was 51.2 years while 45.0% acquired secondary education. This result implies that the respondents were young, active and in their productive ages. Farmers in their active age are expected to supply the labour required during farming operations. This result conforms to the

findings of Akinbile *et al* (2013) that majority of the rural populace in Nigeria are actively involved in farming activities. Farmers' level of education is an added advantage in terms of achieving huge yield/output, efficient marketing and sustainable cocoa production (Farmuyiwa *et al.*, 2012). This finding supports Moyib *et al.*, (2013) that higher level of education determines the quality of skills of farmers, their abilities, efficiency and how well informed they are of the innovations and technologies disseminated to them. The result shows that a moderate proportion (46.7%) of the farmers had 20 years farming experience with mean annual farm income of ₦394, 225.8 and cocoa bean output of 23706kg/hectare. Simonyan *et al.*, (2012) found that farming experience has been shown to enhance the participation and adoption of improved farming techniques by farmers thereby increasing agricultural output. Oseni *et al.*, (2013) observed that increase in income would enable poor households to save more financial resources and consequently gain the required financial ability to invest in cocoa production. Oguntade, (2013) asserted that the total output realized by farmers in donor-sponsored agricultural programme technologies create favorable disposition for effective participation.

Table 1: Socio-economic Characteristics of Respondents in the Study Area (n = 180)

Variables	Indices
Mean age (years)	50.7
Secondary education (years)	45.0
Mean farming Experience (years)	20.0
Mean farm income (Naira)	394225.8
Mean cocoa bean output (kg)	23706

Source: Field Survey 2018

Level of Farmer's Participation in Cocoa Farmer Field School Trainings

Result in Figure 1 showed the distribution of respondents based on their extent of participation in Farmer Field School training programme. The grand mean of 3.8 indicates that the participants in Farmers Field School had high level of participation in the training programme. This may be attributed to the perceived benefits accruing from the programme, as well as the relevance of the training to their cocoa farm enterprise. Furthermore, the participants had high level of participation in all the components of the FFS training programme which indicates a strong desire from the farmers to improve in all aspect of their cocoa enterprise. In corroboration with the findings of this study, Sustainable Tree Crop programme (2009) used Farmer Field School programme to evaluate the output on agricultural practices, and knowledge of integrated crop and pest management by the cocoa farmers in both Cross River and Ondo States, and they found that the Farmer Field School programme induced the

farmers in these States to promote good agricultural practices in cocoa production. Furthermore, the Farmer Field School programme in Nigeria had given wider knowledge of key factors of cocoa production and the required technical efficiency of cocoa farmers in Nigeria. Farmer Field Schools had shared knowledge of effective utilization of farm inputs, to achieve efficiency in cocoa production among cocoa farms participants in the extension programme in cocoa belts of Nigeria (Nwaobiala, 2014).

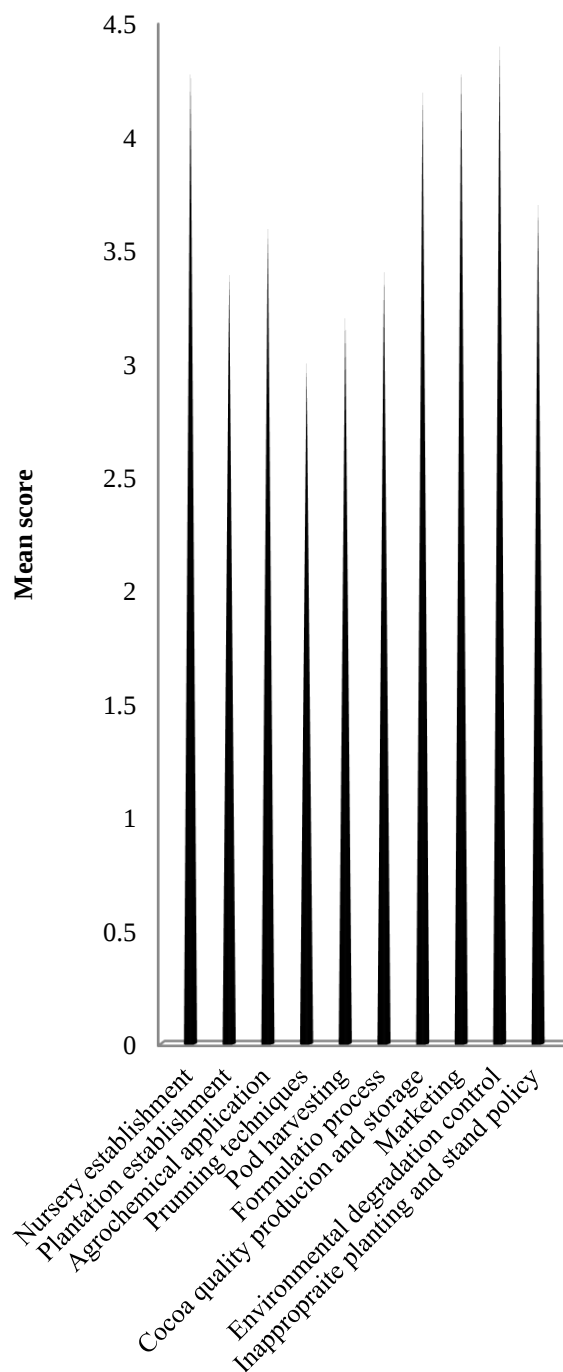


Figure 1: Level of farmers participation in cocoa farmer field school training programme

Perception of Cocoa farmers about Farmer Field School Training Programme

The result in Figure 2 showed perception of cocoa farmers about FFS Training programme in the study area. The result revealed cocoa farmers had positive perception ($\bar{X} = 3.4$) on the programme trainings. The result suggest that participants in the programme are more aware of the benefits associated to FFS training programme. The knowledge acquired in FFS programme had

further assisted the farmers to improve their agricultural productivity, household income and food security. Furthermore, Farmer Field School participants were better equipped towards handling critical matters in the farm, through analytical skills, critical thinking and ability to make better decisions. Orimogunjeet *al.*, (2019) opined that the technologies and trainings disseminated by Farmer Field School facilitators were yield enhancing which increases cocoa production.

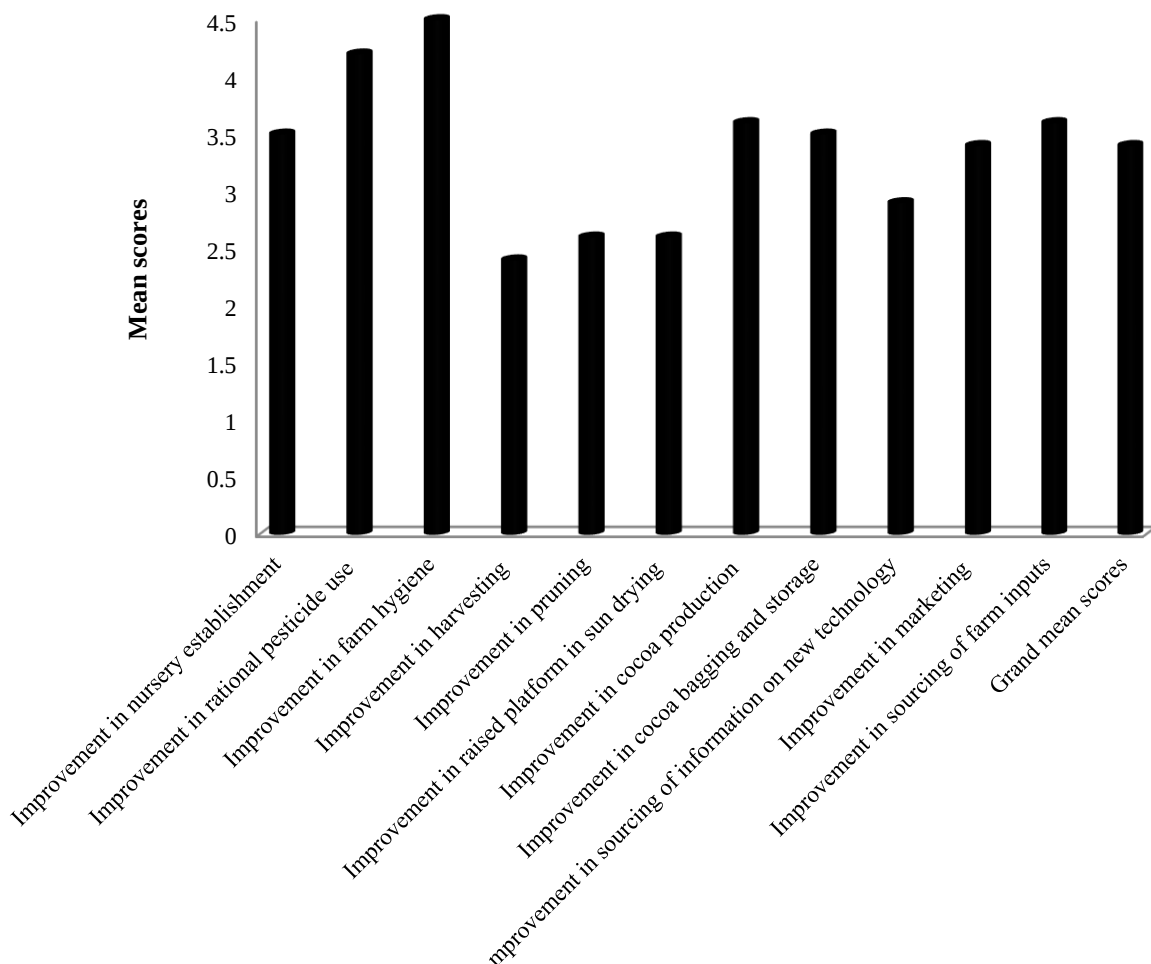


Figure 2: Perception of cocoa farmers about farmer field school trainings

Table 2: Multiple regression estimates of socio-economic characteristics of the respondents and their participation in the programme trainings in the study area

Variables	Parameters	Linear	Exponential	Semi-log+	Cob Douglas
Constant	B ₀	65249.516 (1.286)	10.467 (16.207)***	1.292E6 5.446***	4.305 (4.731)***
Age	β ₁	-25772.915 (-1.723)*	-0.153 (-0.755)	-93237.124 (-2.914)***	0.756 (-2.256)**
Sex	β ₂	418.022 (0.806)	.006 (0.845)	21777.121 (0.644)	.371 (1.048)
Marital status	β ₃	-4445.507 (-0.359)	-0.052 (0.529)	-33766.830 (-1.203)	-.172 (-0.586)
Household size	β ₄	945.149 (0.252)	.025 (-0.048)	-22358.072 (-1.090)	0.195 (-0.907)
Education	β ₅	246.548 (10.152)***	0.011 (5.537)***	1613.220 (7.055)***	0.188 (6.611)***
Farming experience	β ₆	2945.011 (1.841)*	.023 (1.714)*	38490.305 (2.284)**	.298 (1.876)*
Income	β ₇	11.125 (13.307)***	5.368E-5 (5.044)***	164878.706 (9.803)***	.844 (4.788)***
Farm size	β ₈	18136.906 (0.768)	.037 (0.121)	31148.830 (0.998)	.150 (0.198)
Cocoa output	β ₉	0.017 (2.487)**	2.345 (2.775)***	1.4938 (3.005)***	0.028 (11.232)***
R ²		0.887	.617	0.890	0.608
R-Adjusted		0.861	0.538	0.866	0.508
F – ratio		34.833***	7.157***	18.966***	6.038***

Source: *Field Survey, 2018*

* p≤ 0.10, ** p≤ 0.05 and ***p≤ 0.01

Result in Table 2 shows the multiple regression estimates of the relationship between the socio-economic characteristics of the respondents and their participation in FFS programme trainings. The four functional form of multiple regression were analyzed and semi-log functional form was selected based on the magnitude of R² value, number of significant variables and F- ratio. The R² (coefficient of multiple determination) value was 0.89 which implied that 89% of the total observed variations in the dependent variable (Y) were accounted for, while 11% of the variation was due to error. F–statistics was significant at 1% indicating a very high fitness of the model used for the analysis. The F-ratio (18.966) was statistically significant at 5.0%. The coefficient of age was statistically significant at 1.0% and negatively related to the output. This inverse relationship implies that as the age of the farmers increase their

participation in the programme trainings decreases. The result is in agreement with Nwaobiala, (2017) who reported that education was a strong determinant of participation among IFAD farmers in Abia and Cross River States. The coefficient of education was statistically significant at 1% and positively related to output. This implies that as the farmer's educational level increases, participation in the programme trainings increases. This is in agreement with *a prior expectation*. Generally education is thought to create a favourable mental attitude for the acceptance of new practices especially of information intensive and management practices (Onwumere *et al.*, 2010). The coefficient of farming experience was significant at 5.0% and positively related to participation in the programme trainings. The result implied that a unit increase in the years of farming will lead to an increase in the participation in the programme trainings. The positive effect of farming

experience is thought to stem from accumulated knowledge obtained from years of observations and experimenting with various technologies (Bonabana-Wabbi and Taylor, 2008). The coefficient of income was significant at 1.0% and it is positively related to participation. This implies that a unit increase in income will lead to an increase in participation in the programme trainings. This may be attributed to the fact that an increase in income will enable the farmer to adopt improved farm technologies, secure farm inputs and relevant agricultural information. The result corroborates with that of Ebewore and Emuh, (2013) who found that cocoa farmers' income encourages their participation of cocoa farmers in input delivery agencies. The coefficient of cocoa output was significant at 1.0% and it is positively related to participation. This implies that a unit increase in income will lead to an increase in participation in the programme trainings. This may be attributed to the fact that an increase in income will enable the farmer to adopt improved farm technologies, secure farm inputs and relevant agricultural information. Opalauwa *et al.*, (2019) reported that farmers output enhances participation of beneficiary farmers in agricultural development programmes.

CONCLUSION

The study concluded that cocoa farmers had high participation and positive perception in farmer field school programme trainings. Multiple regression results showed that age, education, farming experience, farm income and cocoa output influenced farmer's participation in the programme.

The study therefore recommends that;

Since education had positive influence on cocoa farmers' participation, deliberate policy should be enacted to strengthen access to education to farmers. In order to achieve this, adult education centres should be located in the rural areas to

complement Farmer Field School Approach stated objectives.

The programme should provide inputs to participating farmers as and when due. This will lead to increased farmers' income and cocoa output.

Experienced farmers in the programme should be encouraged to remain in cocoa farming by providing them with credit facilities to enhance their participation in the programme.

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EFFECT OF CLIMATE CHANGE ON NIGERIAN AGRICULTURE: LEVEL OF AWARENESS AND THE ROLE OF AGRICULTURAL EXTENSION

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ABSTRACT

This study is an overview of climate change effects in Nigeria particularly on food production. The degree of natural disaster occurrence in form of flood, erosion, drought, deforestation, crop losses, dwindling population of common and uncommon animal species have taken toll on human developments particularly agriculture. The methodology was based on review of existing secondary information sources and the researcher's field experience among smallholder farmers. The consequence of these scenarios on human beings has led to famine, wars, terrorism, pests and diseases outbreak, loss of lives and infrastructure among others globally. The tension is more in developing countries and Nigeria is receiving a heavier weight of these challenges due to the large population, poor linkage between agricultural programme planning and execution among others. Climate change effect is gradually increasing in scope but the awareness creation among farmers and integration of agricultural extension principles is poor contrary to the burden of increasing adverse effects of climate change and its complexity. The role of extension principles and adoption process were examined in this study as means of exploiting the various adaptation and mitigation strategies. The recommendations emphasized creation of effective advocacy campaign on effects of climate change among smallholder farmers, prompt alert on signals of impending climate change disasters through extension and adoption of coping strategies by involving farmers in all stages of planning and execution. The integration of indigenous knowledge on climate change adaptation measures to support the efforts of meteorologists and other researchers is also important.

Keywords: Climate change. Extension. Awareness. Adaptation. Food security. Adoption.

INTRODUCTION

Climate and weather variation is an age long experience with mankind spanning several decades from early age. The current experiences in this century are becoming pronounced varied and unusual from the expected weather patterns. The unpredictable nature of weather and climate variation is becoming complex that meteorologists are employing various devices to forecast and guide but the variation is gaining new dimensions with time. Climate change presents profound

challenge to food security and sustainable development in Africa such that the negative impacts are likely to be greatest in the region which is already food insecure (Hailu 2017). The challenge of food insecurity in Africa is great with 243 million malnourished, 38 million children under the age of three years old stunted in growth and 10 million young children obese (Adesina 2018). The negative effect of climate change on food security is worrisome apart from its influence on other areas of human development.

The Gross Domestic Product of Agricultural sector in Nigeria was 24.44% in 2017 and the rice production dropped between 2016 and 2018 compared to the situation in 2015. The rice demand per annum is 7.8 million tonnes while the total production is 5.8 million tonnes (Ibirogbu 2018). The growth achievement in food production in the immediate past was lost due to climate change devastating effects among other factors. .

Therefore, the catalytic effect of climate change disasters on agriculture must be arrested on all fronts particularly using agricultural extension to educate the African small holder farmers on the adaptation and mitigation measures.

The West Africa sub-region has been severally affected by adverse effects of climate change with Nigeria the giant of Africa more affected. Nigeria was classified as one of the ten most vulnerable countries in the world based on climate change index by the 2014 World Climate Change Vulnerability Index published by global risk analytics company, Verisk Maplecroft (Ibrahim 2017).

OBJECTIVE

The general objective was to review the effects of climate change on agricultural activities in Nigeria and the role of agricultural extension principles and adoption process.

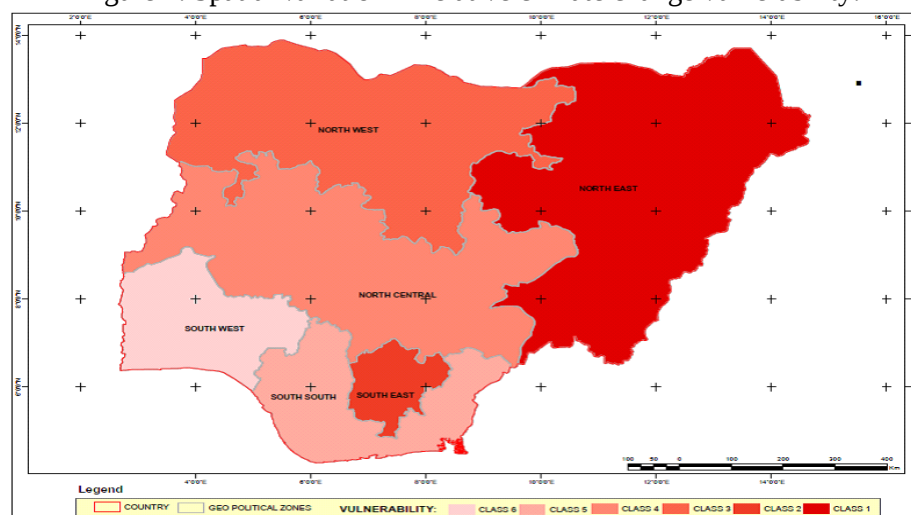
Specific objectives include:

1. Enhancement of knowledge on climate change concepts and its potential impacts on Nigerian agriculture.
2. Review of some secondary data sources on effect of climate change in Nigeria and some of the efforts of the government in relation to global efforts.
3. Elucidate on the role of extension principles and adoption process on the challenges of climate change.

EFFECT OF CLIMATE CHANGE IN NIGERIA

The map of Nigeria below in figure 1 provide information on the vulnerability class of various regions in the country

Figure 1. Spatial variation in relative climate change vulnerability.



Source: Nigeria's INDC. Climate Change Adaptation Impacts and Vulnerability (FEM)

The effect is significantly noticeable across Nigeria from the South with heavy rainfall mean average of 3500mm along the coast to the drier North with very low rainfall of less than 600mm mean annual rainfall and eleven states including Sokoto were threatened with desertification affecting the livelihood of some forty million people (Unah 2017).

The devastating effect of flooding, drought desertification and emergence of insect pests among other factors is gaining different dimensions annually. The value of agricultural extension as a tool to harmonise all the current adaptation and mitigation efforts at global level to educate farmers cannot be over emphasised.

Nigeria as an agrarian nation even though agriculture had suffered neglect due to diversion of attention to oil revenue and currently the negative effect of climate change is taking its toll as aggravated by the peculiarity of the various regions. The Eastern Nigerian battling with severe soil erosion, the Western Nigeria attempting to cope with high forest which affect mechanised agriculture and the Northern Nigeria with the challenge of low rainfall, wind erosion, drought and desertification even though the land favours mechanised agricultural.

Adejuwon (2004) asserted that the effect of climate change has become more threatening not only to sustainable development of socioeconomic and agricultural activities but to the totality of human existence. It is not limited to crop production but livestock production and total agricultural sector. The various challenges raised above could have been harnessed for agricultural development if proper connection is made between the nation's agricultural policy, fund allocation and realistic execution of sustainable agricultural development projects which are already on the drawing boards. Ayinde *et al* (2011) noted that the effect of climate change is posing threat to food security in Nigeria and it has significant effect on agricultural productivity in Nigeria. Unah (2017) reported that floods affected thirty out of thirty - six states in

Nigeria in 2012 causing estimated damage of 16.9 million dollars due to overflow of rivers, washing away of farmlands, settlements and crucial infrastructure with several lives lost and large numbers displaced from their homes.

The eleven states in Northern Nigeria which account for about 35% of the country's local land area where livestock and several arable crops production are done extensively are under the threats of desertification with livelihoods of some 40 million people under threat. The deforestation rate at 3.5% resulting in 350,000 – 400,000 hectares estimated to cost a financial loss of 10.5 billion naira yearly is a great challenge.

Mpofu (2017) reported that the effect of Fall Army Worm costed Nigeria 8 million dollars, the highest among all African countries. In 2018, the overflow of rivers Niger, Benue, Ogun etc. Led to massive flood and loss of farmlands in Benue and Kogi, Edo, Ogun and other states in the Nigeria.

METHODOLOGY

Area of Study

This study is a review work on Nigeria, located along the Atlantic Ocean's Gulf of Guinea, having an area of 923,769 square kilometers and a projected population of 195.9 million as at 2018 (World Bank 2018). The South Western boundary is partly shared with Republic of Benin and the North West with Niger Republic.

There are two major climatic seasons, Dry and Wet while the pattern of vegetation vary from Mangrove and Rain forest in the South along the Atlantic coast to Savannah in the Middle Belt and the Northern part of the country.

Method of Data Collection

The secondary data used for this review was derived from the Federal Ministry of Environment publications, website and report of field survey on climate change in various parts of Nigeria by IRIN, Switzerland. The field experience of the

researcher as rural extension worker also contributed to the study.

Role of Agricultural Extension on Climate Change Enlightenment

The basic role of agricultural extension is to educate the farmer's education to improve agricultural production through adoption of innovations or improvement in the ways of practicing of a particular idea or techniques using research results and sometimes proven indigenous knowledge.

The goal of extension is transformation of livelihood of the farming family and consequently the whole populace. Agricultural extension is not only about transfer of technological innovation but rather a means of sensitising the farmers and the farm family to contemporary challenges of agriculture and how to solve the problem based on mutual understanding. The objective of agricultural extension is to change the farmer's outlook toward their difficulties. It is concerned not just with physical and economic achievement but also with the development of the rural people themselves.

Adeniyi (2008) noted that agricultural extension is a service or system which assists farm people through educational procedures in improving farm methods and techniques, increasing production efficiency and by implication farmers' income, quality of life and lifting the social and economic standard of rural life.

However in Nigeria between 2011 and 2015, the impact of extension was evident as information on agro input supply and key extension messages reached about 200 million small holder farmers through the implementation of e-wallet system (Francis and Thorp 2015). The system was introduced by the then Minister of agriculture who is currently the President of African Development Bank, Dr. Akinwunmi Adesina.

The huge success of increasing the food production in Nigeria by 21 million tonnes within the 4 years (Reeve 2018) cannot be divorced from

the integration of information communication technology to boost extension outreach to Nigerian small holder farmers.

Agricultural extension provides a bridge between the researchers and other stakeholders in agricultural value chain and practitioners particularly the small holder farmers who are often neglected but they are the key players in food production chain.

The present involvement in agricultural extension service delivery in Nigeria by the government and non-governmental agencies is a form of public private partnership that seeks to indirectly guide farm and farm allied business operators on sustainable production. Oladosu *et al* (2004) gave overview of public private extension activities to include training and dissemination of information, improved farming techniques, organizing farmers into cooperative societies among others.

The various outreaches to farmers through the research institutes and governmental agencies at various levels are also on-going. The era of extension activities through the Agricultural Development Projects signalled mass involvement of field extension agents but the approach ended with the conclusion of Training and Visit extension system and the supportive World Bank funding. However on-going efforts are in place to sustain extension activities in various forms through various national and international supports.

The challenges of poor funding of extension services managed by a network of trained officers who are expected to provide agricultural advisory services was documented by IRIN (2017) report on some parts of North Western Nigeria. It was noted that few extension workers lack full knowledge about climate change and they face challenges of transport facilities and also the farmers were not involved in the design, implementation and monitoring efforts. Extension service is in better position to give farmers the needed information at

the right time with early warning on impending disasters.

Influence of Extension Principles and Adoption Process on Challenges of Climate Change

Agricultural extension as interaction between extension workers and farmers using various communication strategies to relate agricultural information is a potent tool to solve farmers' problem along the agricultural value chain.

Extension as an out of school education is a veritable tool to arrest the devastating effect of climate change on food production using communication principles. The role of communication, cooperation and leadership development among others as extension principles are relevant in tackling effects of climate change (Afolabi 2017).

Awareness creation as a principal factor in adoption process is very crucial at the rural level among the farm families. In view of the urgency peculiar to climate change issues, the unprecedented and unpredictable nature, the integration of principles of extension and adoption process will relieve the smallholder farmers who are at the receiving end of negative effects of climate change.

The core principles of extension are weight lifters that will unburden Nigerian farmers if employed. Oakley and Garforth (1985) emphasized the following extension principles: Extension works with people and not for them (participation), accountability to the client, two-way link (feedback mechanism), cooperation with other rural development organisations and extension work with target groups.

Operating at Farmers Level

The current challenge of declining yield and poor economic status provides a basis to assist farmers cope with climate change hazard. The extension role of employing the idea of current need to rescue smallholder farmers is a noble idea. This is

because the knowledge of an extension worker provides a resource base to the farmer who is faced with production problem but may not be able to proffer solution either due to ignorance of the reality of contemporary challenges of climate change or lack of economic power.

Extension should be based on needs and Interest

The need and interest of a farmer are complementary in the sense that every agricultural problem has a solution and the interest of any producer is productivity. Therefore intermarriage of the needs and interest of farmers on declining yields due to climate and weather hazards are better tackled through introduction of adaptation and mitigation efforts which are being adopted globally to confront climate change effects.

Involvement of the farm family in planning execution and monitoring of climate change projects

The various investigative studies on the holistic effect of climate change abound and the policy maker along with various stakeholders and the Federal Ministry of Environment are working on various government programmes and projects to mitigate the effects of climate change.

The grassroots collaboration and linkage not just in post disaster support but prior involvement in planning, execution and monitoring will arouse the interest of the farmers who are at the receiving end. Involvement in foundational process of policy making and project execution is a great asset for success.

Constant Evaluation

The variation in dimensions of climate change signals and the various effects makes integration of constant evaluation at the local level among the smallholders a critical issue. Agricultural extension workers are rural workers and they are the potent tool advantageously positioned to

constantly assess farmers' situation on various climatic changes signals and consequences.

Awareness Creation on Climate Change

The adoption process of Awareness, Interest, Evaluation and Trial are factors that can be employed individually or holistically to cushion the effect of climate change.

Awareness creation is a primary issue in adoption of technological innovation. In all agricultural extension programmes, awareness creation is a goal scorer that must be given foundational attention.

However on issues of climate change in Nigeria, creation of awareness on the catastrophic effect of climate change, its variation and speed within localities have not been given due attention among the smallholder farmers.

According to Ibrahim (2017) some of the farmers interviewed in rural part of Northern Nigeria claimed ignorance about climate change in Kaduna State. It is pathetic however to note that the farmers experienced more losses in harvest due to reduced rainfall, increase pest infestation, soil degradation and strange weather but they expressed lack of knowledge about the current global phenomenon of climate change. It is also challenging that these farmers adopt their own coping strategies but without the full knowledge of how to relate their current experiences in agricultural production losses to climate change.

Efforts at Curbing Climate Change Effects

Globally efforts are on-going to mitigate the effects of climate change, the regional and national efforts are also on board to synergize with the global efforts to arrest the devastating effect of climate change on agriculture and other areas of development.

The Intergovernmental Panel on Climate Change (IPCC) is an international scientific body mandated to provide the world with a clear

understanding of climate change and its potential environmental and socio-economic impacts (Mafongoya and Ajayi 2017).

The federal government of Nigeria is a signatory to various international agreements on climate change. Nigeria joined UNFCCC in 1992 even though the formal approval became effective in 2017 and the nation became part of Kyoto protocol in 2004 and signatory to the Paris climate agreement in 2017.

National Policy on Climate Change and Response Strategy have been adopted, National Adaptation Strategy and Plan of Action on Climate Change are also in place and the department of Climate Change with a Mitigation Division has been created in the Federal Ministry of Environment. (FME 2017).

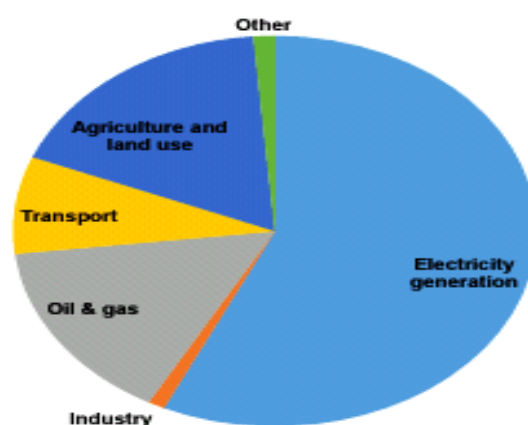
Unah (2017) reported the launching of National Agency for Great Green wall in 2007 to plant 15 kilometres stretch of trees along 800 kilometres of the Southern edge of the Sahara. It was a project involving 20 countries in the Sahel with 8 billion dollars mobilised for the initiative. The agency reported success in the implementation but the states gave list of problems with general lack of enthusiasm and poor fund release to execute the project. The National Strategic Action Plan for desertification and Drought was developed in 2012 but lack of fund and political will was also reported.

The Presidential Initiative on Afforestation was also launched in 2012 with millions of seedlings projected for planting.

Sectoral Emission Reduction

The contribution from various sectors as projected for 2030 (Figure 2) shows that electricity generation, agriculture and oil and gas are major contributors. The various efforts on emission reduction are targeted on the key sectors as specified in the National Adaptation Strategy and Plan of Action. The sectoral strategies are shown in Table 1 overleaf.

Figure 2 Sectoral contribution to emission reduction in Nigeria



Source: Nigeria's intended nationally determined contribution (FEM)

Table 1 Strategies, policies, programmes and measures for Agriculture (crops and livestock) Fisheries and Forestry.

STRATEGIES, POLICIES, PROGRAMMES AND MEASURES FOR KEY SECTORS
A. STRATEGIES FOR AGRICULTURE (CROPS AND LIVESTOCK)
1. Adopt improved agricultural systems for both crops and livestock (for example, diversify livestock and improve range management; increase access to drought resistant crops and livestock feeds; adopt better soil management practices; and provide early warning/meteorological forecasts and related information). 2. Implement strategies for improved resource management (for example, increase use of irrigation systems that use low amounts of water; increase rainwater & sustainable ground water harvesting for use in agriculture; increase planting of native vegetation cover & promotion of re-greening efforts; and intensify crop and livestock production in place of slash and burn). 3. Focus on agricultural impacts in the savannah zones, particularly the Sahel, the areas that are likely to be most affected by the impacts of climate change.
B. STRATEGIES FOR FRESHWATER RESOURCES, COASTAL WATER RESOURCES AND FISHERIES
1. Initiate a national program for integrated water resource management at the watershed level 2. Intensify programs to survey water quality and quantity for both ground and surface water 3. Implement programs to sustainably extend and improve water supply and water management infrastructure 4. Explore water efficiency and management of water demand, particularly in Sahel and Sudan savannah areas 5. Enhance artisanal fisheries and encourage sustainable aquaculture as adaptation options for fishing communities.
C. STRATEGIES FOR FORESTS
1. Strengthen the implementation of the national Community-Based Forest Resources Management Program. 2. Support review and implementation of the National Forest Policy. 3. Develop and maintain a frequent forest inventory system to facilitate monitoring of forest status; and initiate a research program on a range of climate change related topics, including long term impacts of climatic shifts on closed forests. 4. Provide extension services to CSOs, communities and the private sector to help establish and restore community and private natural forests, plantations and nurseries. 6. Improve management of forest reserves and enforce low impact logging practice
D. STRATEGIES FOR BIODIVERSITY
1. Support the active implementation of the National Biodiversity Strategy and Action Plan (NBSAP), particularly those strategic actions that address climate change impacts. 2. Support recommended climate change adaptation policies and programs in sectors that affect biodiversity conservation, including agriculture, forestry, energy and livelihoods. 3. Support and implement programs for alternative livelihoods in order to reduce unsustainable resource use that contributes to loss of biodiversity (see Sector/Theme Livelihoods).

Source: Nigeria's intended nationally determined contribution (FEM)

Implementation of the various policies, strategies and measures outlined in the Table 1 above will alleviate climate change challenges greatly, particularly if the extension roles outlined above is given due attention.

The National Adaptation Strategy and Plan of Action for Climate Change Nigeria (NASPA-

CCN) describe the adaptation priorities bringing together existing initiatives and priorities for future action. The 2011 NASPA – CCN Vision is an embodiment of climate change adaptation strategies as a component of sustainable development for the nation Nigeria (FEM 2012).

CONCLUSION

The reality of population growth and poor planning and execution of agricultural programme and other development programmes particularly in Africa put more pressure on the majority who belong to the lower class. Since farmers belong to this class it is crucial that priority be given to boost economy to favour the smallholder farmers such that food production can increase in the face of various global challenges. Climate change issue is just one of the global threats to food security and efforts at the global level must be matched with complimentary actions at regional, continental and national levels.

Agricultural extension has been an age long solution for agricultural growth as it brings transformation to farm families and the general populace. The involvement of extension proactively will enhance other measures being adopted to mitigate and adapt to climate change hazards.

RECOMMENDATIONS

Creation of effective advocacy campaigns to create awareness on climate change and its effects on agricultural production

Prompt action to raise alarm on signals of impending climate related disaster

Empowerment of farmers on affordable adaptation and mitigation strategies of climate change.

Adoption of coping strategies for climate change with the input of local farmers based on the peculiarities of their physical environment in their communities.

Enforcement of effective connection between the various climate change programmes strategic plan and project execution to solve real climate problem in farmers' environment.

Integration of Indigenous Knowledge and scientific knowledge on climate change adaptation and mitigation measures.

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ASSESSMENT OF RICE CONSUMERS' ROLE IN THE PROMOTION OF NIGERIA HOMEGROWN RICE IN NORTH CENTRAL NIGERIA

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ABSTRACT

The promotion of Nigeria homegrown rice (NHGR) has become necessary to boost farmer's income, discourage importation and consumption of foreign rice, encourage consumption of Nigeria homegrown rice, increase food security and national economy. The purpose of this study is to assess rice consumers' role in the promotion of Nigeria homegrown rice. Multistage sampling techniques were used to select 360 rice consumers from north central Nigeria (Federal Capital Territory Abuja, Nasarawa State and Niger State). Data were analyzed using descriptive statistics and majority of the rice consumers and majority (55.3%), of the rice consumers were male, 61.4% married, 88.2% had house hold size of 1-10 persons, 52.7% had income level of N50,000-N100,000. All (100%) of the consumers consumed NHGR, 92.8% informed family and friends about taste and nutritional values of NHGR, 93.1% shared rice for promotion, 98.6% eat NHGR and neglect foreign rice, 99.2% sell rice at affordable price 99.4% produce, process and market NHGR, 95.3% inform families and friends about better taste of NHGR than foreign rice, 95.6% inform families and friends about better nutritional values of NHGR than foreign rice and 95.6% inform families and friends that NHGR swells better than foreign rice. Hypothesis was tested using chi-square and the result revealed that socioeconomic characteristic of rice consumers and their activities have positive influence on the promotion of Nigerian homegrown rice and socioeconomic factors of rice consumers have positive influence on the consumption of rice type. We recommend that Local farmers should be supported with farm inputs such as processing, packaging and storage facilities to prevent stones and dirt's. There should be public awareness on the newly improved Nigerian homegrown rice. Governments should uptake and subsidize the locally produced rice and make it available, affordable to consumers. Government should control smuggling of foreign rice into our country through our porous borders, boost rice farming production and reduced our dependence on foreign rice. Farmers should produce quality Nigerian homegrown rice and intensify its promotion.

Keywords: Promotion, Nigerian Homegrown Rice (NHGR), and Consumers.

INTRODUCTION

According to Onyibo *et al.* (2016) rice is a leading staple crop in Nigeria that is cultivated and consumed in all parts of the country. In the past decade, rice consumption has increased by 4.7 percent, almost four times the global consumption growth and reached 6.4 million tons in 2007-

accounting for about 20 percent of Africa's consumption. As at 2011, rice accounted for 10 percent of household food spending, and 6.6 percent of total household spending (Patrick, 2019). According to Olagunji (2014) rice is an important crop in the family of cereal crops which provides the required food nutrients minimum 2,400 calories per person per day.

In recent times, rice production has become a major source of economic income for the country and for the citizenry so maintaining the template of production for the ever-increasing population is paramount. Production consumption of Nigeria homegrown rice can be sustained by rice consumers through proper promotional activities to depress importation and consumption of foreign rice which will consequently increase the farmer's income and return on investment. This study seeks to assess rice consumers on the promotion of Nigerian homegrown rice

Rice production and consumption in Nigeria are of global importance, providing more than 2.0 percent of caloric needs of millions of people on daily basis. However, how consumers contributed to the promotion of Nigerian homegrown rice has not been fully ascertained. Also searches through the literatures show that little or no work has been documented on the promotion of Nigerian homegrown rice by rice consumers.

It is important to find out whether there has been deliberate or strategic, plan for the promotion of Nigeria homegrown rice by Nigerian rice consumers in order to depress import and increase patronage and consumption of our domestically produced rice.

Despite the quality, quantity, taste and nutritional value of our domestically produced rice, some Nigerians choose to buy imported rice over our Nigeria homegrown rice probably because there was no strategic, systematic, effective and efficient promotion of our homegrown rice.

Policy makers will have a well-researched policy document that will be a focal point for rational decision in the promotion of homegrown rice in North Central Nigeria and the nation at large.

This study will assist policy makers to develop evidence based on future research, extension, and development programs aimed at benefiting rice smallholder farmers in the study area. The rational is it provides road map that will revolutionize production and promotion of homegrown rice in Nigeria base on the recommendations. This study

will help extension workers with valuable information that will assist improving efficiency of communication, add to the existing body of knowledge, improves efficiency of agricultural research. Furthermore, this study will be useful to researchers, farmers, and development planners.

Objectives of the Study

The main objective of the study is to assess the role of rice consumers in the promotion of Nigeria homegrown rice in the study area. The specific objectives were to:

1. Analyze the socioeconomic characteristics of rice consumers in the study area.
2. Examine the activities of rice consumers in the promotion of Nigeria homegrown rice in the study area.
3. Determine the problems affecting the effective dissemination of information on the promotion of Nigeria homegrown rice to the public by rice consumers in the study area.

Hypotheses of the Study

The hypotheses for the study are stated in the null form

H_{01} There is no significant relationship between the socioeconomic characteristic of rice consumers and consumption of Nigeria homegrown rice.

H_{02} There is no significant relationship between socioeconomic characteristics of rice consumers and the consumption of rice type

METHODOLOGY

This study was carried out in north central Nigeria. North central Nigeria comprises of seven states namely Benue, Kogi, Kwara, Niger, Plateau, Nasarawa, and FCT. The Population of the study consists of all rice consumers in the cities of North Central Nigeria (Federal Capital Territory Abuja, Nasarawa State and Niger State respectively).

Simple random sampling techniques were used in sampling the rice consumers as stated by Asika (2005). A multistage sampling technique was used for the study. First stage was the selection of three (3) states (Federal Capital Territory Abuja, Nasarawa State and Niger state) purposively out of seven (7) states in the north central zone. Second stage was purposive selection of two (2) local government areas from each of the three (3) selected states making total of six (6) local government areas because of the cosmopolites of the people in those local government areas and the presence rice consumers. The third stage was the random selection of three (3) wards from each of the local government area making the total of 18 wards. The fourth stage was the random selection of 20 respondents from each of the wards totaling 360 respondents.

Data for the study were collected from primary and secondary sources. Primary data were collected with the use of structured questionnaires, interviews, focused group discussions, and personal observation. The questionnaire was used to collect data from literate respondents while the interview and focused group discussions was used to collect data from less literate respondents. Reliability test for the instrument was carried out by administering 10% of the total sample size of the questionnaires in Bida Niger State. The questionnaires were analyzed to determine if the 90% of the questionnaires will be reliable. The result of the test shows that value of the cronbach's alpha for the questionnaire was 0.75. This means that the instrument for the data collection was 75% reliable. Reliable and dependable enumerators who understand the study areas very well were trained to assist in the administration of instruments on the target population.

Method of Data Analysis

Data were analyzed using descriptive statistics and correlation matrix.

Descriptive Statistics: Descriptive statistics involve the use of mean, mode, range, frequency

distribution tables, and percentages etc. These were used to examine the socio-economic characteristics of consumers, analyze the activities of consumers in enhancing the promotion of Nigerian homegrown rice, and determine the problems affecting the effective dissemination of information on the promotion of Nigeria homegrown rice to the public by rice consumers in the study area. The Socio-economic characteristics include; gender, marital status, household size, age and level of education, skill etc.

Test of Hypotheses

Correlation Matrix

The Model of Correlation Matrix is stated thus

$$r_{xy} = \frac{(X_i - \bar{x})(Y_i - \bar{y})}{\sqrt{(X_i - \bar{x})(Y_i - \bar{y})}} \dots \dots \dots (2.1)$$

Where,

r_{xy} = Correlation Coefficient

X_i = Socioeconomic Characteristics (Units)

Y_i = Activities of Consumers in promoting Nigerian homegrown rice (Units)/ the consumption of rice type (Units)

$\bar{X}$ = Mean of Socioeconomic Characteristics (Units)

$\bar{Y}$ = Mean of Activities of Consumers in promoting Nigerian homegrown rice (Units)/ the consumption of rice type (Units)

RESULTS AND DISCUSSIONS

Socio Economic Characteristics of Rice Consumers

Table 3.1 showed the socioeconomic characteristics of rice consumers. The majority of respondents (55.3%) were male while 47.7 % were female. The results indicated no particular influence of gender on the consumption of NHGR. However, results showed that 61.4% of the respondents were married and thirty-five-point three percent (35.3%) were single, eighty-eight-point two percent of respondents (88.2%) had house hold size of between 1-10 members, while

Assessment of Rice Consumers' Role in the Promotion of Nigeria Homegrown Rice

52.7% of the respondents had monthly incomes of N50, 000-N100, 000 and 32.8% earned above N100, 000.00. Furthermore, 37.3% of the respondents' ages were 21-30 years old. And more than 60.0% of the respondents were fairly well educated, with qualifications of OND and above. The socio-economic characteristics thus far has exhibited that marital status, age, household size, income and education have shown

a combined effect on the consumption choices and preferences for NHGR by the respondents. Apriori, it is expected that women and young persons will always show a preference for rice over and above other foodstuff. The natural tendency of women and young persons, a sure income and good relevant information have also contributed in the consumption and promotion of NHGR by the respondents.

Table 3.1: Socio Economic Characteristics of the Respondents

Variable	Frequency	Percentage
Gender		
Male	199	55.3
Female	161	47.7
Marital Status		
Single	127	35.3
Married	221	61.4
Divorced	10	2.8
Widow	2	0.6
House Hold Size		
1-10	318	88.2
11 – 20	35	9.7
21-30	5	1.5
31-40	1	0.3
41-50	1	0.3
Age		
<20	20	5.5
21-30	134	37.3
31-40	86	24
41-50	88	24.3
51-60	25	6.9
61-70	5	1.4
70-80	2	0.6
Education		
Non-Formal Education	15	4.2
Primary School Education	9	2.5
Secondary School Education	50	13.9
OND	56	15.6
NCE	31	8.6
Bsc	158	43.9
Msc	40	11.1
PhD	1	0.3
Income		
<N50,000	45	12.5
N50.000-N100,000	189	52.7
N101-N150,000	118	32.8
N151,000-N200,000	6	1.7
N201,000-N250,000	1	0.3
N251,000-N300,000	1	0.3

Source: Field Survey, 2019

Activities of Rice Consumers in the Promotion of Nigeria Homegrown Rice

Table 3.2 showed the activities of rice consumers in the promotion and consumption of Nigeria homegrown rice among the population. All of the respondents (100%) agreed that they consumed Nigeria homegrown rice, 92.8% of respondents informed neighbors, family members and friends about the taste and nutritional value of NHGR, 93.1% shared NHGR as gifts to others, 98.6% ate NHGR other than foreign, 99.2% agreed NHGR was sold at affordable price, 99.4% believed that properly processed and packaged NHGR facilitated its promotion while 95.3% agreed that they informed family members, neighbours and

friends that Nigerian homegrown rice had better taste than foreign rice. Majority of respondents (95.6%) informed family members, neighbours and friends that NHGR had better nutritional values than foreign rice. While, (95.6%) of the respondents informed family members, neighbors and friends that NHGR swelled better than imported rice. The results of the activities of the rice consumers indicated that majority of the consumers had influenced the promotion and consumption of NHGR, further, it showed that dissemination of nutritional value of NHGR, good packaging and competitive pricing had combined to positively promote the consumption of NHGR by the respondents

Table 3.2: Activities of Rice Consumers in the Promotion of Nigeria Homegrown rice

Variable	Frequency	Percentage
Consumption of NHGR		
I do consume NHGR.	360	100
I do not consume NHGR.	0	0
Informing neighbours, family and friends about the taste and nutritional values of NHGR		
I do inform neighbours, family and friends about the taste and nutritional values of NHGR.	334	92.8
I do not inform neighbours family and friends about the taste and nutritional values of NHGR.	26	7.2
Sharing NHGR as gift for its promotion		
I do share NHGR as gift for its promotion.	335	93.1
I do not share NHGR as gift for its promotion.	25	6.9
Eating NHGR other than foreign rice		
I do eat NHGR than foreign rice.	355	98.6
No, I do eat foreign than NHGR.	5	1.4
Selling NHGR at affordable price facilitate its promotion		
I do agree that selling NHGR at affordable price to consumers facilitate its promotion.	357	99.2
I do not agree that selling NHGR at affordable price to consumers facilitate its promotion.	3	0.8
Proper processing and packaging NHGR facilitate its promotion		
I do agree that proper processing, packaging and marketing of NHGR facilitate its promotion.	358	99.4
I do not agree that proper processing, packaging and marketing of NHGR facilitate its promotion.	2	0.6
Inform family members, neighbors and friends that NHGR has better taste than foreign rice		
I do inform family member's neighbors and friends that NHGR has better taste than foreign rice.	343	95.3
I do not inform family members' neighbors and friends that NHGR has better taste than foreign rice.	17	4.7
Inform family members neighbors and friends that NHGR has better nutritional values than foreign rice		
I do inform family members neighbors and friends that NHGR has better nutritional values than foreign rice	344	95.6
I do not inform family members neighbors and friends that NHGR has better nutritional values than foreign rice	16	4.4
Inform family members neighbors and friends NHGR swells better than foreign rice		
I do inform family members neighbors and friends that NHGR swells better than foreign rice	344	95.6
I do not inform family members neighbors and friends that NHGR swells better than foreign rice	16	4.4

Source: Field Survey, 2019

NHGR- Nigeria Homegrown Rice

Challenges Encountered in the Promotion of Nigeria Homegrown Rice by respondents

Table 3.3 showed the responses of the respondents on some challenges encountered in the promotion of NHGR. The majority of respondents (61.10%) indicated that the presence of stones and dirt in NHGR was a major challenge for promotion and consumption of NHGR, 3.6% identified that some consumers lacked awareness on the new improved NHGR, 16.1% believed that production, processing, packaging and marketing were serious challenges, 9.16% blamed high price of the NHGR against its promotion. Some respondents (3.8%) believed that scarcity of the product was a challenge, 0.8% of the respondents agreed that they were not interested in the consumption or promotion of

NHGR. Other respondents (2.8%) agreed that lack of farm inputs for the production, processing and packaging of NHGR has affected its consumption and promotion as stated by Ogunremi (2015) that inefficient rice processing technologies and techniques have presented two main challenges (1) Significant loss in quality of rice produced (2) Lower quality of locally processed rice. Furthermore, 1.4% suggested that smuggling activities and over dependence on imported rice has affected the promotion of NHGR, 1.1% opined that lack of financial support for the media organizations affected the promotion and consumption of NHGR. Promotion and consumption of NHGR from the results will get a boost once the rice is adequately cleaned, de-stoned, adequately packaged and competitively priced.

Table 3.3: Challenges Encountered in the Promotion of Nigeria Homegrown Rice by respondents

Variable	Frequency	Percentage
Presence of stones and dirt's in some NHGR	220	61.10
Inability of government and media organization to create public awareness on the new improved NHGR	13	3.6
Problems of Production, processing, packaging and marketing of NHGR	58	16.1
High price rate of NHGR	33	9.16
Unavailability of quality NHGR for consumers	14	3.8
Some consumers are not willing and interested in NHGR	3	0.8
Lack of farm inputs for quality and quantity of rice production	10	2.8
Importation, smuggling and over dependence on foreign rice	5	1.4
Lack of financial support for media organization to promote NHGR	4	1.1

Multiple Responses

Source: Field Survey, 2019

NHGR- Nigeria Homegrown Rice

Test of Hypotheses

Hypothesis 1

The study was guided by a null hypothesis which states that there is no significant relationship between the socioeconomic characteristics of consumers and consumption of Nigeria homegrown rice. From the result of the correlation

matrix between the socio-economic characteristics of the consumers and the activities of consumers in promoting Nigeria homegrown rice. The variables with the asterisks (*) were found to be significant socioeconomic characteristics, this includes gender, age, marital status, household size, education, income, and years of experience had a significant relationship with the activities of

the consumers in promoting Nigeria homegrown rice. The positive signs on the correlation coefficients of each variable depict a direct relationship between the socio-economic characteristic of the consumers and his/her activity in promoting Nigeria homegrown rice while the negative signs show an inverse relationship. Based on the findings of this study, the hypothesis which states that there is no significant relationship between socio-economic characteristics of the consumers and consumption

of Nigeria homegrown rice was rejected, while the alternative hypothesis which states that there are significant relationships between the socio-economic characteristics of the consumers and consumption of Nigeria homegrown rice was accepted. This implies that the socio-economic characteristics had a significant effect on the and the activities of consumers in promoting Nigeria homegrown rice in the study areas.

Table 3.4: Correlation Matrices Showing the Relationship between the Socioeconomic Characteristics of consumers and consumption of Nigeria Homegrown Rice

	Gender	Age	Marital Status	Household Size	Education	Income	Years of Experience	Informing family and friends	Sharing HGR	Eating HGR	Selling of HGR	Processing, packaging and marketing
Gender	1.00											
Age	-0.16	1.00										
Marital Status	0.01	0.43	1.00									
Household Size	0.03	0.31	0.12	1.00								
Education	0.04	0.12	0.07	-0.05	1.00							
Income	-0.20	0.57	0.31	0.22	0.29	1.00						
Years of Experience	-0.03	0.02	0.04	0.06	0.09	0.06	1.00					
Informing family and friends	0.03**	0.07*	0.08*	0.06*	-0.01***	-0.04**	0.16	1.00				
Sharing HGR	0.07*	0.05**	0.07*	0.04**	-0.01***	-0.04**	0.06*	0.86	1.00			
Eating HGR	0.07*	0.03**	0.07*	0.03**	0.04**	-0.01***	0.07*	0.39	0.48	1.00		
Selling of HGR	0.04**	0.01***	0.11	0.04**	0.05**	0.03**	0.08*	0.29	0.39	0.82	1.00	
Processing, packaging and marketing	0.02**	0.02**	0.09*	0.03**	0.02**	0.05**	0.00***	0.22	0.34	0.71	0.87	1.00

Source: Field Survey, 2019

NHGR- Nigeria Homegrown Rice

Test of Hypothesis 2

The study was guided by a null hypothesis which states that there is no significant relationship between the socioeconomic characteristics of

consumers and consumption of Nigeria homegrown rice. From the result of the correlation matrix between the socio-economic characteristics of the consumers and the type of rice they consume. The variables with the asterisks (*) were found to be significant socioeconomic characteristics, this includes gender, age, marital status, household size, education, income, and years of experience had a significant relationship with the activities of the consumers in promoting Nigeria homegrown rice. The positive signs on the

correlation coefficients of each variable depict a direct relationship between the socio-economic characteristic of the consumers and his/her choice of type of rice they consume while, the negative signs show an inverse relationship. Based on the findings of this study, the hypothesis which states that there is no significant relationship between socio-economic characteristics of the Consumers and consumption of Nigeria homegrown rice was rejected, while the alternative hypothesis which states that there are significant relationships between the socio-economic characteristics of the consumers and consumption of Nigeria homegrown rice was accepted. This implies that the socio-economic characteristics had a significant influence on the and the consumption of Nigeria homegrown rice in the study areas.

Table 3.5: Correlation Matrices Showing the Relationship between the Socioeconomic Characteristics of consumers and the consumption of rice type

	Consumption of homegrown rice	Gender	Age	Marital Status	Household Size	Education	Income
Consumption of homegrown rice	1.000						
Gender	-0.029**	1.000					
Age	0.017**	-0.162	1.000				
Marital Status	0.037**	0.014	0.426	1.000			
Household Size	0.060***	0.031	0.306	0.119	1.000		
Education	0.092*	0.043	0.123	0.074	-0.049	1.000	
Income	0.061**	-0.203	0.573	0.312	0.216	0.285	1.000

Source: Field Survey, 2019

CONCLUSION AND RECOMMENDATIONS

Given the findings, it can be concluded that consumers have contributed significantly to the promotion of Nigerian homegrown rice. This can be seen in the various activities they performed by the consumers in promoting Nigerian homegrown rice. Presence of stones and dirt's in some

Nigerian homegrown rice was the major challenges faced by consumers when consuming homegrown rice. The socioeconomic characteristics of the consumers influenced the activities they performed and also influenced their choice of rice type in the study area. Based on the results of the study the following has been recommended

Local farmers should be supported with farm inputs such as quality improved seeds, fertilizers, and other agro chemicals

Processing, packaging and storage/marketing technologies/facilities that will eliminate stones and dirt be made available, affordable as well as adoptable to the rice producers.

There should be continuous and focused public awareness on improved Nigeria homegrown rice to raise awareness and attract patronage of consumers.

Governments should uptake and subsidize the locally produced rice and make it available, affordable to consumers.

Government should intensify efforts at stopping the of smuggling of foreign rice into our country.

Farmers should adopt good agricultural practices (GAP) by working with agricultural agencies of government and credible private providers to produce quality Nigeria homegrown rice and intensify its promotion.

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MULTIDIMENSIONAL WELLBEING ANALYSIS OF WOMEN FARMERS IN AKWA IBOM STATE, NIGERIA

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ABSTRACT

Women farmers remain a vital segment of the rural population and create critical links between the present generation of farmers and the future. The rationale for more studies on the issues of their wellbeing is anchored on the sustained development of approaches that give better understanding of the phenomenon. This study examined the multidimensional well-being of women farmers in agricultural zones of Akwa Ibom State using functioning approach. Specifically, it assessed the socio-economic characteristics of the farmers and analyzed the wellbeing of the farmers using six functional dimensions including information access, employment, education, nutrition and health, autonomy, housing and sanitation. Primary data were obtained from 300 respondents selected from the 6 agricultural zones spread across the 3 Senatorial districts of the state through a multi-stage sampling procedure. Data analysis was done using descriptive statistics and fuzzy set analysis. The Findings showed that the mean age of women farmers in the zones was 46years and their mean household size was 6. It also showed that majority (76%) of the respondents from the agricultural zones in Akwa Ibom South fall within 0.401-0.50 wellbeing index spread across four of the six dimensions considered, 67% of the respondents in Akwa Ibom North East zones fall within 0.301-0.40 wellbeing index while 56% of the respondents from Akwa Ibom North West zones fell within 0.20 – 0.30 wellbeing index across the dimensions. Interventions in the area of employment, education and information access, is needed for the women farmers, especially, in Akwa Ibom North West agricultural zones.

Keywords: Multidimensional, Wellbeing, Women farmers, Agricultural zones, Akwa Ibom state

INTRODUCTION

Undoubtedly, rural women and men play complementary roles in guaranteeing food security in the society, but women tend to play a greater role in natural resource management and ensuring adequate nutrition (FAO, 2013). Women often grow, process, manage and market food and

other natural resources, and are responsible for raising small livestock, managing vegetable gardens and collecting fuel and water (FAO 2013). Dennison, (2013) in an interdisciplinary research discourse organized by the postgraduate school of the University of Ibadan on “the burden of our women” commented that everyone has a mother, sister or daughter and therefore is bound

to experience their importance in their lives. Women are regarded as agents of change whose activities affect almost all facets of a society's life. In order to take good care of their family needs, women carry a lot of burden both physically and emotionally to make sure that every member of the household is comfortable. Many women have to deal with the stress of having two jobs; one as an executive in the office and the other an unpaid job at home doing childcare and house work. Many indigenous communities are characterized by economy in which women are active and bear the primary responsibility of feeding members of their homesteads (Christidou and Koulaidis, 2016). Also study by Bapna et al (2009) showed that rural women spend between 10 to 16 hours a day doing house work, fetching water and firewood, caring for their children and providing their families food. To corroborate this contribution of women a World Bank study (2010) found that women's burden of work is significantly larger than men's. For example, African women perform about 90% of the agricultural production work ranging from work of hoeing, weeding, processing food, providing water and firewood. 80% of food storage and transport and 60% of harvesting and marketing are also performed by them. There is need therefore for policies and programmes that addresses the welfare and wellbeing of rural women. Policies and programmes that empower women farmers will lead to faster reductions in poverty and promote their wellbeing and availability for more sustained agricultural productive activities.

Wellbeing can also be referred to as good quality of life (Narayan et al, 2000). It encompasses dimensions such as material wellbeing, often expressed as having enough bodily wellbeing which includes being strong, being in the right frame of mind and looking good; social wellbeing which includes caring for people and settling children, having self-respect, peace and good relations in family and community; having

security, which includes civil peace, safe and secure environment, personal and physical security and confidence in the future; having freedom of choice and action which includes being able to help others in the community. This implies that there is more to wellbeing than income and/or asset dimension, even though they are important wellbeing determinants, (Frey and Stutzer, 2002; Stevensons and Wolfers, 2008; Easterlin, 2003; Ijaiya et al, 2009).

Wellbeing has also been construed as activities of human that portrays a state of life condition one has attained and experienced (Adeoti and Akinwande, 2013). It refers to an examination of a person's life situation or 'being', hence, a description of individuals' life situation. It is a means to an end and an end in itself as well as a basic right of every human being (Oladokun et al, 2017). Wellbeing is also a key factor that contributes to economic growth and productivity of every nation (Oladokun et al, 2017). Poverty is an unacceptable human condition and an outstanding social problem in the twenty-first century. It is a global problem characterized by not having enough resources and abilities to meet human basic needs both as individual and as social beings due to its dynamic and multidimensional nature. Both poverty and well-being are interconnected (Laily, 1995). With an increase in income, a great number of needs are satisfied and a higher standard of wellbeing is achieved. It is a common inference therefore that a poor person is one whose wellbeing is low.

The Nigerian core welfare indices survey presents a list of indicators to achieve the purpose of a multidimensional assessment of wellbeing for this study (National Bureau of Statistics, 2006). Such indicators as health, housing and education are basic indicators in use in many literatures, (Alkire, 2007). Psychologists have used various approaches to study one-dimensional wellbeing including the income and utility approaches (Clark, 2005) and

the happiness approach (Kingdon&Knight, 2004; Easterlin, 2003). The recent functioning/capability wellbeing approach have been used to analyse multidimensional wellbeing, (Chiappero, 2000; Majumder, 2006). The functioning/capability approach which emerged as a means of finding an encompassing definition for wellbeing recognizes wellbeing as the 'ability to be'. Theoretically, functioning is defined as the 'being' or the 'achievement' of the individual/household being considered, (Chiappero, 2000; Clark, 2005a, 2005b). While it may be difficult to access dimensions and indicators of capabilities from the national data, it is useful to use the sets of functioning achieved by the rural households in the study, (Chiappero, 2000; Majumder, 2006).

As observed by Azeez and Abang, (2015), remarkable progress has been made in some parts of the World to increase the wellbeing of rural families. The greatest progress has been made in East Asia and the Pacific, where the share of the poor fell from 30% in the 1990 to 9% in 2004. In contrast, the share of the poor in sub-Saharan Africa (Nigeria and Akwa Ibom inclusive) has decreased by a little more than 5% and remains above 40% (Ravallion et al., 2007). This scenario of low wellbeing among rural people is against the backdrop that rural people are not only isolated from economic opportunities, but they also tend to have less access to social services such as health, sanitation, education and economic services like electricity and good water supplies. As posited by Ajakaiye and Adeyeye (2001), a deep insight into the nature of wellbeing remains essential so as to appropriately design successful poverty alleviation programmes. An insight into the rural households' situation as it concerns their wellbeing is therefore a precondition for effective pro-poor development strategies. A clear understanding of how many are not living well or what groups are vulnerable to poverty are imperative for meaningful articulation of remedial intervention. This study was, therefore, conducted

to examine the multidimensional well-being of women farmers in agricultural zones of Akwa Ibom State with the specific objectives of assessing the socio-economic characteristics of the farmers and analyzing the wellbeing of the farmers.

METHODOLOGY

Akwa Ibom State, with a total landmass of 8,412km² (AKS, 1989) is Nigeria's 21st State in the Niger Delta region with 31 Local Government Areas (LGAs). It is situated between latitudes 4° 32'^I and 5° 53'^I North and longitudes 7° 30'^I and 8° 25'^I East, and lies in between Cross River, Rivers and Abia States in the south-eastern Nigeria (AKS, 1989). According to FRN (2004), Akwa Ibom State has a population of about 3.92 million people and it's divided in to three Senatorial Districts namely, Akwa Ibom North East (Uyo), Akwa Ibom South (Eket) and Akwa Ibom North West (Ikot Ekpene) senatorial districts. The area is characterized by undulated landscape and four main relief regions- the lowlands, the uplands, the highlands and high plateau and mountains (AKS, 1989). Ninety percent of its population live in the rural areas (AK-BASES, 2005) and are engaged mainly in agriculture, trading and the gathering of Non-Timber Forest Products (NTFP). The study area is in the rain forest zone and has two distinct seasons viz: The rainy and the dry season. The state is divided into six agricultural zones, Abak, Etinan, Eket, Ikot Ekpene, Oron and Uyo (Ekong, 2015). The six zones of course are spread across the three Senatorial Districts with each Senatorial Districts gaining two zones.

The population of study was made up of registered women farmers in the six agricultural zones in Akwa Ibom State which sums up to 30,135 in number. The Yaro Yamane (1967) formula was used to determine the sample size

$$n = \frac{N}{1 + N(e)^2}$$

Where: n is the sample size, N is the population size, and e is the level of precision.

Hence, approximately 300 registered farmers were sampled across the State. Proportional representation was adopted to sample respondents from AKADEP blocks as units of observation in the three Senatorial Districts. Primary data included copies of the questionnaires administered to the women farmers while secondary data included number of registered women farmers in the State obtained from the Akwa Ibom State Agriculture Development Project (AKADEP).

Collected data were analysed using descriptive statistics and fuzzy set theory. The descriptive statistics used include percentages, frequency distribution tables, and the mean. Fuzzy set Analysis was used to estimate the wellbeing status of the women farmers. The fuzzy set substitutes the characteristic function of a crisp set that assigns a value of 1 or 0. Large values denote high degree of membership. The degree of wellbeing is shown by the placement of the individual on the 0 or 1 value or other values in-between.

The model is considered as follows: Assume a population A of n individuals, $A = (a_1, a_2, a_3 \dots a_n)$. A fuzzy subset B includes all individuals with $a_i \in B$. The degree of wellbeing of the ith individual ($i=1, \dots, n$) with respect to a particular attribute j given that ($j = 1, \dots, m$) is defined. The variables that define indicators of welfare are either dichotomous or categorical in nature.

$$\mu_B(x_j(a_i)) = x_{ij}, 0 \leq x_{ij} \leq 1$$

Where: $x_{ij} = 1$; condition of full possession of wellbeing attribute

$x_{ij} = 0$; condition of total lack of wellbeing attribute and

$0 \leq x_{ij} \leq 1$; conditions within the range of full possession and lack.

RESULTS AND DISCUSSION

Socio economic characteristics of the Respondents.

Results on the socio-economic characteristics of the respondents from the agricultural blocks across the three senatorial are presented on table 1. Item 1 on table 1 presents the age distribution of the respondents. It shows that majority (40% & 58%) of the respondents from Akwa Ibom North East and Akwa Ibom North West senatorial districts respectively were within 31 – 40 years of age, while majority (60%) of the women farmers sampled from agricultural blocs in Akwa Ibom South senatorial districts were between 31 – 50 years of age. The combined mean age was found to be 46. The result is consistent with the findings of Etuk and Odebode, (2016) who in their studies on factors influencing household wellbeing in oil and non-oil producing rural communities of selected States in Niger Delta, Nigeria, found that the mean age of respondents was 42 years and since the majority of the respondents fall within the middle age, it is an indication that they are within the active working age of the communities, implying that they are mature and ready to bear risks in catering for their households' wellbeing.

Item 2 on Table 1 shows that the authors had access to more married women farmers (50% & 42%) from Akwa Ibom North East and Akwa Ibom North West senatorial districts respectively whereas in majority (51%) of the respondents from Akwa Ibom South were single farmers. However, a couple of them (30.0%) were married. The incidence of divorce (25%, 8% & 10%) as well as widowhood (5%, 10% & 9%) were very low across the senatorial districts. This indicates a high level of homogeneity in the distribution of marital status of household across the communities due to similarities in cultural practices. The fact that majority of the respondents across the agricultural blocs in the 3 senatorial districts were married is an indication that they are responsible and mature

adults who are ready to contribute to their household wellbeing. Also it was recorded from the field interaction that most of the marriages were monogamous in the 3 senatorial districts.

Item 3 reports on the distribution of the respondents based on household sizes. Majority of the respondents (48% & 52%) from Akwa Ibom North West and Akwa Ibom South senatorial districts had household sizes of 1 – 5 person while majority (50%) of the respondents from Akwa Ibom North East had families with 6 – 10 persons. The results showed no difference in the mean household size (6) of respondents in the three senatorial districts. While a large household size implies a sufficient supply of household labour for livelihood activities as supported by the findings of Ironkwe et al.(2009) who reported that most rural families in Nigeria have large household sizes between 6 to 10 persons, a large household size could also mean over dependency on household resources resulting in a negative effect on the wellbeing of the household.

Results on educational qualification shown on item 4 in table 1 shows no clear difference in the qualification of the respondents as majority of the respondents across the state had one form of

education or another. This result to some extent is similar to the findings of Bigombe and Whadiagala, (2012) asserting that majority of rural workforce had secondary education. Since a larger percentage of the respondents have one form of education or the other, this can expose them to information that will improve their household wellbeing and development. This finding corroborates Babatunde, et al., (2008) who reported that the education of a household head had a positive influence on the wellbeing of most rural households in Nigeria.

Examination of results as shown on item 8 in Table 1 indicates that the average monthly income of the registered women farmers sampled for this study across the 3 senatorial districts was between N41, 000-N60, 000. The low income level suggests that a greater percentage of the respondents in the study area may find it difficult to meet their daily household obligations. As such savings and investments become impossible leading to a cumulative effect of un-sustainability of households and low level of wellbeing. This result is consistent with (Etim, 2010) who reported that rural household's income was notoriously subject to seasonal variability especially in Nigeria.

Multidimensional Wellbeing Analysis of Women Farmers in Akwa Ibom State

Table1: Socio-economic Characteristics of the Women Farmers based on Senatorial Districts

S/n	Variables	Akwa Ibom North East		Akwa Ibom North West		Akwa Ibom South	
		Frequency	%	Frequency	%	Frequency	%
1	Age						
	10–20	0	0.0	5	5.0	12	12.0
	21–30	36	36.0	14	14.0	22	22.0
	31–40	40	40.0	58	58.0	30	30.0
	41–50	20	20.0	21	21.0	30	30.0
	51–60	3	3.0	2	2.0	6	6.0
	60&above	1	1.0	0	0.0	0	0.0
	Combined Mean	46					
2	Marital Status						
	Single	20	20.0	40	40.0	51	51.0
	Married	50	50.0	42	42.0	30	30.0
	Widow/widower	5	5.0	10	10.0	9	9.0
	Separated/divorced	25	25.0	8	8.0	10	10.0
3	Household Size						
	1- 5	45	45.0	48	48.0	52	52.0
	6-10	50	50.0	39	39.0	40	40.0
	11-15	5	5.0	13	13.0	8	8.0
	Combined Mean	6					
4	Highest Level of Educational						
	FSLC	43	43.0	40	40.0	30	30.0
	SSC	38	38.0	32	32.0	40	40.0
	OND	6	6.0	12	12.0	10	10.0
	HND	8	8.0	6	6.0	10	10.0
	BSc	5	5.0	10	10.0	10	10.0
	MSc	0	0.0	0	0.0	0	0.0
	PhD	0	0.0	0	0.0	0	0.0
5	Primary Occupation						
	Crop farming	34	34.0	40	40.0	28	28.0
	Livestock farming	38	38.0	30	30.0	32	32.0
	Fishing	5	5.0	5	5.0	15	15.0
	Fishing and Livestock farming	6	6.0	2	2.0	12	12.0
	Fishing and Crop farming	12	12.0	7	7.0	6	6.0
	Fishing, Crop farming and Livestock farming	5	5.0	16	16.0	7	7.0
6	Years in Primary Occupation						
	Less than 10years	35	35.0	45	45.0	38	38.0
	10 – 40 years	45	45.0	20	20.0	32	32.0
	41 – 60 years	15	5.0	10	10.0	20	20.0
	above 60 years	5	5.0	25	25.0	10	10.0
7	Secondary occupation						
	Farming	14	14.0	15	15.0	10	10.0
	Trading	62	62.0	72	72.0	56	56.0
	Artisan	11	11.0	10	10.0	20	20.0
	Civil Service	13	13.0	3	3.0	14	14.0
8	Average monthly income						
	Less than N20, 000	12	12.0	14	14.0	10	10.0
	N20, 000-N40, 000	26	26.0	20	20.0	22	22.0
	N41, 000-N60, 000	41	41.0	39	39.0	35	35.0
	N61, 000-N80, 000	11	11.0	20	20.0	23	23.0
	N81, 000 and above	10	10.0	7	7.0	20	20.0
	Combined Mean	N52,000					

Source: Field Survey, 2019

Multidimensional Well-Being of the Women Farmers

Table 2 shows the distribution of the sampled women farmers based on their Wellbeing Index (WI). The WI for the respondents ranges from 0.01 to 0.80 with a mean value of 0.41 and standard deviation of 0.12. Most of the women had their WI between 0.00-0.80 while none had very high between 0.90-1.00. On the average, the respondents have low wellbeing index, this is in line with findings of Alaye-Ogan, (2008) who used uni-dimensional and multidimensional approach and found women to have low wellbeing. The decompositions across the senatorial districts as shown in Table 3 reveals that

in Akwa Ibom North West, majority (56%) of the respondents falls within 0.2001 - 0.30, in Akwa Ibom North East, majority (67%) of the women farmers falls within 0.3001-0.400 and in Akwa Ibom South senatorial district, Majority (76%) falls within 0.40001-0.5000. While the registered women farmers in the three senatorial districts of Akwa Ibom State generally have their wellbeing index (WI) between 0.01-0.80, the least woman has a WI of 0.08, 0.01 and 0.02 in Akwa Ibom North East, Akwa Ibom North West and Akwa Ibom South senatorial districts respectively. This agrees with the work of Alaye-Ogan, (2008) implying that there are opportunities to improve on the wellbeing of women in all the agricultural zones.

Table 2: Distribution of the Respondents by their wellbeing index

Deprivation Index	Frequency	Percentage (%)	
0.0000-0.1000	10	3.33	
0.1001-0.2000	36	12.0	
0.2001-0.3000	73	24.33	
0.3001-0.4000	82	27.33	
0.4001-0.5000	71	23.67	
0.5001-0.6000	16	5.33	
0.6001-0.7000	8	2.67	
0.7001-0.8000	3	1.0	
0.8001-0.9000	1	0.33	
Total	300	100.0	
Mean	0.41		
Standard deviation	0.12		

Source: Computed from field survey

Table 3: Decomposition of Deprivation Index (DI) across Senatorial Districts

Categories	Akwa Ibom North West		Akwa Ibom North East		Akwa Ibom South	
	Frequency	%	Frequency	%	Frequency	%
0.0000-0.1000	5	5.0	3	3.0	2	2.0
0.1001-0.2000	16	16.0	12	12.0	8	8.0
0.2001-0.3000	43	43.0	18	18.0	12	12.0
0.3001-0.4000	14	14.0	53	53.0	15	15.0
0.4001-0.5000	12	12.0	8	8.0	51	51.0
0.5001-0.6000	5	5.0	5	5.0	6	6.0
0.6001-0.7000	4	4.0	1	1.0	3	3.0
0.7001-0.8000	1	1.0	0	0.0	2	2.0
0.8001-0.9000	0	0.0	0	0.0	1	1.0
0.9001 – 1.000	0	0.0	0	0.0	0	0.0
Total	100	100.0	100	100.0	100	100.0

Source: Computed from field survey

Multidimensional Wellbeing Decomposition Across Dimensions And Indicators

The contribution of each welfare dimension and indicator to women's wellbeing is presented in Table 4. Among the six dimensions considered, health and nutrition had the highest absolute and relative contributions of 0.13 and 43.46% and thus contribute more to the women farmers' wellbeing. This is followed by housing and sanitation with 0.10 and 31.48%. This means that the women are better off in these dimensions than others. The high relative contribution of housing is expected since most of them live in the same house with their spouses. These houses are provided by the joint effort of the household. It is also worthy of note that health and nutrition has a high relative contribution. The high relative contribution of health and nutrition underscores the point that power relations within the household is crucial and

ability to participate in decision making particularly with respect to health issues is important for women's wellbeing. The lowest absolute and relative contributions of 0.012 and 15.08% respectively are recorded in employment and 0.067 and 20.16% in employment. These dimensions contribute less to well-being. It implies that the women's access to information and employment is poor presently and improving this dimension will improve their wellbeing. In ascending order of contribution, the six dimensions considered are arranged as follows: employment, education, information access, autonomy, housing and sanitation and nutrition and health. In view of the low well-being index of women in general, these dimensions need to be improved on, particularly employment, education and information access whose contributions to wellbeing are very low

Table 4: Multidimensional Wellbeing Decomposition across Dimensions and Indicators

Dimensions	Indicators		Absolute Contribution	Relative Contribution
Education	Anyone dropped from school and work	μ_{11}	0.0185	5.5237
	Funds for schooling	μ_{12}	0.0199	5.9588
	Grown children schooling	μ_{13}	0.0142	4.2383
	Literacy	μ_{14}	0.0148	4.4357
			0.0674	20.1565
Housing and Sanitation	Type of house walls	μ_{21}	0.008	2.4072
	Type of roofing materials	μ_{22}	0.0181	5.4126
	Type of house	μ_{23}	0.0184	5.4959
	Ownership of the house	μ_{24}	0.0194	5.8198
	Floor of the house	μ_{25}	0.0186	5.5745
	Appearance of the house	μ_{26}	0.0149	4.4885
	Toilet facility	μ_{27}	0.0076	2.2828
			0.105	31.4813
Autonomy	Final decision on who goes to the market and what to buy	μ_{31}	0.0128	3.8285
	Final decision on who visit and who to visit	μ_{32}	0.0171	5.1103
	Final decision on what medical attention to get in the house	μ_{33}	0.0197	5.9023
	Final say on how he spends his money	μ_{34}	0.0150	4.4899
	Final decisions on livelihood and income generating activities in the house	μ_{35}	0.0038	1.1240
			0.0684	20.455
Health and Nutrition	Frequency of adequate food	μ_{41}	0.0194	5.8076
	Affordability of food	μ_{42}	0.0172	5.1397
	Frequency of availability of food	μ_{43}	0.0181	5.4123
	Frequency of Balance diet	μ_{44}	0.0188	5.6403
	Frequency of Visit to clinic	μ_{45}	0.0197	5.9072
	Child delivery at the hospital/clinic	μ_{46}	0.0122	5.2410
	Place of antenatal care	μ_{47}	0.0128	5.1110
	Body mass index	μ_{48}	0.0131	5.2100
			0.1313	43.4691
Employment	Gainfully employed	μ_{51}	0.0123	5.0348
	Place of employment	μ_{52}	0.0067	5.0270
	Remuneration	μ_{53}	0.0119	5.0265
			0.0138	15.0883
Information Access	Listening to radio	μ_{61}	0.0013	5.0881
	Listening to television	μ_{62}	0.0042	4.0217
	Reading from newspapers	μ_{63}	0.0095	2.0356
	Contacts with extension agents	μ_{64}	0.0057	4.6297
	Communication with GSM phone	μ_{65}	0.0129	5.2440
	Membership of co-operative societies	μ_{66}	0.0156	5.2700
			0.0492	26.2891

Source: Computed from field survey

Multidimensional Wellbeing Decomposition across Dimensions and Senatorial Districts

Health and Nutrition

Health and nutrition was assessed considering the Frequency of adequate food, frequency of availability of food, frequency of Balance diet, frequency of visit to clinic, place of antenatal care, place of delivery and body mass index of respondents. The result shows that women in the Akwa Ibom South senatorial district had the highest wellbeing index 0.0541 (26.97%) while women from the Akwa Ibom North East were worse off 0.0444 (13.83%) (See table 5).

Housing and Sanitation

With regards to housing and sanitation, women in the Akwa Ibom South senatorial district are better off in this dimension 0.1063 (34.88%) than women in other senatorial (See table 5).

Information Access

The absolute and relative contributions of this dimension to wellbeing reveals that the women in agricultural blocks of Akwa Ibom South have the highest contribution while those in the Akwa Ibom North East have the least (See table 5).

Autonomy

Women farmers in agricultural blocs in Akwa Ibom North East senatorial district enjoyed the highest level of autonomy with absolute and relative contributions of 0.0572 and 17.85%. On the contrary, the results reveal that women farmers in Akwa Ibom South senatorial district are worse off in this dimension 0.0496 (11.17%). These results indicate that conditions of Akwa Ibom South senatorial district women are worse off with regards to how to spend money, final say on large

household purchases. The implication of this is that women farmers in agricultural blocks of Akwa Ibom South senatorial district are likely to depend on their husband's decision or take decisions jointly with them or other relatives because they possess the lowest WI in relation to two of the indicators examined to determine their level of autonomy. This indicates that these women seek the approval of their husbands or other people on decisions pertaining to their health and before they embark on visit to friends and family members.

Education: Akwa Ibom North East women farmers emerged with the highest index in this dimension 0.0449 (12.76%). The senatorial districts arranged from the descending order with respect to educational attainment are Akwa Ibom North East, Akwa Ibom North West and Akwa Ibom South (See table 5).

Employment: The Akwa Ibom North East women had the highest level of well-being in this dimension. This result is not unexpected as people from this area are widely known for their business prowess. However, Akwa Ibom South women farmers were worse off in this dimension of well-being.

In all, women farmers in agricultural blocs of Akwa Ibom South rank highest in four of the six dimensions considered. These dimensions are health and nutrition, housing and sanitation and information access. The condition of Akwa Ibom North East women is best in two dimensions; autonomy and education. The women of Akwa Ibom North West senatorial district are worse off than their counterparts in other zones in all the dimensions.

Table 5: Multidimensional Wellbeing Decomposition across Dimensions and Senatorial Districts

Dimensions	Akwa North	Ibom East	Akwa North West	Ibom South	All districts
Health and Nutrition	0.0444 (13.83)		0.0531 (16.02)	0.0541 (26.97)	0.1313 (43.46)
Housing and Sanitation	0.0975	(30.43)	0.0125 (28.62)	0.1063 (34.88)	0.105 (31.48)
Information Access	0.0762 (20.78)		0.0681 (21.32)	0.0707 (25.19)	0.0492 (26.29)
Autonomy	0.0572 (17.85)		0.0543 (16.38)	0.0496 (11.17)	0.0684 (20.45)
Education	0.0449 (12.76)		0.0341 (9.57)	0.0141 (4.57)	0.0674 (20.16)
Employment	0.0203 (6.32)		0.0197 (5.92)	0.0168 (5.465)	0.0138 (15.0883)

Source: Computed from field survey. Values in the parenthesis are the relative contributions while values outside parenthesis are the absolute contributions.

CONCLUSION

This study provides empirical evidence of the wellbeing of registered women farmers in the Akwa Ibom State. Women farmers in agricultural blocs of Akwa Ibom South were better off than their counterparts in other zones. Interventions in the area of employment, education and information access is needed for the women farmers, especially women in Akwa Ibom North West senatorial district. Governments and Non-Governmental organizations should put in place interventions in these dimensions so that the Sustainable Development Goals put in place by the United Nations can be achieved by 2030.

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FACTORS AFFECTING YAM PRODUCTION AND YIELD IN DELTA NORTH AGRICULTURAL ZONE, DELTA STATE, NIGERIA

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ABSTRACT

The study assessed various factors that affect farmers' choice of yam species for cultivation and yield determinants in Delta State. Data were collected from sixty-nine respondents and analyzed using descriptive statistics and binary logistic regression analysis. Findings show that 97.1% of the farmers are male, 81.2% of the farmers are married, 47.8% had primary education, 68.1% engaged in mixed-farming and 62.3% of the farmers preferred planting white yam over yellow yam. The result on determinants of choice of yam species for production showed that farming experience (Z-score = -0.59, p=0.003), farm size (Z-score = 15.53, p=0.021) and cost of fertilizer (Z-score = -1.871, p=0.061) were the major determinants of the probability of choosing either yellow or white yam for planting by the farmers. Meanwhile yam yields were largely influenced by education level of farmers (Coef=-0.0123, t-ratio = -2.452), fertilizer quantity applied (Coef: 0.0006, t-ratio = 1.757), species choice used for planting (Coef.= 9.406, t-ratio =197.794) and yam sett quantities applied (Coef= -0.0107, t-ratio= -1.988) significantly influenced yield at 1%, 5%, 10%, 1% and 1% levels of significance respectively. Based on the findings the study recommends that females should be encouraged to participate in yam production to reduce male dominance. Farmers should be encouraged to build capacities in yam production, particularly in use of improved yam sets, the benefit of usage and methods of fertilizer applications to enhance yield. Relevant institutions should create awareness on the benefit of yellow yam production in addition to white yam for both biodiversity and nutrition reasons.

Keywords: yam production, yellow yam and biodiversity, determinants of yam species choices, food security

INTRODUCTION

Yam is the second most important root/tuber crop in Africa (only second to cassava). "Yam" name was derived from Portuguese 'Inhame,' which originated from West African languages during trade contacts (Harper, 2017). Over 150 species of yam are grown throughout the world and distributed throughout the humid tropics, but the most economically important species are the, white yam (*Dioscorea rotundata*) yellow yam (*Dioscorea cayenensis*), water yam

Dioscorea alata), and bitter yam (*Dioscorea dumetorum*). FAO (2013), Verter1 and Bečvářová (2015) indicated that the total land area harvested with respect to yam in the world had risen from 1.15 million (Ha) in 1961 to 5.04 million (Ha) in 2012. The yield (Hg/Ha) in the world also increased from 72.35 thousand metric tons in 1961 to 116.65 thousand metric tons in 2012. Nigeria accounted for over 65% (38 million metric tons) of the world yam production, which was valued at \$7.75 billion and cultivated about 2.9 million hectares of land in 2012.

White yam (*Dioscorea rotundata*), originated in Africa and is the most grown and preferred yam species (Mignouna & Dansi, 2003). The tuber is roughly cylindrical in shape the skin is smooth and brown and the flesh is usually white and firm. There are a number of white yam cultivar, with little difference on their production and post-harvest characteristics. Yellow yam (*Dioscorea cayenensis*), is native to West Africa and very similar to the white yam in appearance, except for its yellow flesh, which is brought about by presences of *Carotenoids*. The tuber-skin of the yellow yam is smoother than that of the white yam. The yellow yam has a longer period of vegetation and a shorter dormancy than white yam (Mignouna & Dansi 2003).

Yam farming have been a traditional practice in West Africa (Asiedu-larbo, 2010). The commodity is of great importance in the economy of West Africa, as it is a source of local commerce and accounts for about 32% of foreign trade (International Institute of tropical agriculture, IITA, 2010). The crop is also a major source of foreign exchange and is used as raw material; for starch industries and pharmaceutical companies (Amanze, Agbo, EkeOkoro & Njoku, 2011). Yams generally grow for six to ten months, and is dormant for two to four months (depending on the species). These two phases, usually corresponds to the wet season and the dry season. Maximum yield is attained with an annual rainfall of over 1,500mm, distributed uniformly throughout the growing season. FAO (2018), puts world yam production as at 2017, at 72.02 million metric tons (mmt), with Nigeria as the nation with the highest annual output, with 49.38 mmt produced in 2016, accounting for 67.6% of world production. In 2010, Nigeria produced 37.32 mmt, 33.13 mmt in 2011, 32.32 mmt in 2012, 35.62 mmt in 2013, 45.15 mmt in 2014, 45.68 mmt in 2015, 45.15 mmt in 2016 (FAOSTAT, 2017). From the statistics, it can be seen that Nigeria's output has been on an increase from 2013, which make Nigeria a major stake holder in world yam production. Nigeria,

according to FAO (2017), farms yam on about 5.8 million hectares, which is about 74% of world total land area allocated to yam farming (7.8 million hectares).

In fact, according to the International Institute of Tropical Agriculture IITA, (2006) 'yam has been embedded in the population habit and has socio-cultural significance, as considerable amount of ritualism is developed around the production and utilization of yam'. For instance, some households uses it during marriage and fertility ceremonies. More so, festival (especially amongst the Igbo ethnicity), takes place yearly to celebrate its harvest, and other social ceremonies (IITA, 2013). In addition, the cultivation of the crop is very profitable despite high costs of production and price fluctuations in the markets (IITA, 2013). According to the report, an average profit per yam seed, after harvest and storage in Nigeria, was calculated at over N3.8 million per hectare harvested (IITA, 2013).

Consequently, the economic and health benefits of yam are inexhaustible. But, despite all these importance and potentials, there is a seeming lack of interest in the cultivation of yam, especially in the arable part of the country, due to the shift of interest from indigenous agriculture, to crude oil explorations (Ogunsumi, 2007). This shift of interest has severe consequence, because according to Okuneye, (2001), population growth has overwhelmingly surpassed agricultural production. Also, the neglect of yam cultivation has nutritional implications; as (Ogunsumi, 2007), found that yam contained approximately 1.4-3.5g per 100g edible portion of protein, which is the highest protein content of any root and tuber crop. In Nigeria, empirical studies have shown that yields of yam are constrained by fertilizer, cultural practices such as planting density and cropping system intensification practiced (Enesi, Hauser, Lopez-Montez, and Osonubi, 2018). Scholars such as Okeke, Okeke and Udeora (2013) noted that

socio economic factors such as farmers' age, farming experience, education level, farm household size and farm size positively impact yam yields in South-East Nigeria significantly. Ajiehi (2012) found a significant relationship between farmers' socioeconomic attributes and their level of adoption of yam mini-sett technology in Delta State.

Considering the importance and potentials of yam, and the declining production of same it is worrisome that this area of study had been neglected and not much effort is being made, to the best knowledge of these researchers to promote the production of yellow yam in Nigeria. Such efforts can improve biodiversity and nutrition outcomes in Nigerian households. ; Against this backdrop, this study/ was designed to examine the issues regarding choice of yellow yam for production by farmers in Delta State Nigeria and to evaluate the determinants of its yield in the area.

Specifically, the research was conducted to:

- (i) Describe the socio-economic characteristics of the yam producers in the area,
- (ii) Evaluate the major determinants of choice of yam species cultivated by farmers, and,
- (iii) Estimate the determinants of yam yield from the yam farms in the area.

RESEARCH METHODOLOGY

The study was conducted in Delta North Agricultural Zone of Delta State. The zone comprises of 9 (nine) local government areas, which are; Aniocha North, Aniocha South, Ika North-east, Ika South, Ndokwa East, Ndokwa West, Oshimili North, Oshimili South, and Ukwuani local government areas. Delta state covered a land mass of 5,793km² (NDEBUMOG, 2012) of which, more than 60% is land. The region

lies approximately between Longitude 5°.00 and 6°.45. East and latitude 5°.00 and 6°30 North. Delta state has a population of 4,112,445 (males: 2,069,309, females: 2,043,136) (National Population Commission, 2006). The majority of this population, are rural dwellers, with those living in the central and southern Delta agricultural zone, involving in fishing as a means of livelihood and the delta north agricultural zone dwellers involving in crop cultivation (mostly cassava and yam). The state has an average annual rainfall of about 2,665mm in the coastal areas and 1,905mm in the extreme north (Delta north agricultural zone), with the highest and heaviest rainfall occurring in July. Temperature increases from South to north in the state, with the south having an average daily temperature of 30°C, and a daily average temperature of 44°C in the northern part of the state (Niger Delta Budget Monitoring Group (NDEBUMOG), 2012). Delta north agricultural zone, has good basic infrastructure such as; good road network, electricity, basic and post-primary schools, and tertiary institutions.

Sampling Procedure

The population of the study comprises all yam farmers (including yellow and white farmers) in Delta North Local Government of Delta State. There are about 265 registered yam farmers in the study area (ADP, 2010). A two stage random sampling technique method was used to select the yam producers. First, 3 communities were purposely selected from each of the local government areas based on availability of yam farms there. In stage two, 27 yam farmers were randomly selected per community to give a total of 81 producers. A total of 81 copies of a structured questionnaire were administered to the farmers.

Analytical Technique

Data from this study were analyzed using different tools and techniques. Quantitative analytical

techniques were employed in order to achieve the objectives. Specifically, the first objective which is to describe the socio-economic characteristics of yam farmers in the study area, was achieved using descriptive statistics i.e. measures of central tendencies, measures of variability (standard deviation or variance), skewness and kurtosis. The second objective, which intends to verify the various socio-economic and production factors that influence the choice of yam species cultivated by the farmers (whether yellow yam or white yam) were analyzed using binary logit (logistical regression) model. Dummy model was used, where choice of yellow yam was assigned a value of '0' while a value of 1 represents yellow yam choice. Some of the hypothesized variables which could affect the choice of yam cultivar to plant include; cost of yam sett, farming experience, farm income, farm size, cost of fertilizer, labour cost, land rent, household size, and educational status.

The probability of choosing yellow yam as a cultivar ($j = 0$ or 1) or not is derived from the following logistic model following Penn State Elberly College of Science (2018):

$$\pi_i = \Pr(Y_i=1|X_i=x_i) = \text{logit}(\pi_i) = \log(\pi_i / 1 - \pi_i) \\ = \exp(\beta_0 + \beta_1 x_i) / 1 + \exp(\beta_0 + \beta_1 x_i) \dots \text{Eq. 1}$$

Where $\exp(\beta_0)$ = the odds that the characteristic (adoption of yellow yam) is present in an observation i when $X_i = 0$, i.e., at baseline.

$\exp(\beta_1)$ = for every unit increase in X_{i1} , the odds that the characteristic is present is multiplied by $\exp(\beta_1)$. This is similar to simple linear regression but instead of additive change it is a multiplicative change in rate. This is an estimated odds ratio.

In general, the logistic model stipulates that the effect of a covariate on the chance of "success" is linear on the log-odds scale, or multiplicative on the odds scale.

If $\beta_j > 0$, then $\exp(\beta_j) > 1$, and the odds increase.

If $\beta_j < 0$, then $\exp(\beta_j) < 1$, and the odds decrease.

Where;

$Y(\frac{Y_i}{1-Y_i})$ = yam species cultivated (where 0 = white yam and 1 = yellow yam)

X_i represents the following independent variables: X_1 =Marital status of the farmer (Single=1, Married = 2, Separated = 3, widowed = 4, divorced=5) with the code, MARSTAT; X_2 = Land rent per annum (naira) with the code LANDRENT; X_3 =Labour cost (naira); [number of labourers X cost per manday multiplied by number of days = cost of labour] coded as L ABCST; X_4 =House-hold size (counts) coded as HSHDSZ; X_5 =Fertilizer Cost (naira) coded as FERTCST; X_6 =Farm size (ha) with the code, FAMSZ; X_7 = farming experience (years) coded as FAMEXP; X_8 = Educational level (in years), coded as EDUSTAT; and X_9 =Cost of yam sett (naira) which is coded as MSET.

Thus the final logistic model estimated is of the form: $Y(\frac{Y_i}{1-Y_i}) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 \dots + \beta_n X_n + \mu \dots \text{Eq. 2}$

β_0 = Intercept
 β_1 to β_9 = Regression coefficients indicating the relative effect of a particular explanatory variable on the outcome.
 μ = error term

The third objective, which focuses on the factors that determine the yields of yam in the study area was attained using OLS regression analysis. The explanatory variables include; yam sett, sex, specie choice, herbicide, marital status, farming system, farming experience, farm income, farm size, fertilizer, labour, household size, educational status.

The various forms of regression model were used to ascertain the determinants of yield of yams in the study area. The model is implicitly expressed as: $Y = f(x_1, x_2, x_3, x_4, x_5, \dots, x_n, e) \dots \dots \dots \text{Eq. 3}$ Explicitly the model is stated thus:

Linear Form

This was chosen to be the lead model considering the relatively high R^2 (37%) F-statistics. Also, five of the variables considered are significant at either 5% or 1%.

$$Y(\text{output}) = \beta_0 + \beta_1 \text{Edu} + \beta_2 \text{Frmexpr} + \beta_3 \text{Frmicom} + \beta_4 \text{Frmsys} + \beta_5 \text{Frmsiz} + \beta_6 \text{Fertilz} + \beta_7 \text{Herbicid} + \beta_8 \text{HHsize} + \beta_9 \text{Labor} + \beta_{10} \text{MStatus} + \beta_{11} \text{Sex} + \beta_{12} \text{SpeciCH} + \beta_{13} \text{Yamset} + \mu \dots \dots \dots \text{Eq. 4}$$

Y = Quantity of either species consumed (kg)

β_0 = Intercept

β_1 to β_{13} = Regression coefficients

Edu = Education (years)

Frmexpr = Farm experience (years)

Frmicom = Farm income (naira)

Frmsys = Farming system (Dummy: Whether monocropping = 1, mixed cropping = 2, or agroforestry = 3).

Frmsiz = Farm size (hectares)

Fertilz = Fertilizer cost (naira)

Herbicid = Herbicide cost (naira)

HHsize = house-hold size (counts)

Labor = Labour (mandays)

Mstatus = Marital status of the farmer (Single=1, Married =2, Separated =3, widowed = 4, divorced = 5)

Sex = Sex of the farmer (Dummy: Male =0, Female=1)

SpeciCH = Yam specie choice cultivated (Dummy: Yellow yam=1, White yam=0)

Yamset = Yam sett (count)

μ = error term

Semi-Log (log-linear) Form

$$\ln Y(\text{output}) = \beta_0 + \beta_1 \text{Edu} + \beta_2 \text{Frmexpr} + \beta_3 \text{Frmicom} + \beta_4 \text{Frmsys} + \beta_5 \text{Frmsiz} + \beta_6 \text{Fertilz} + \beta_7 \text{Herbicid} + \beta_8 \text{HHsize} + \beta_9 \text{Labor} + \beta_{10} \text{MStatus} + \beta_{11} \text{Sex} + \beta_{12} \text{SpeciCH} + \beta_{13} \text{Yamset} + \mu \dots \dots \dots \text{Eq. 5}$$

Where;

$\ln Y$ = natural logarithm of Y (output)

Double Log (log-log) Form

$$\ln Y(\text{output}) = \beta_0 + \beta_1 \ln \text{Edu} + \beta_2 \ln \text{Frmexpr} + \beta_3 \ln \text{Frmicom} + \beta_4 \ln \text{Frmsys} + \beta_5 \ln \text{Frmsiz} + \beta_6 \ln \text{Fertilz} + \beta_7 \ln \text{Herbicid} + \beta_8 \ln \text{HHsize} + \beta_9 \ln \text{Labor} + \beta_{10} \ln \text{MStatus} + \beta_{11} \ln \text{Sex} + \beta_{12} \ln \text{SpeciCH} + \beta_{13} \ln \text{Yamset} + \mu \dots \dots \dots \text{Eq. 6}$$

Where;

$\ln \text{Edu} - \ln \text{Yam}$ = natural logarithm of Educational status – Yamsett

Y = quantity of either species produced (kg)

β_0 = intercept

β_1 to β_{13} = regression co-efficients

RESULTS AND DISCUSSION

Socio-Economic Characteristics of yam farmers in Delta North

The socio-economic features of the yam producers examined include gender, marital status, educational level, farming system, preferred yam specie, farming experience and extension visit and it's presented in Table 1 below.

Table 1. Socio-Economic Characteristics of yam producers

Variables	Items	Frequency (n=70)	Percentage (%)
Gender	Male	67	97.1
Marital status	Married	56	81.2
Educational Level	Primary	33	47.8
Farming system	Mixed-cropping	37	68.1
Preferred yam specie	White yam	43	62.3
Farming Experience	11-20	61	76.5
Extension Visit	No	67	97.1

Source: Field Survey, 2019

Results from Table 1 shows that, 97.1% of the respondents were male, while 2.9% were female. This implies that majority of the respondents who engaged in yam production were males. This may be connected to the laborious nature of yam production which most females cannot contend with. This result is in consonance with the findings of Ogunniyi, Adepoju, Olagunju, Ojedokun and Ganiyu (2013) who also found that men dominated the work force in Nigerian agricultural communities. It is deduced from the table that majority of the yam farmers 81.2% are married while 17.4 % are single implying that majority of the farmers are married. This implies that most of the yam farmers are responsible individuals, who contribute directly or indirectly to household food security and national food availability. This finding agrees with Okeke (2013) who stated that married people were predominantly engaged in various agricultural activities so as to improve their livelihood and that of their households.

The result, further indicates that majority 47.8% of the respondents had primary education with 8.7% of the yam farmers having no formal educational background. This also agrees with the findings of Okeke et al (2013), who found that education affect the level with which new technologies are being diffused and accepted by the farmers. The result on table 1 further portrays that most 68.1% of the yam farmers engaged in mixed-cropping, while 31.9% engaged in mono-cropping. This

conforms to the findings of Adegeye and Ditttoh, (1985), who reported that most of the yam farmers diversified production because of the risk and uncertainty associated with farming. On the preferred yam species for planting, majority 62.3% of the respondents picked white yam over yellow yam, while only 4.3% of the yam farmers cultivated both yam species. On the level of experience gathered in yam production, majority 76.5% of the yam farmers had 11-20 years of yam farming experience. This is in line with the findings of Okeke et al (2013) who reported that farming experience is directly related to technical efficiency. From the findings, the socio-economic attributes of the farmer, affects the choice of species they choose to cultivate, hence the null hypothesis is accepted.

Extension contact distribution of the respondents is also presented in Table 1. The result shows that most of the respondents 97.1 % do not have access to extension service and only 2.9% of the sampled yam farmers, had access to extension agent. This implies that majority of the yam producers in the study area do not have access to recent technologies on the best practices in the study area, and this affects the outputs level of the yam farmers greatly. This conforms to the findings of Achoja, Idoge, Ukwuaba, and Esowhode, (2012) who stated that output depends on the volume and frequency of information gotten from extension agents.

Table 2 Logistic regression result showing determinants of Choice of yam specie cultivated by the farmers
Dependent Variable: Specie Choice (1=Yellow yam, 0=otherwise or chose white yam)

Variable	Coefficients	Z –values	P>Z
Cost of Yam Sett	0.0000252	1.633	0.102
Educational Status	-0.164	-0.267	0.789
Farming Experience	-0.596	-2.959	0.0031***
Farm Income	-0.00000182	-0.994	0.320
Farm Size	15.532	2.312	0.0208**
Fertilizer Cost	-0.000797	-1.871	0.0614*
Household Size	0.865	1.426	0.154
Labour Cost	0.00000182	1.017	0.309
Land Rent	-0.0000387	-1.441	0.150
Marital Status	-7.127	-1.702	0.089*
Constant	14.818	2.272	0.023**

Source: Compiled from field survey data, 2019

LR chi2 (6) =43.74977; Prob>chi2 = 0.00004, Pseudo R2= 0.490

*** Significant at 1%, **Significant at 5%

Entering all of the proposed variables into the logistic regression model produced a degenerative effect, but gradual and stepwise elimination of some of variables yielded a set of variables that give the model with the best fit in terms of the highest number of significant variables, a significant chi statistics and the highest Pseudo R-square. From the logistic regression result (Table 4), the coefficient of farming experience is negative and had a significant z-statistic at $P=0.0031$ (Table.4). This implies that farming experience have a negative relationship with the

probability of selecting yellow yam choice cultivation. Farm size with a positive coefficient had a significant z-statistics at $P=0.0208$ indicating that farm size has a positive relationship with the probability of selecting either yellow or white yam specie for cultivation.

Determinants of yam yield in the Study Area

The study also assessed the significant variables that determined yam yield in the study area. Table 3 shows the determinants on the output of yam in the study area.

Factors Affecting Yam Production and Yield in Delta North Agricultural Zone

Table 3. Determinants of Yam Yield in the study area

Variables	Linear	Semi-log ⁺	Double-log	Exponential
Constant	20422.47 (9264.934) 2.204**	7.532 (0.155) -0.166***	-11.701 (0.142) -81.932***	-106467.400 (63363.100) -1.680 *
Education in Years	188.1148 (175.849) 1.0697	-0.000489 (0.00295) -0.166	-0.0123 (0.00506) -2.452 **	4125.273 (2242.861) 1.839290
Farming experience	350.7645 (195.778) 1.792 *	0.00073 (0.00328) 2.232**	0.00319 (0.00499) 0.640	3709.042 (2214.438) 1.675 *
Farm Income	0.002035 (0.000595) 3.421 ***	1.43E-08 (0.00000000999) 1.430	0.00575 (0.00625) 0.919	3280.180 (2774.423) 1.182
Farming System	4180.577 (1765.592) 2.368 **	0.000751 (0.0296) 0.0250	-0.00568 (0.00661) -0.860	4440.211 (2932.944) 1.514
Farm Size	28247.04 (7158.953) -3.946 ***	0.8103 (0.120) 6.742 ***	0.0135 (0.0140) 0.959	-860.9271 (6227.985) -0.138 ***
Fertilizer	14.68691 (60.394) 0.243	0.002959 (0.00101) (2.9187) ***	0.000628 (0.000358) 1.757 *	-257.9824 158.659 -1.626
Herbicide	167.6952 (202.801) -0.827	-0.003454 (0.00341) -1.0145	-0.056838 0.00730 -7.784 ***	-11404.98 (3239.383) -3.521 ***
Household Size	50.77182 (213.337) 0.153	0.000514 (0.00556) 0.0924	-0.000508 (0.000423) -1.202	436.0605 (187.625) 2.324 **
Labour in Mandays	127.7627 (233.946) -0.546	-0.004180 (0.00393) -1.0642	-0.028067 (0.0139) -2.0194 **	-1850.358 (6166.294) -0.300
Marital Status	2791.130 (1799.163) 1.551	0.00192 (0.0302) 0.0636	-0.00261 (0.00300) -0.871	-180.930 (1328.750) -0.136
Sex	80.57170 (4129.833) -0.0195	0.157 (0.0693) 2.262 ***	0.00164 (0.00803) 0.204	4408.627 (3564.214) 1.237
Specie Choice	3390.153 (1674.129) 2.025	0.0391 (0.0281) 1.391	9.406 (0.0476) 197.794***	32867.840 (21098.060) 1.558
Yam Setts	0.022347 (0.129) 0.1732	0.0000566 (0.00000216) 26.145 ***	-0.0107 (0.00536) -1.988 *	-1739.904 (2377.346) -0.732
R-Squared	0.488	0.94	0.99	0.46
F-statistic	4.03321***	71.100***	3999.814***	3.687***
Akaike Information criterion	20.087	-1.903	-5.876	20.130
Durbin-Watson Statistics	1.664	1.641	1.764	

The results in Table 3 show the estimated determinants of yam output in the study area. The F- ratio for the lead equation was 3999.8 and significant at 1% implying that there was a very high joint significance of the combined effects of the explanatory variables used in the model. This implies a very good fitting. The double log model was chosen not only based on the strength of the R-squared but also on the considerations of its results which represents elasticity besides, it has the highest level of R-square, (0.99) implying that the explanatory power of the model was the highest of all. The results indicated that education level of farmers, (Coef=-0.0123, t-ratio = -2.452) , fertilizer quantity applied (Coef: 0.0006, t-ratio = 1.757) and species choice used for planting (Coef.= 9.406, t-ratio =197.794) significantly influenced yield at 1%, 5%, 10% and 1% levels of significance respectively. The significant effect of fertilizer quantity applied observed is expected and indicates that higher cost of fertilizer decreases the yield as there is a tendency to add less quantities of fertilizer as indicated by the negative coefficient of fertilizer cost. This is in agreement with Srivastava (2010) who found that mineral fertilizer application exerted significant positive effect on the total biomass production and tuber yield of two yam species. They studied. According to Enesi, Hauser, Lopez-Montez, and Osonubi (2018) species combination and fertilizer quantity applied also affect yield of yam. The finding also agreed with Okeke, et al (2013) who noted that education level, positively influenced yam yields in South-East Nigeria significantly. The findings also agreed with Ajieh (2012) who found a significant relationship between farmers' socioeconomic attributes and their level of adoption of yam miniset technology in Delta State.

CONCLUSION

The study notes that yam production is an enterprise dominated by male farmers in the study area most of whom are married. Farming

Experience, farm size, cost of fertilizer and marital status of the farmers influenced the probability of choosing yellow yam as a cultivar by the farmers in the area. The yield recorded by yam farmers in the study were influenced by education level of farmers, fertilizer quantity applied, species choice used for planting and yam sett quantities applied. It is therefore recommended that female farmers should be encouraged to participate in yam production to reduce male dominance. Farmers should be encouraged to build capacities in yam production, particularly in use of improved yam sets, on the benefits of usage of such improved cultivars, particularly for yellow yam, and on better methods of fertilizer applications to enhance yield. Relevant institutions should create awareness on the benefit of yellow yam production in addition to white yam to expedite biodiversity and better nutrition. It is equally recommended that land should be made available for yellow yam production due to the observed positive correlation between land and the propensity to produce yellow yam, as this will encourage yellow yam production in the study area.

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ASSESSMENT OF URBAN WOMEN PARTICIPATION IN AGRICULTURAL PRODUCTION ACTIVITIES IN PLATEAU STATE, NIGERIA

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ABSTRACT

The study analysed urban women participation in agricultural production activities in Plateau state, Nigeria. Multi-stage sampling procedure was used in selecting one hundred and twenty (120) respondents for the study. Data were obtained with the aid of questionnaire and analyzed using descriptive statistics to achieve the objectives while the hypothesis was tested using multiple regression analysis. Majority (34.2%) of the urban women fall within 28-37 years age (average 34), while 61.7% were married and most of them (25%) were Hausas. 53.8% had tertiary education with civil service being the primary occupation (24.4%). Most (46.2%) had farming experience between 1-5 years, the majority (46.2%) also had 1-5 person in their household while the farmland size of the majority (51.8%) was 1-2.9 ha. The result also indicates that marketing (mean=2.90) was the major agricultural activity participated in followed by planting (mean=2.63). The study concluded that socio-economic characteristics of the urban women significantly influenced their participation in agricultural production activities while marketing was the agricultural production activity they majorly participated in and that majority of them participated on a small scale. The study recommends that government should link urban women with micro finance banks in order to have access to capital in form of credit/loan which will enhance their participation in agricultural production activities to ensure their enterprise expansion for greater income.

Key words: Urban women, Urban Agriculture, Production activities, Poverty

INTRODUCTION

Women farmers are the main food producers in developing countries and yet they are among the most vulnerable groups (Karki, 2009), their economic empowerment to produce more and to participate in policy formulation is critical to addressing poverty and food insecurity. Studies have shown that Nigerian women play major roles in key farming operations such as planting, weeding, and harvesting, to the extent that certain crops are designated as “female” crops in some areas. For instance, in southeastern Nigeria, yam is being grown by male while cassava and other ephemeral crops like melon, cocoyam are female crops (Ajani, 2008). Anosike and Fasona (2004) pointed out that in Lagos women shoulder the responsibility in the provision of food and welfare

for their households despite their access to little productive resources. Amali (1989) added that women’s labour input is highest in food production, processing and the marketing of both raw and processed agricultural commodities. Women are often the farmers who cultivate food crops and produce commercial crops alongside the men.

Urban women participate in Agricultural production activities so as to maintain livelihoods and contribute to household incomes through subsistence production and they even sell surplus for cash (Hovorka, 2003). They are important in the translation of the products of a vibrant agriculture sector into food and nutritional security for their households. Many studies in developing countries have shown that women contribute as

much or more than men do to family food security and children's nutritional status when unpaid work is included in the estimates. A study undertaken in Zimbabwe which found that women produced 60% of urban food production which is majorly consumed by household members (Mbiba, 2005). Thornton *et al.* (2002) added that urban women play a significant role in the agriculture and farming activities which include food production activities except ploughing, livestock production activities and in the fish sector with the aim of improving their financial situation.

The role of women generally in agricultural production has been recognized globally. This was as a result of enormous tasks they perform in agriculture from production to value addition. City women farmer in relation to women participation is receiving a boost due to increasing awareness of women in agricultural production activities. It is imperative to realize that urban women are now championing the clarion call by the government to partake in agricultural production.

Agricultural production activities are any activity directly related to the production of crops, poultry or livestock for initial commercial sale or as a principal means of personal subsistence (Bareja, 2014; Barau and Oladeji, 2017). It also include any activity directly related to fish farming and cultivation and harvesting of trees. On the other hand, the word urban lacks a universally applicable definition, but could literally be referred to as a city or metropolitan area. However, agriculture is ever trending and gaining prominence especially in developing economies because it has been discovered to be a viable poverty intervention strategy. The presence and potential of agricultural production activities in Nigeria especially in big cities is not a new phenomenon. Urban agriculture is being practiced in almost all metropolitan areas in both developing and developed countries. The popularity of urban agriculture has increased considerably in the last

few years as concerns about the environment have combined with increased interest in health and community building issues, giving rise to support for food systems in metropolitan areas as an integral part of a sustainable development path for cities (Hendrickson and Porth, 2012; Barau and Oladeji, 2017).

Increasing population in the urban centers as a result of rural-urban migration and natural growth rate necessitated the need to feed more mouths hence, there is the need to increase productivity since food produced in the rural areas cannot sustain the growing population. So in order to at least solve the food insecurity problem, women became the backbone of urban agriculture just like the rural areas.

Women's relevance in meeting the challenges of agricultural production and development cannot be overemphasized (Rahaman, 2008) although in most accounts of agricultural development planning, farmers are generally perceived as 'males' by policy makers, development planners and agricultural service deliverers. Researchers have shown that women contribute significantly to agricultural enterprise. The World Bank (2003) reported that women in Asia provide up to 90% of the labour for rice cultivation. Also, in Egypt they contribute about 53% of the agricultural labour while in Nigeria, they contribute between 60 and 80% of labour particularly in subsistence food production as well as in all sub-sectors of agriculture, such as crops, livestock, fisheries and agro-forestry. Enete and Amusa (2010) pointed out that men have reportedly continued to dominate farm decision making even in areas where women are the largest providers of farm labour.

The main objective of this study was to assess the participation of urban women in agricultural production activities in Plateau State, Nigeria. The study specifically described the socioeconomic

characteristics of the urban women, it equally determined their level of participation as well as found out what motivated them to participate in agricultural production activities.

METHODOLOGY

The study was conducted in Plateau state, Nigeria. It is located between latitude $8^{\circ} 24'N$ and longitude $10^{\circ} 38'E$. The state is bound by Bauchi state to the north-east, Kaduna state to the north-west while to the south-east and south-west, it is bound by Taraba and Nassarawa states respectively. It has an area of about 26,899 km² with an estimated population projection of about 4,200,400 people and population of women projected as 2,105,790. The state was created in 1976 with fourteen (14) Local Government Areas (LGAs). New ones were created in 1989, 1991 and 1996, amounting to seventeen (17) LGAs (Trade Investment in Nigeria, 2008; Plateau State Government, 2016).

The state has over forty ethno-linguistic groups, majority which are indigenous tribes such as Berom, Afizere, Amo, Anaguta, Aten, Bogghom, Buji, Challa, Chip, Fier, Gashish, Goemai, etc and from other parts of country (Hausas, Igbo, Yoruba, Ibibio, Annang, Efik, Ijaw, and Bini) who came to settle in Plateau state (PSG, 2016).

The altitude of the state ranges from around 1,200 meters to a peak of 1,829 meters above sea level. The mean annual rainfall varies from 131.75 cm in the Southern part to 146 cm on the Plateau. Though in the tropical zone, a higher altitude means that Plateau state has a near temperate climate with an average temperature of between 18 and 22°C. The highest rainfall is recorded during the rainy season months of July and August.

The state is known for both agricultural and manufacturing activities. Agricultural products produced include potatoes, groundnut, vegetables of varied sorts, fruits, yams etc. and livestock

species reared include cattle, sheep, goat, poultry etc.

Sampling Procedure and Size

A multistage sampling procedure was used to realize the sample size for the study. Stage one involved a purposive selection of 3 Local Government Areas namely Shendam, Jos-North and Jos-South. The selection of the areas was informed and guided by the agricultural nature of the place and higher concentration of urban women participation in agricultural activities.

Stage two involved the selection of forty (40) respondents across ten (10) wards in each Local Government Areas using table of random numbers of the households that participate in the agricultural production activities. Lastly, four (4) respondents were selected from each ward making a total of forty (40) respondents. A total of one hundred and twenty (120) respondents constituted the sample for the study.

Method of Data Collection

Data for the study were generated from the primary source only and was generated through administration of structured questionnaire and interview schedule.

Analytical Techniques

Descriptive statistics such as frequencies, means and percentages were used to achieve the objectives of the study such as the socio-economic characteristics of the respondents, participants' level of participation as well as motivations toward participation in agricultural production activities.

Results and Discussion

Socio-economic Characteristics of the Women Participants

Age.

The result in Table 1a presents the age range of women participants. It showed that women participants within the ages of 28 – 37 years constitutes the majority with 34.2% followed by those within the ages of 18 – 27 years having 31.7% while ages of 38 – 47 years and 48 – 57 years are 14.1% and 13.3% respectively. Women with the age ranges of 58 years and above and less than 18 years had a low percentages of 5.9% and 0.8% respectively. The average age of the participants was 34 years and this result agrees with the finding of Bilkisu (2011) who reported the majority of the age group of women participant in agriculture in Kogi state to be between 28-37 years. Bawa *et al.* (2010) added that women involved in agricultural seed systems activities in Borno state, North-East Nigeria are within the age range of 18-35 years. This age range can be regarded as youthful and productive age when farmers can make vital impact in agricultural production and development in general.

Marital Status

Table 1a shows that majority of the women participants representing 61.7% were married. This was followed by few (30%) of them who are single. 4.2% are divorced and very few constituting 3.3% are widow and a non-significant percentage (0.8%) are separated. This result agrees with the findings of Salau and Attah (2012) who reported majority (90%) of the urban women participants in agricultural activities to be married followed by single (7.7%) women. The reason behind the majority being married is due to the encouragement of early marriage in the Nigerian Society.

Ethnicity

Result (Table 1a) on ethnicity shows that majority representing 25% are Hausas which is closely followed by the Yorubas (18.3%). Goemai are 15.8%, Birom, 13.3% while few (10.8%) are Igbos

and very few of the participants are Fuliani, Kwanpan, Nupe. Anga, Ebira, Ron, Gwari and Tai. This result indicated that the study area is a multi-ethnic region though the Hausas are the majority being that the state is closer to the northern Nigeria. Belonging to one ethnic group or the other has effect on participation of urban women in agricultural production activities (Barau and Oladeji, 2017).

Highest educational level attained

As presented in Table 1a, majority of the respondents representing 53.8% had attained tertiary education while 23.5% attained secondary education. 13.4% attained primary education and very few representing 9.2% attended Qur'anic education only. The result implies that majority of the urban women farmers are educated and farmers' education generally have been found to enhance participation in food crop production and resulting in their efficiency in the usage of new production technology (Ani, 2006).

Primary occupation

The results (Table 1a) show that majority (24.4%) of the respondents were civil servants, 20.2% had farming as their major occupation while 19.3% were students. 12.6% were housewives and very few respondents 9.2%, 7.6% and 6.7% are in public service, trading and handiwork as the major occupation. This finding agrees with that of Foeken and Mwangi (2000) that most of the farming activities in the urban areas were carried out on part time basis by people engaged in other occupations. Their involvement in urban agriculture was to augment household food/income.

Secondary occupation

The result on secondary occupation (Table 1b) indicated that majority representing 66.5% of the

participants are farmers. This was followed by those that are traders with 29.4% and housewife, student and handiwork having 3.4%, 0.8% and 0.8% respectively. Most of the farming activities in the urban areas were carried out on part-time basis by people engaged in other occupations as stated by Foeken and Mwangi (2000).

Years of farming experience

Table 1b also shows that majority (42.2%) of the respondents had urban farming experience of between 1-5 years, 25.8% had 6-10 years experience while 12.1% had between 16-20 years of experience. Respondents with 11-15 years of experience are 11.2% and very few (8.7%) of them had farming experience of 21 years and above. This result is however contrary to the findings of Salau and Attah (2012) in their study conducted in Nassarawa state who recorded majority (55.56%) of the respondents had urban farming experience of between 11-20 years, 22.28% had 1-10 years experience while 15.56% had between 21-30 years of experience. The longer farming experience indicates that most of the respondents were well experienced in urban farming and are expected to have acquired relevant skills for effective operations.

Monthly income

The monthly income of participants as presented in Table 1b reveals that majority representing 70.7% of the respondents earned between ₦10,000-₦50,000. 19.8% earned between ₦51,000-₦100,000 while 5.4% earned less than ₦10,000 and those that earned ₦101,000-₦150,000 and ₦151,000 and above were 2.3% and 1.8% respectively. The mean estimated monthly income as also presented in the table was ₦45,848.2k. This shows that urban women farmers in the state were small income earners and the low income status might reduce their ability to procure capital intensive technologies as income

level has a positive relationship level of technology adoption (Agbamu, 2006).

Household size

On household size of the participants, the result (Table 1b) shows that majority (46.2%) of the respondents had within 1-5 persons in their households. This was closely followed by 45.2% of the respondents whose household size is between 6-10 and few (5.3% and 3.3%) had household of 11-15 and 16 and above. The average household size of the participants in the study area is 7 persons. The trend in the household size as found out in this study seems to agree with the result of the study of Abah (2011) on household size of tomato farmers in Abuja. Also, the result on average household size correspond to the findings of Oyekale and Oyekale (2008) who found out that the average number of persons per farm household in Nigeria is approximately 7 persons.

Farmland size

The result in Table 1b revealed that majority of the respondents representing (51.8%) operated between 1-2.9 ha of farmland. 22.7% operated less than one hectare (< 1 ha.) of farmland while 19.1% operated between 3-4.9 ha and very few (3.6% and 2.7%) of the respondents operated between 7 ha and above and between 5-6.9 ha respectively. The average farmland operated on is 2 ha, this implies that most of the farmers were operating on subsistence level. This might not be unconnected with the difficulty in acquiring land for farming purposes in the city. Studies have shown that most urban farmers in Nigeria operate on small scale (Aniedu, 2006 and Emodi, 2009).

Table 1a: Distribution of urban women based on socio-economic characteristics

Variable	Frequency (N=120)	Percentage (%)	Mean	
Age (Years)				
Less than 18	1	0.8	34.1	
18-27	38	31.7		
28-37	41	34.2		
38-47	17	14.1		
48-57	16	13.3		
58 years and above	7	5.9		
Marital Status				
Single	36	30.0		
Married	74	61.7		
Divorced	5	4.2		
Separated	1	0.8		
Widow	4	3.3		
Ethnicity				
Yoruba	22	18.3		
Hausa	30	25.0		
Fulani	7	5.8		
Igbo	13	10.8		
Birom	16	13.3		
Nupe	3	2.5		
Goemai	19	15.8		
Kwan pan	4	3.3		
Tal	1	0.8		
Ebira	1	0.8		
Ron	1	0.8		
Gwari	1	0.8		
Angos	2	1.7		
Highest education level attained				
Primary	16	13.4		
Secondary	28	23.5		
Tertiary education	64	53.8		
Qur'anic education only	11	9.2		
Primary Occupation				
Civil servant	29	24.4		
Housewife	15	12.6		
Public service	11	9.2		
Farming	24	20.2		
Student	23	19.3		
Trading	9	7.6		
Handwork	8	6.7		

Source: Field survey, 2019

Table 1b: Distribution of urban women based on socio-economic characteristics

Variable	Frequency (N=120)	Percentage (%)	Mean
Secondary Occupation			
Housewife	4	3.4	
Farming	78	65.5	
Student	1	0.8	
Trading	35	29.4	
Handiwork	1	0.8	
Farming experience (years)			
1-5	49	42.2	
6-10	30	25.8	
11-15	13	11.2	
16-20	14	12.1	
21 and above	10	8.7	
Monthly income (₦)			
Less than 10000	6	5.4	45848.2
10000-50000	79	70.7	
51000-100000	22	19.8	
101000-150000	3	2.3	
151000 above	2	1.8	
Household Size			
1-5	43	46.2	6.8
6-10	42	45.2	
11-15	5	5.3	
16 and above	3	3.3	
Farmland size (ha)			
Less than 1	25	22.7	2.0
1-2.9	57	51.8	
3-4.9	21	19.1	
5-6.9	3	2.7	
7 and above	4	3.6	

Source: Field survey, 2019

Participants Level of Participation.

Level of participation in various agricultural production activities

Table 2 indicates the level of participation of the respondents in various agricultural activities. Marketing was ranked first followed by planting (2nd) while harvesting was third and next to harvesting was land preparation (4th). Pest control, weeding and giving livestock water were fifth, six and seventh respectively. Fertilizer application (8th) was followed by feeding livestock (9th) and cleaning of livestock house (10th). Threshing

(11th), winnowing (12th), secondary processing (13th) and processing livestock product (15th) was least in the ranking. Studies have shown that Nigerian women play major roles in key farming operations such as planting, weeding, and harvesting, to the extent that certain crops are designated as “female” crops in some areas (Ajani, 2008). Thornton *et al.* (2002) also added that urban women play a significant role in the agriculture and farming activities which include food production activities except ploughing, livestock production activities and in the fish sector with the aim of improving their financial situation.

Table 2: Mean ratings of urban women level of participation in various agricultural production activities

S/N	Agricultural activities	Fully	Partially	Not at all	Mean	Standard deviation	Ranking
1	land preparation	51	46	23	2.23	0.75	4 th
2	Planting	86	22	11	2.63	0.65	2 nd
3	fertilizer application	43	44	29	2.12	0.78	8 th
4	weeding	50	36	32	2.15	0.82	6 th
5	pest control	47	44	26	2.18	0.77	5 th
6	Harvesting	85	15	19	2.55	0.76	3 rd
7	Threshing	43	21	49	1.95	0.91	11 th
8	Winnowing	39	15	59	1.82	0.92	12 th
9	Secondary processing	26	35	53	1.76	0.80	13 th
10	Feeding of livestock	57	14	44	2.11	0.93	9 th
11	giving livestock water	57	17	42	2.13	0.92	7 th
12	cleaning of livestock house	50	18	47	2.03	0.92	10 th
13	processing livestock products	25	24	60	1.68	0.83	14 th
14	marketing	103	12	0	2.90	0.31	1 st

Source: Field survey, 2019

Motivation to participation in agricultural production activities

Table 3 revealed that many (38.3%) of the women participants were motivated by the passion they had for the enterprise. This was closely followed by 34.8% who were motivated by increase in income from the enterprise while 24.3% were motivated based on inheritance and very few 1.7% and 0.9% were motivated based on consumption and circumstances respectively. This result implies that urban farming provided household

food, additional income and full time employment to the participants. Therefore the development of urban agriculture would lead to increased employment opportunities, national food security and income generation. This finding is in line with that of Hovorka *et al.* (2009) who reported that urban agriculture has important positive effects on poverty alleviation, local economic development, food security, nutrition and health of the urban poor.

Table 3: Distribution of the urban women based on what motivated them to participate in agricultural production activities (N=120)

Variable	Frequency	Percentage (%)
Increased income	40	34.8
Passion	44	38.3
Inheritance	28	24.3
Consumption	2	1.7
Circumstances	1	0.9

Source: Field survey, 2019

Income Level of Participants in Agricultural Production Activities

Contribution of farm business to income

The result in Table 4 shows that farm business contributed highly to their income based on the responses of many (49.2%) of the respondents and it was closely followed by 45% who claimed it moderately contributed to their income while very

few added that it contributed lowly to their income. This result agrees to the findings of Salau and Attah (2012) who reported majority (75.56) of the respondents indicated additional household income as their benefit from urban farming. Also, Hovorka *et al.* (2009) reported that urban agriculture has important positive effects on poverty alleviation, local economic development, food security, nutrition and health of the urban poor.

Table 4: Distribution of the urban women based on the contribution of farm business to their income (N=120)

Variable	Frequency	Percentage (%)
High increase	59	49.2
Moderate increase	54	45.0
Low increase	7	5.8

Source: Field survey, 2019

CONCLUSION AND RECOMMENDATIONS

The study concluded that majority of the urban women participated in agricultural production activities but on a small scale. Socio-economic characteristics of the urban women significantly influenced their participation in agricultural production activities and also that agricultural marketing was the major agricultural activities participated in by the urban women. Lastly, the enterprise had highly contributed increasingly to the income of the urban women in the study area. Based on the findings and conclusions drawn from this study, the following recommendations were made:

1. There is need to identify the training needs of women participation in agricultural production.
2. Government should link urban women with micro finance banks in other to have access to capital in form of loan/credit which could be used to improve their participation and expand enterprises for greater income.

3. Government and NGO's should extend scholarship programmes to women in the study area and the need for sensitizing them on a better way to improve or participate in agricultural production activities.

4. Awareness should be created to rural women on how they can impact positively on the economy through agricultural production.

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IMPERATIVE FOR AGRICULTURAL POLICY REDIRECTION IN THE POST COVID-19 PANDEMIC ERA

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ABSTRACT

The COVID-19 pandemic snuck up on even the most responsive societies and countries around the world and altered almost everything in its path. The effects and far-reaching impacts of the pandemic continue to rage in Nigeria. The agricultural sector in Nigeria has been affected and the effect is expected to continue touching food systems, distribution channels, livelihoods and the capacity for farmers to produce. For Nigeria, it is critical to formulate policies and revolutionize the agricultural sector in its entirety having in mind the possibility that similar events of even greater magnitude may occur in the future. The paper expatiates the imperative for the alteration of policy and programmes to improve the dynamism and resilience of the sector in preparation for the current and future eventualities. The evolution of the agricultural sector is an imperative for sustainable development but more important is the careful and deliberate redirection of policy to help the sector adjust to rapid and sporadic changes or impacts of natural phenomena. Recommendation was made for decreasing the informality of the agricultural sector for agricultural workers and business owners alike to incorporate them into a larger framework of consistent wage regime. This is achievable if the sector itself becomes financially self-reliant through increased productivity and incorporation of standardization and technology.

Keywords: COVID-19, agricultural Policy, coronavirus, imperative, Nigeria.

INTRODUCTION

After months of redundancy and mandatory lockdown, the Nigerian economy is likely to enter a recession as industry watchers and analysts have predicted. The COVID 19 pandemic is a global phenomenon that has altered virtually everything from the way we sleep to the way we interact. The era of social distancing has emerged with an imperative for lifestyle alterations. The COVID-19 pandemic, like other natural disasters similar to it, took its greatest toll on the poorest of the poor in the country. Nigeria's economy was specifically

hard-hit given that oil prices and demands plunged dramatically. As at late May of 2020, global demand for crude oil had started climbing back to pre-pandemic levels and prices continued on an upward run (Kelly, 2020). However, the lockdown and ultimate shutdown of economic activities have both taken their tolls on a Nigerian economy just recovering from recession. Following the impacts of the virus, other sectors relying on the luxury of oil wealth are predicted to suffer greatly. One such sector is the agricultural sector of Nigeria. According to Ogbe (2018), Nigeria imports food commodity worth \$22 billion per annum.

Compounding the extra expenditure incurred on food imports is the fact that the Nigerian agricultural system is simply not properly evolved to handle the country's increasing population that shows no sign of abating any time soon. Nigeria is not yet food self-sufficient or food secure. Majority of the poorest of the poor in Nigeria operate in the agricultural economy and the corona virus is making their survival and livelihood more complicated.

There were already about 820 to 825 million undernourished people in the world pre-coronavirus and 2 billion food insecure (IPES-Food, 2020). By the end of 2020, 265 million people are projected to face acute food insecurity, this figure was formerly 135 million people before the coronavirus pandemic (World Bank, 2020). Currently, the world produces twice the amount of food needed by the entire global population, the question is not necessarily food production but access. Distribution of food is critical in ensuring food security. In the 1943 famine of Bengal, disruption of food distribution as well as poor policy and not lack of it was responsible to the death of about 2 – 3 million people (Sen, 2003). Preliminary findings from a GODAN survey suggest that world global economic growth rate has declined by 1% in comparison to a similar period last year as a result of COVID-19. This will lead directly to rise in extreme poverty by between 1.6% and 3%. Based on simulations, the number of extremely poor could rise by 14 million and 22 million if trade channels are further disrupted (GODAN, 2020).

The COVID-19 pandemic has revealed the fragility in Nigeria's economy. Experiences from the pandemic have shown us that a more disastrous global event, Nigeria and other countries with a single source of income are likely to face when more virulent pandemics or economic events occur. What we have learned from COVID-19 is that we need to make permanent, far-reaching changes and we need to do it now. As at April 2020

oil prices had collapsed so terribly that producers of oil had started paying buyers to offtake from them having run out of storage facilities and seeing little global demand for the product (Tagliapietra, 2020). Nigeria's foreign reserve has also dipped in recent times. Implementing policy for increased food production will help improve the value of our currency and achieve food security and self-sufficiency. This could prove important during periods like the COVID-19 lockdown. One of the greatest paradoxes of Nigeria is the fact that it possesses about 84 million hectares of arable land within its territory but has not leveraged on this resource to become one of the greatest food exporting nations in the world. Future simulative extrapolations of similar shocks acting on the Nigerian economy clearly points to the fact that we need to develop sustainable policy that will transform the Nigerian agriculture to a more resilient sector able to absorb shocks and function near optimally.

Policy Alternatives for Nigeria's Agriculture.

Even though Nigeria was hard-hit by the COVID-19 pandemic, it is most fortuitous that the ease of lockdown is emerging just at the point when the farming season of 2020 is beginning. Majority of Nigeria's agriculture is characterized by smallholdings and employment of part time labour. Most transactions for the majority of the smallholders in agriculture are informal and as agriculture is a completely outdoor activity, an end to lockdown is auspicious to agriculture but the sector cannot continue to depend on fortuity. There is need to have a working policy to ensure resilience in the worst-case scenario. A perfect policy will be a fully mechanized agriculture system which will require a minimal human effort and lead to maximum agricultural productivity.

Vulnerability Mapping.

There are food insecurity hot spots around Nigeria and there is an imperative to develop and

implement policy that will address geographical locations identified as such. Typically, fragile areas and areas affected by conflict where the market chains have been disrupted will constitute food security hot spots; areas affected by extreme weather events and pest infestations; people who are already poor and vulnerable. The homeless and extremely poor in Nigeria are the most likely to suffer from the fallout of food shortage and disruptions of food supply chains across the country. There is also need to identify most-at-risk regions in the country, such as the North East of Nigeria, hunger mapping can help policy-makers prioritize those regions where interventions are most need and help decide the magnitude and type of intervention needed.

Land Policy Improvement.

Less than half of the about 84 million hectares arable soil resource in Nigeria is currently under cultivation. The opportunity for agricultural productivity expansion is enormous and an improvement from the rudimentary methods to a more technology-driven, innovations-led approach is necessary. The Green imperative agricultural policy plan of the current administration is an elaborate mechanization scheme that can solve the entire problem of the agricultural production system in Nigeria. Clear definitions of land ownerships and the extent to which lands can be used as well as what lands can be used for are necessary to alter the course of land use policy in Nigeria. The dedication of land for different uses is very necessary in Nigeria especially considering that the farmer-herder crisis is currently the deadliest internal violence in the country. The consolidation of small landholdings to larger parcels of land can be considered. The option of Land Use Consolidation and Crop Intensification (LUCCI) may be appropriate for Nigeria but other land use policies can be developed in Nigeria given that unlike Rwanda, where LUCCI is in practise, Nigeria has an abundance of land.

Financial Inclusion Policy.

The agricultural sector in Nigeria is notoriously underfinanced. Most recently formal credits to the sector rose to an abysmal 4.2% from about 1% just a few years ago (Udegbumam, 2019). Farmers in Nigeria are characterized by smallholdings, low capital and poor access to credits as well as extreme poverty. This is the fraction of the society expected to feed the rest of the country. It is little wonder the country is neither self-sufficient nor food secure. The traditional tenure system in Nigeria is determined through patriarchy and patrilineality. For this reason, landholdings are continually partitioned and majority of the farmers in Nigeria have landholdings of about 1 hectare. Subsistence is usually the method of food production among majority of Nigeria's farmers and while over 70% of the population in Nigeria get their incomes from agriculture, the incomes are usually meagre making the sector about the poorest in the country. To exacerbate this financial inadequacy further, country-wide currency devaluation concerns have been raised and should be the areas of prime concern (World Bank, 2020). However, the current COVID-19 relief fund of the NIRSAL microfinance bank (worth ₦50 billion) could go a long way in changing the lives of Nigerian farmers. Even so, the agricultural sector in Nigeria needs more access to finance.

Monetary and Microfinance Policy.

Following the impacts of COVID-19 on the country, interest rates for loans have been reduced to 5% from 9% including a moratorium of one year for all loans. IMF (2020) stipulated that the CBN has also established a ₦50 billion credit facility accessible to Nigerian citizens, an extra 3.6 trillion naira into the banking sector and another 100 billion to the health sector. The manufacturing sector will receive ₦2 trillion while the real sector gets ₦1.5 trillion for its impacted industries. Relevant to the agriculture sector is the ₦1 trillion support fund to cushion the effects of food

shortages in Nigeria. The principal activities the fund should be dedicated to should be infrastructure, mechanization, storage facilities and the development of a functional marketing system with proper linkages between areas of highest production to areas of highest demand. Transformation of raw materials to finished goods should also be prioritized to address the huge losses occasioned by spoilage of agricultural produce all around the country. The agricultural sector may also benefit from a special private sector intervention targeting ₦130 billion to fight COVID-19. For the agricultural sector in Nigeria, it is pertinent to establish resilience and strengthening food production, distribution, storage and transformation. In the event of a greater pandemic or another forcing impacting the sector we may not escape as easily as this.

Logistics and Transport.

The most sophisticated delivery systems in the world were not negatively affected by the COVID-19 pandemic in terms of food distribution. Smart city technologies all over the developed world helped countries to practice the most extreme forms of lockdown more effectively. Fortunately, Nigeria and most of Africa did not have to experience such extreme lockdown as would have people totally indoors during the current COVID-19 lockdown but with different forms of new diseases springing up, there is the possibility of another pandemic, not to sound pessimistic, but may be one more deadly, there is a possibility that we may find ourselves in the midst of such lockdown sometime in the future. In the last decade, a number of new diseases have emerged in different regions of the world, each one surpassing its predecessor in virulence. Therefore, an excellent transport and delivery system is needed to help agriculture distribute food with ease if countries in the developing world will survive a future pandemic of more virulent illnesses. The policy recommendation here is to structure a for-

agriculture-only transport system to help address the situation of transportation.

Labour Wage and Social Security.

The agricultural sector in Nigeria is excluded from national labour protection laws, although most of the private sector is excluded from such protection in Nigeria, the agricultural sector is worst hit. There is no standard payment for agricultural labourers and most of the wages are driven by the nature of the locality. Agricultural workers receive payment on the basis of economic buoyancy or otherwise of the rural economy. Workers in this informal sector are excluded from minimum wage, specification of maximum working hours, sick leave or social security. The seasonal nature of agriculture also means that agricultural workers only get to receive reasonable payment for a season in the year. The agricultural sector can also be a place where professionals can forge a career. This is possible if average income estimates or production value of farmers are known and distributed over a year and paid to farmers accordingly. A developed agricultural economy can provide formal *green collar* employment within its extensive value chains for the teeming army of unemployed Nigerian youths.

Innovation and Technology Incorporation

Innovation and incorporation of digital technology in Nigeria's agriculture is the pathway to achieving a modern agricultural sector. Through extension, it is possible to transmit technology and innovations to smallholder farmers and effectively monitor adoption. Digital technologies such as geo-tagging, remote sensing, precision agriculture, virtual markets for inputs and products, specialized storage devices, communication and payments need to be incorporated into the agricultural sector in Nigeria. Once agricultural productivity is increased through proper mechanization and adoption of the best production technologies and techniques, the

next big question will be how to seamlessly distribute food to the areas where they most demanded. For instance, E-commerce has contributed in helping nations flatten the COVID-19 curve through food delivery. Platforms like the Amazon made incredible profits during the lockdown period as evidence of the relevance of E-commerce.

The importance of agritech organizations and start-ups has come to the fore. Agri-logistics companies will need to fill the space of the absence of inter-state travel and restrictions on travel. Currently, there are very few e-commerce establishments in Nigeria. Innovative online platforms such as Jumia and Konga have delved into food distribution and this is positive. However, totally agricultural online platforms need to be developed specifically for the purpose of market penetration and reaching the consumer base unable to move due to restrictions. COVID-19 is expected to accelerate digitization of agriculture even in developing countries.

This kind of initiative can be very successful once it is private sector-led and monitored and/or financed by the government. The objective of digitization is to distribute food optimally to the greatest possible number of people thereby minimizing the risk of spreading the virus. However, this could be an opportunity for the much-needed digitization of the agricultural sector since compulsion is a precursor to creativity. A concern is the role of labour absorption which agriculture is very proficient in, transcending to a digital platform would mean relieving agriculture of human labour. This concern is well attended to given that incorporation of technology will give rise to the emergence of new areas and value chains in agriculture requiring labour. These new areas include luxury goods, exotic products, marketing, processing and technology-based storage systems.

CONCLUSION

Policy alteration and careful implementation are necessary to put the agricultural sector in Nigeria on the right track to resilience amid the possibility of natural occurrences or disasters acting on the sector. Clearly, the path to agricultural prosperity will involve the deliberate development of the agricultural sector toward improved productivity, development of infrastructure and financial stability. In the midst of the COVID-19 pandemic, the Nigerian agricultural sector can take the opportunity of reinventing itself through technology incorporation and adoption of the right forms of virtual resources that will enable it continue to serve the growing population in Nigeria. It is key to make proper assessment of the impacts and consequences of the COVID-19 pandemic on the agriculture space in order to plan accurately in dealing with the issue.

Policy Recommendations and Implementation Strategies

- i. The level of informality of the agricultural sector needs to be broken, agricultural workers and business owners alike need to be incorporated into a larger framework of consistent wage/salary regime. This is achievable if the sector itself becomes financially self-reliant through increased productivity and incorporation of standardization.
- ii. Injection of funds either in the form of loans or grants have to be done with a clear purpose and properly defined, clear terms and targets for the development of rural economy. Infrastructure, properly accentuated market linkages and transformative technologies for raw materials development should be the targets of injected funds.
- iii. The entire value chain of agriculture in Nigeria should be strengthened and revolutionized. Although finance is a very important aspect of modern agriculture, it is not a lone ingredient; proper training through

agricultural extension, development of technical capacity in specific interest areas and clear definition of the overall direction the sector is headed is important for agricultural revolution.

iv. There is the need to develop an all-encompassing, longer term agricultural plan factoring all facets of agriculture as well as interrelationships and interdependencies each facet shares with the next one. A permanent balance between food and animal production both of which are currently not operating optimally needs to be achieved.

v. Weak and low irrigation capacity in Nigeria is a huge hindrance to year-round farming, much-needed productivity is lost as a result of poor irrigation. Implementation of sustainable policies regarding irrigation is necessary.

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NIGERIAN FOOD SYSTEMS AND AGRICULTURAL PRODUCTIVITY AMID COVID-19

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ABSTRACT

It is obvious now more than ever that the wanton dependency on food imports is unreliable and unsustainable. This era of the coronavirus pandemic has shown clearly that food self-reliance and the ability of the country to provide its population's agricultural requirement must be domesticated as even with money the global supply chain of agriculture can be severely affected beyond the control of an external party. The paper assesses the economic and productivity losses that the agricultural sector in Nigeria may suffer or has already suffered as a result of the coronavirus pandemic and the level of efficiency and adequacy of the country's response plan. As it becomes increasingly difficult to gain access to quality food due to strain on the supply channels and the absence of financial power to purchase the adequate requirements for nutritious feeding as a result of income losses, the most vulnerable members of the population will be worst hit. On the part of the smallholder farmers producing up to 80% of the food in Nigeria, uncertainty and poor access to financing and the required agri-inputs will most likely lead to a significant decrease in the volume of food production across the country. It was recommended that with the high level of uncertainty in the immediate future of agricultural production acting as a huge demotivation to the productivity decision of farmers in Nigeria, farmers being basically smallholder and practicing subsistence as their form of agricultural production will respond immediately to the smallest shock acting on the food system. To mitigate this occurrence there has to be a protection policy taking away possible risks through insurance and risk sharing for farmers going into the 2020 farming season and entering the domestic food demand of 2021.

Keywords: COVID-19, agriculture, coronavirus, productivity, food systems, Nigeria.

INTRODUCTION

The coronavirus pandemic has affected all sectors of the Nigerian economy especially the sectors directly linked to the welfare and wellbeing of the population. As an ever-increasing population of about 200 million people, it is necessary to assess and ascertain the status of productivity and viability of the food system and agricultural sector of the country relative to the shocks of the current coronavirus. The agricultural sector especially in

less developed nations is sitting on a keg of gun powder. There are more than a billion people around the world who will probably go to bed hungry tonight. There is great possibility that more people will go to bed hungry as a result of COVID-19. There is clear evidence that several countries are dependent on others for food and agricultural products. As borders around the world were closed up due to lockdown orders, the most vulnerable food systems in the world are most likely to suffer food shortages and the most poorly evolved agricultural sectors in countries around the world,

especially low-income countries, are likely to suffer production losses.

There is a number of complicating factors associated with COVID-19 and the agricultural system in Nigeria. Labour supply has always been insufficient due to huge reliance on human labour and poor status of mechanization in Nigeria. There is also the question of financial exclusion, exemption of women and youths from traditional resource ownership and poverty. The COVID-19 situation has brought to the fore a number of fragilities, inequities and inequalities existing in our food systems and the patterns of distribution (ILO, 2020). Wealthier countries have had the issue of access to nutritious food. During the coronavirus lockdown, underlying societal inadequacies came to the fore such as people already in isolation (including the aged and the sick), others are people with no access to online retail or living outside delivery areas (IPES-FOOD, 2020). For most African nations, with probably some of the poorest response systems in the world, it can only be said that we were fortuitous probably due to a formidable immune system but for how long can we honestly rely on fortuity. The COVID-19 pandemic is a call for action.

In Nigeria, agricultural productivity and distribution were not at their optimum levels even in the pre-coronavirus era. The coronavirus lockdown situation has complicated the situation even further. Fortunate enough for the Nigerian agricultural sector borders had been closed since the ending of 2019 giving the citizenry an advantage of having acclimatized to the situation for the months leading to the lockdown occasioned by COVID-19. Nevertheless, food distribution channels are still rudimentary and small shocks can overturn the system completely. So far extreme cases of food supply and distribution have not been recorded in Nigeria, mainly because the lockdown was stricter in other areas than others and the fact that law enforcement has not been as

effectual as would have been preferred. What has been observed, however, is the fact that across the country, sharp increases in the cost of food and vital products have occurred. The most likely cause is the ban on interstate travels and the extra cost of transportation imposed on traders due to physical distancing laws.

As the farming season sets in, labour will be of particular concern given that interstate travels have been restricted due to the lockdown. In Nigeria, agricultural labourers come in from Niger, Chad and parts of Cameroon and return to their respective countries later, with lockdown this situation will be a lot more difficult. Currently, some foreign labourers have been trapped in Nigeria unable to return to their countries and yet unable to operate optimally to save enough money to improve their lives.

Financial Uncertainty and Future Projections.

The very financially weak private sector employing most of Nigeria's educated young has been undone by the sheer unpredictability of the coronavirus pandemic. Wage and salary cuts have been rife. Worst case scenarios have seen a total stoppage of salaries by vulnerable small businesses and start-up companies in Nigeria as well as massive job losses. Many farmers will not produce optimally in the wake of this pandemic. Even those who will produce at full capacity will face the risk of having their products wasted or forced to sell at a loss. A fall in household consumption will occur as households will spend money only on essential goods and services; low income expectation in a foreseeable future will lead to miserly financial behaviour especially among short-term employees, contract staff and people in the informal sector. Uncertainties exist as a result of current wealth erosion and the possibility of losing expected incomes (Onyekwena and Ekeruche, 2020).

Economic loss is one of the most predictable fallouts of the COVID-19 pandemic. According to a United Nations 2020 report on effects of COVID-19, the global economy is expected to contract by 3.2% and the global output loss is expected to reach \$8.5 trillion over the next 2 years as a result of COVID-19. Furthermore, a sharp decline in global demand and disruptions due to lockdown is expected to cause World trade to contract by up to 15% (UN, 2020). Analysts are of the opinion that Nigeria's financial response to the COVID-19 pandemic is inadequate because global average of national stimulus package is about 12% of their individual national GDPs. The US package was about 11% but stimulus package in sub-Saharan Africa is 0.4% of GDP on average (Ogunpolu, 2020). In Nigeria, the stimulus package is 0.34% of the national GDP meaning it is even less than the sub-regional average. There is no way this can cause significant impact to an already frail economy. The pandemic is also expected to deal a blow on the attempt to end global poverty as about 34.3 million people will fall into poverty with an additional 130 million likely to join the ranks of poverty by 2030 (UN, 2020). This is of particular interest to Nigeria having taken over the top position of country with the highest number of extremely poor people in the world in 2019.

Global foreign direct investments (FDI) are projected to decrease by up to 40% in 2020 from the \$1.54 trillion of 2019. This is according to the world investment report of United Nations Conference on Trade and Development for 2020. The decline is expected to bring global FDI under \$1 trillion for the first time since 2005 (Adekoya and Salau, 2020). The cause is not far-fetched. The COVID-19 pandemic has been described as a demand, supply and policy shock for FDI. Economic duress is particularly deleterious to the agricultural sector as the sector has the greatest incidence of working poverty, about 25% of the workers in agriculture globally live in extreme

poverty (ILO, 2020). The rate of extreme penury among agricultural households is far greater in the developing world. A huge percentage of agricultural workers suffer poverty and food insecurity. In extreme cases the constant food supply to the household is actualized on a seasonal basis. This is further complicated by the fact that the agricultural sector is composed mainly of rural people with poor financial intelligence.

Are rural agricultural businesses eligible for formal loans?

As far as informality goes there is no form of business more informal than agricultural businesses in Nigeria and many other parts of the world. To get the typical agricultural businesses into measurable or evaluable businesses can be a herculean task. Data is unavailable as to the number of farmers in Nigeria and their concomitant agri-inputs requirements that may lead to optimum productivity. Therefore, distributing agricultural credits in the characteristic patterns of agricultural landholdings and business forms is most likely impossible. Ownership of land is also not formal; land ownership is mostly by inheritance meaning that lands are not well stipulated as formal documentation is unavailable. The Anchor Borrowers scheme is a firm attempt at correcting this anomaly through land consolidation. However, it is important to have data on the specific number of farmers and their holdings in order to develop agricultural policy plan with a firm knowledge of the assets and resources available to the agricultural sector in Nigeria as smallholders, and not big farms, have always contributed to 80% of the local food produced in Nigeria. As the COVID-19 pandemic continues to ravage the lifestyles and conventional standards of society, there has to be an easy way of influencing the productivity and vibrancy of the agricultural sector in Nigeria.

Currently, there is a ₦50 billion stimulus loan available to businesses and households to cushion the effects of the coronavirus pandemic in Nigeria. For agriculture, there is ₦1 trillion dedicated to address food shortages occasioned by the pandemic. In Nigeria, as simple as agricultural information for farmers living in the hinterlands could pose tremendous challenge. Most farmers are financially excluded and do not have as simple as a bank account. Therefore, reaching farmers with invaluable agricultural loans presents a huge challenge. But beyond distributing loans to farmers is the question of how to develop the agricultural space in Nigeria with the dynamism required to deal with current and future challenges of the magnitude of COVID-19. In the imminent future, loans targeting agricultural productivity must be all-encompassing. Boosting productivity is an all-inclusive process that involves infrastructure such as roads, marketing channels and storage facilities. It is also important to dedicate finances intended for agricultural productivity for the development of capacity of women and youth in the area of agricultural processing to cut down wastage and improve the level of income from agriculture through addition of value.

Food Quality.

The lockdown restriction will result in a drop in the quality of nutrition across the world. It could be worse in African countries already faced with malnutrition and nutrient insecurity. With transportation restriction, a fall in the availability of fresh vegetable, fruits and foods have been observed. The absence of readily available fresh foods will lead to higher consumption of processed foods or in the case of Nigerians foods that are below safety standards for consumption. This could lead to a high prevalence of non-communicable diseases such as diabetes, organ diseases and other diet-related diseases. Diet-related diseases are strongly correlated to poverty; the consequence of poor diet could be a

contributing factor to susceptibility to COVID-19. As evidence 76.5% of critically ill coronavirus patients in the UK are overweight (IPES-FOOD, 2020).

The disruptions of food supply chains for nutrient-rich foods forcing low income families to switch to cheaper foods that are not necessarily as nutritious in order to maintain the required caloric intake (Heady and Ruel, 2020). The elements that are needed for a balanced diet in Nigeria are complex to put together. Animal sourced protein and the chief producers of it have been embroiled in a bitter conflict for generations with crop farmers and access from the north where it is produced to other parts of the country have been terribly affected in the years leading up to this pandemic. On the other hand, poultry and fish that are excellent alternatives to beef are affected by the fact that workers in those areas have been unable to carry out their duties due to restrictions placed on movement.

A consumerist economy like Nigeria will do itself well to heed the warnings and challenges posed by this coronavirus to indigenize its food sources and develop a structure for nutrient distribution to the most vulnerable members of society such as children, women, nursing mothers and pregnant women. The coronavirus pandemic has taken its toll on all aspects of the global food system and this will be felt in Nigeria in the long-term even if it does not happen immediately. The pandemic will affect everything from primary production, processing, trade as well as national and international logistics to intermediate and final demand (Schmidhuber *et al.*, 2020). As nutritious foods are already highly priced in low income countries, like Nigeria for instance, increased price can only lead to more uncertainty, this notwithstanding, the quantity and demand for nutritious food will be determined by how much the income profile of the consumer may have suffered or survived the sharp impacts of the coronavirus.

CONCLUSION

In the wake of a global pandemic with deleterious consequences on food and agricultural supply and value chains around the world, Nigeria has to align natural, financial and human resources together to facilitate the evolution of the agricultural sector from an undefined subsistence system to a responsive, resilient and dynamic sector that can shake off and adapt to unpredictable externalities such as the coronavirus. In the future, Nigeria's agriculture and food distribution networks should be able to provide access to food for the people living furthest from the location of food production. At the end of the day, the nation's agricultural sector must produce more than the requirement of the current population and have enough storage for the purpose of tackling eventualities such as the COVID-19 pandemic.

Policy Recommendations

- i. There has never been a more critical period where data is required in Nigeria like this coronavirus pandemic era. The immediate policy response would be to collect reliable and accurate data about the exact number of people in Nigeria and their net worth as well as the actual number of farmers in the country and their geographical location, input requirements and assets.
- ii. The high level of uncertainty in the future of agricultural production will serve as a huge demotivation to the productivity decision of farmers in Nigeria. Farmers being basically small holder and practicing subsistence as their form of agricultural production will respond immediately to the smallest shock acting on the food system. To mitigate this occurrence there has to be a protection policy taking away possible risks through insurance and risk sharing for farmers going into the 2020 farming season and entering the domestic food demand of 2021.

iii. All monies dedicated to the agricultural sector in form of loans and/or grants should be expended in a strategic manner with clear focus and targets on the most vulnerable areas of the agricultural sector. Offering loans and grants to farmers to boost productivity may fail if the basic infrastructure and proper linkages are not first developed. Rural development is all-encompassing, attending to a specific facet will only lead to marginal growth.

iv. A lot has been said about food security but nutrient security is quite as important. To overcome non-communicable diseases and ensure the well-being of the population, the types of diet and quality thereof are very important. Therefore, access to quality diet and the purchasing power to acquire it are paramount in ensuring that poor members of society also get the best of foods.

v. The agricultural system in Nigeria is simply under-funded and where funds are available there is too much bureaucracy and erratic policy to record exceptional growth and development of the sector. If we, as a country, separate politics from national development there can be enormous development in the agricultural sector. Where excellent policies are inherited it beholds on the prevailing government to fund, monitor and supervise it until its set target is achieved.

vi. Establishment of strategic payment regimes for workers and entrepreneurs in the agricultural sector could be a boost in their productive capacities. A way to achieve this is to try and change the farming orientation of the over 80% smallholder farmers from subsistence to commercial and profit-oriented farming.

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