

ANALYSIS OF FARMERS' AWARENESS AND ADOPTION OF FARM YARD MANURE TECHNOLOGY (FYMT) FOR PLANTAIN PRODUCTION IN BEKWARRA LOCAL GOVERNMENT AREA OF CROSS RIVER STATE, NIGERIA

¹Agabi, F.I., ¹Adinya I.B. and ²Mahmood, H.U.

¹Department of Agricultural Economics and Extension, Cross River University of Technology, Obubra Campus

²Department of Agricultural Economics and Extension, Taraba State University, Jaligo

Corresponding Author E Mail Address: dradinyaignatius@gmail.com

Received 12th January, 2016 Accepted 2nd July, 2016

Abstract

The study analyzes farmers' awareness and adoption of farm yard manure technology (FYMT) for plantain production in Bekwarra Local Government Area of Cross River State, Nigeria. Data were collected from one hundred and ten (110) respondents from the study area. Data collected were analyzed using descriptive statistics, probit and logit model and benefit-cost ratio. The result of maximum likelihood estimates of logit model showed that the coefficient of farm size (X_1), frequency of extension contact (X_2) and estimated yield adoption (X) entered the model with a prior expected positive sign. The results of the study also revealed that return to investment was N16.48k. Based on the findings of the study it was recommended that extension agent should integrate method demonstration with result demonstration, if method demonstration is done first and unemployed youths should start plantain farming as a business.

Keywords: Adoption, manure, technology, plantain, benefit-cost ratio

Introduction

Plantain (*Musa spp*) are herbaceous perennial crop which provide food, income and employment for many rural communities in Nigeria mostly as a subsistence cropped, plantains are generally grown by small-scale farmers or resource – poor peasants, with little or no inputs under traditional farming systems, consequently, yields are low ranging from 5 tons/ha in mixed cropped farms to 20 tons/ha. Under monoculture, generally the crop soon becomes unproductive and often times it is abandoned because of a “decline problem” which has been attributed to soil fertility, poor drainage and pests and diseases Stover and Simmonds (1989).

Plantain is one of the major staple food crops in Nigeria. Its production provides suitable option for subsistence and income generation in the east African mid and high elevation areas (Bagamba *et al.*, 2004). In Nigeria, the selling of plantain products is a thriving business that provides employment to hundreds of people. It provides an important source of livelihood for middlemen and also provides foreign exchange earnings (Adinya and Idaka, 2009).

Fertilizers used for plantain production are in the forms of inorganic and organic.. Inorganic (chemical) fertilizer are very expensive and beyond the reach of resource poor farmers (Emuh, 2010). Organic fertilizers such as farm yard manure is readily available for use by the resource organic manure impacts positively on soil and eventually crops. Farm yard manure (FYM) is the best of all nutrients, it has lasting effect on the soil, improves soil structure thus increase aeration and moisture retention capacities and it is also reasonably cheap to obtain. The soil capacity to store and release nutrients is improved by farm yard manure application. The transfer of farm yard manure, material technology to farmers for adoption has been described as simple and straightforward, unlike the transfer of knowledge based (Swanson, 1996).

Statement of the problem

In Nigeria despite the fact that huge amounts of money have been spent on agriculture yet “food security” is still a mirage. There is a huge gap between demand and supply of plantain. In Nigeria plantain production has not witnessed a dramatic increase because of constraints that militate against its production, this includes; farmer's

negative attitude toward improved varieties of plantain, lack of awareness and adoption of improved varieties of plantain. Nigeria population growth rate which is put at 2.8% per annum, whereas food production declined to below 2.5% per annum (Nsikak-Abasi, Edet and Awoyemi, 2005; Central Bank of Nigeria Report, 2012). Yet, because of increase demand due to increase in population in the country, the gap between domestic supply and demand of plantain is still wide (Arikpo, 2010).

Raising plantain productivity is necessary to increase domestic food production and farmer's income (Arikpo and Adinya, 2011). According to Delgado, Hopkins and Kelly (1994), agricultural boost is required to improve land productivity and generate extra funds for investment, which will have a positive multiplier effect on the rural economy. In the same vein, Enya and Bime (2008) stated that agricultural economic development entails a sustainable increase in productivity of agricultural resources (Lands, capital, labour and management) over a long period of time. Some of the tools available to provide agricultural boost include efficient use available resources, adoption of improved plantain production technological innovations, formulation of good policies and adoption of recommended solutions to constraints that militate against increased plantain production. Plantain respond well to farmyard manures application (<http://agritech.nau.ac.in/orgfarmmanure.html>). Manures are plant and animal wastes that are used as sources of plant nutrients, they release nutrients after their decomposition. The art of collecting and using wastes from animal, human and vegetable sources for improving crop productivity is as old as agriculture. Manures are the organic materials derived from animal, human and plant residues which contain plant nutrients in complex organic forms. Naturally occurring or synthetic chemicals containing plant nutrients are called fertilizers. Manures with low nutrients, content, per unit quantity have longer residual effect besides improving physical properties compared to fertilizer with high nutrient content.

Major sources of manures are: cattle shed wastes – dung, urine and slurry from biogas plants, human habitation wastes – night soil, human urine, town refuse, sewage, sludge and sillage, poultry litter, droppings of sheep and goat, by products of agro industries – oil

cakes, bagasse and press mud, fruit and vegetable processing wastes, .

Green manure crops and green leaf manuring material., weed and crop wastes – sugar cane trash, stubbles and other related material, slaughterhouse wastes – bone meal, meat meal, blood meal, horn and hoof meal, fish wastes (<http://agritech.nau.ac.in/orgfarmmanure.html>) Manures can also be grouped, into bulky organic manures and concentrated manures based on concentration of the nutrients.

Bulky Organic Manures:

Bulky organic manure contain small percentage of nutrients and are applied in large quantities. Farm yard manure (FYM), compost green – manure are the most important and widely used bulky organic manures. Use of bulky organic manures has several advantages: They supply plant micronutrients., they increase the availability of nutrients, they improve soil physical properties like structure, water holding capacity, carbon dioxide released during decomposition acts as a CO₂ fertilizer, and plant parasitic nematodes and fungi are controlled to some extent by altering the balance of micro organisms in the soil.

Farmyard manure refers to the decomposed mixture of dung and urine of farm animals along with litter and left over material from roughages or fodder feed to the cattle. On an average well decomposed farmyard manure contain 0.5 percent Nitrogen, 0.2 percent P₂O₅ and 0.5 percent K₂O (<http://agritech.nau.ac.in/orgfarmmanure.html>). The present method of preparing farmyard manure by the farmers is defective, urine, which is wasted, contains one percent nitrogen and 1.35 percent potassium, nitrogen present in urine is mostly in the form of urea which is subjected to volatilization. However, it is practically possible to avoid losses altogether, but can be reduced by following improved method of parathion of farmyard manure. Trenches of sizes 6m to 7.5m length, 1.5 to 2.0m width and 1.0m deep are dug (<http://agritech.nau.ac.in/orgfarmmanure.html>)

Farm yard Manure from different sources **Sheep and Goat Manure**

The droppings of sheep and goats, contain higher nutrients than farmyard manure and compost, on an average the manure contains 3 percent N, 1 percent phosphorus pentoxide (P₂O₅) and 2 percent potassium oxide (K₂O). It is applied to the field in two ways. The sweeping of sheep or goat sheds are placed in

pits for decomposition and it is applied latter to the field. The nutrients present in the urine are wasted in this method. The second method is sheep penning, wherein sheep and goats are kept overnight in the field and urine and fecal matter added to the soil is incorporated to a shallow depth by working blade harrow or cultivator.

Poultry Manure: The excreta of birds ferment very quickly, if left exposed, 50 percent of its Nitrogen is lost within 30 days, poultry manure contains higher nitrogen and phosphorus compared to other bulky organic manures. The average nutrient content is 3.03 percent P_2O_5 and 1.4 percent K_2O .

Concentrated Organic Manure: Concentrated organic manures have higher nutrient content than bulky organic manure. The important concentrated organic manures are oil cakes, blood meal, fish manure, etc. these are also known as organic Nitrogen fertilizer. Before the organic Nitrogen is used by the crops, it is converted through bacterial action into readily usable ammonical Nitrogen. These organic fertilizers, are therefore, relatively slow acting, but they supply available nitrogen for longer period.

Research questions

The study intends to find answers to the following research questions:

What are the socio-economic characteristics of plantain farmers in Bekwarra Local Government Area of Cross River State?

What is the level of awareness of use of farm yard manure technology for improved plantain production?

What are the different categories of adopters of farm yard manure technology (FYMT)?

What are the major sources of information in the study area/

What are the roles played by extension agents to ensure that plantain farmers adopt the use of farm yard manure technology in plantain production?

What are the problems militating against the adoption of farm yard manure technology by plantain farmers in the study area?

Objective of the study

The main objective of the study is to identify and analyze the awareness level of plantain farmers in the use of farm yard manure technology for sustainable plantain production in Bekwarra Local Government Area of Cross River State, Nigeria. The specific objective of the study are to;

describe the socio-economic characteristics of plantain farmers in the study area;

analyze the level of awareness of use of farm yard manure technology for improved plantain production;

determine the different categories of adopters of farm yard manure technology among plantain farmers in the study area;

identify and analyze the sources of information for improved plantain production technologies in the study area;

examine and evaluate the roles played by extension agent(s) to ensure that plantain farmers adopt the use of farm yard manure technology in plantain production; and

identify problems that are militating against adoption of farm yard manure technology by plantain farmers in the study area.

Significance of the study

In Nigeria increasing plantain production through the use of modern technology is needed to bridge the demand supply gap of plantain in local and international markets.

The optimum growth and yield of plantain depend on fertile soil and other factors of production, plantain require high amount of nutrients which are often supplied by the soil. But for the rural farmers to get to know this innovation and thereafter adopt it, there need for farmers to train by extension agent(s) using pictures to show them practical way of application of farmyard manure.. It is therefore important for extension agents to bridge the gap between researchers and farmers, so as to encourage adoption and use of farm yard manure for sustainable plantain production because farmers do not need to buy farm yard manure, so it reduce cost of production and maximizes profit.

The study is significant because it will create more awareness and adoption of farm yard manure technology among plantain farmers and also provide solution to the problem militating against the adoption of farm yard manure technology among plantain farmers in the study area. The study will also serve as guide to other plantain farmers in other state or countries. The result of the findings will serve as a guide for government policy planners to make or adjust new policies and formulate agricultural programme that will be adopted by farmers after extension agents disseminate information on new technologies.

Methodology

Study Area: This study was conducted in Bekwarra Local Government Area of Cross River state, Nigeria. There are three agricultural zones in the state (Northern, Central and Southern Zones). There are eighteen (18) Local Government Areas in Cross River State. There are five local government areas in the Northern Zone of Cross River State (Bekwarra, Yala, Ogoja, Obudu and Obanliku Local Government Areas), six local government areas in the Central Zone of Cross River State (Boki, Etung, Ikom, Obubra, Yakurr and Abi Local Government Areas) and seven local government areas in the Southern Zone of Cross River State (Calabar South, Calabar Municipality, Bakassi, Akpabuyo, Odukpani, Akamkpa and Biase Local Government Areas) (Adinya, 2011). In 1996, Bekwarra Local Government Area was created. There are ten political wards in Bekwarra Local Government Area, namely; Ibiaragidi, Abuochiche, Gakem, Ukpah, Ugboro, Beten, Nyanya, Otukpuru, Afrike Ochagbe and Afrike Okpeche.

Bekwarra Local Government Area covers about 304.30 square kilometers land mass and a population of about 57,965 people inhabit the area (Quarterly News Letter of the Ministry of Local Government Affairs, Cross River State, 2006; Adinya et al., 2010). It is located at latitude 6° 40' and 5° 42' North of the equator and longitude 8° 45'E and 7° 40' East of the Greenwich Meridian (Menakaya and Floyd, 1978). It is bordered on the south by Ogoja Local Government Area, North by Benue State, and in the West by Yala Local Government Area, while in the East by Obudu Local Government Area of Cross River State (Adinya et al., 2010). Bekwarra Local Government Area is situated in a rain forest belt, which promote the growth of crops such as groundnut, cassava, yam, plantain, potato, maize, cocoyam and vegetables. According to Adinya et al (2010) Bekwarra Local Government Area plays a role in the economic life of the state being one of the producer of groundnut in the state. There are two distinct climate seasons in the area, rainy season from March to October and dry season from November to February.

The annual rainfall varies from 1,200mm to 1,300mm per year. The average temperature is around 27 – 28°C (CRADP, 1992; Adinya et al., 2010).

The main occupation of Bekwarra people is farming, with over seventy percent of the inhabitants cultivating crops and rearing animals like goat, sheep and poultry birds. Apart from farming the people of the area also engage in agro-based activities, a good number of people are involved in civil service, marketing of agricultural products and other forms of non-farming activities like barbing saloons, hair dressing and provision stores (Adinya et al., 2010).

Sampling technique

Random sampling technique was used in first stage while proportional sampling technique was used in second stage of this study. There are ten political wards in Bekwarra Local Government Area, namely: Ibiaragidi, Abuochiche, Gakem, Ukpah, Ugboro, Beten, Nyanya, Otukpuru, Afrike-Ochagbe and Afrike Okpeche.

In the first stage, two villages were randomly selected from each political ward in the study area (20 villages were selected). This was followed by proportional selection (10, 20, 30, 40, 50, 60, 70, 80, 90, 100) of 5 respondents from each of the villages (2, 4, 6, 8, 10, 12, 14, 16, 18, 20) giving total of 110 respondents

Source of data collection

Primary and secondary data were collected with the use of structured (closed-ended questions) and un-structured question (open-ended questions) in questionnaires designed based on the study objectives. The primary source of data were obtained mainly from field survey while secondary data were obtained from books, journals, periodicals, magazines, Central Bank of Nigeria Statistics Report, Bulletin.

Method of data collection

The researchers visited the selected villages to administer eleven (11) copies of questionnaires to selected respondents as pilot survey to pretest the instrument. Thereafter, the instrument will be corrected based on the experience gained in the pilot survey. In the course of doing this, 110 questionnaires were distributed to selected respondents in the study area.

Method of data analysis

Data obtained for this study were subjected to descriptive statistical analysis. Descriptive statistical analysis (example frequency and percentage); Logit model was used to determine if farmers adopted farm yard manure technology in plantain production in

the study area or not; A form of the logit model adopted in this study (Pindyck and Rubinfeld, 1981).

$$P_i = C/(1 - e^{-Z_i})$$

P_i = probability that a farmer I ($I = 1, 2 \dots 110$) choose to adopt farm yard manure or not, given the information embodied by index Z_i = Unobserved, was investigated as being predicted by the following relationship:

$$Z_i = B_0 + B_1X_1 + B_2X_2 + \dots B_iX_i$$

Where choice index Z_i , on which to classify farmers in farm yard manure technology adopters and non farm yard manure technology adopters in Bekwarra Local Government Area

$X_1 - X_i$ = are factors influencing the farmer's decision to adopt farm yard manure technology or not;

X_1 = farm size

X_2 = frequency of extension contact

X_3 = yield from farm yard manure technology adoption

B_0 = A constant assumed to be unity without loss of generality and the form in which the logit model was estimated is:

$$\ln(P_i/1-P_i) = B_1X_1 + B_2X_2 + \dots B_iX_i$$

Results and Discussion

Data collected from respondents in the study area through questionnaires were analyzed, discussed and presented thus:

Table 1: Distribution of respondents according to age

Age (years)	Frequency	Percentage(%)
18 – 20	5	4.54
21 – 30	33	30.00
31 – 40	24	21.82
41 – 50	30	27.27
51 years and above	18	16.36
Total	110	1000

Source: Field survey, 2014

Analysis of data in Table 1 revealed that 30% of the respondents were within the ages of 21 – 30 years, 21.82% of them were within the ages of 31 – 40 years, while 27.27% of them were within the ages of 41 – 50 years, 16.36% of them were within the ages of 51 years and above. Further analysis of Table 1

reveals that 4.54 of the respondents were within the ages of 18 – 20 years. This implies that plantain farmers in the study area were matured and took good decisions, in plantain farming activities.

Table 2: Distribution of respondents according marital status

Marital status	Frequency	Percentage (%)
Married	49	44.54
Single	23	20.91
Widowed	12	10.91
Widower	10	9.09
Divorced	16	14.55
Total	110	100

Source: Field survey, 2014

Table 2 showed that 44.54% of the respondents were married, 20.91% of them were single, 14.55% of the respondents divorced. While 9.09% of them were widower. This implies that

married plantain farmers outnumbered single plantain farmers in the study area.

Table 3: Distribution of respondents according to gender

Gender	Frequency	Percentage(%)
Male	67	60.91
Female	43	39.09
Total	110	100

Source: Field survey, 2014

Data in Table 3 indicates that 60.91% of the respondents were males while 39.09% of them were females. This implies that male plantain

farmers outnumbered the female plantain farmers in the study area.

Table 4: Distribution of respondents according to educational attainment

Educational attainment	Frequency	Percentage(%)
Years of schooling		
1 – 6 years spent in obtaining First School Leaving Certificate	1.9	17.27
9 years spent in obtaining junior secondary school certificate	9	8.18
12 years spent in obtaining senior secondary school certificate	30	27.27
16 – 25 years spent in tertiary institution	40	36.36
No schooling/ no formal education	12	10.91
Total	110	100

Source: Field survey, 2014

Table 4 revealed that 17.27% of the respondents spent 6 years in primary school and they disclosed that they obtained First School Leaving Certificate (FSLC), 8.18% of them spent 9 years in secondary school and had junior secondary school certificate (JSSC), 27.27% of them spent 12 years in secondary school and had senior secondary school

certificate (SSSC). While 36.36% of the respondents attended tertiary institution. Only 10.91% of the respondents never had formal education. This implies that majority of respondents were educated. Anyannale and Bamicel (1996); Ofuoka et al (2006), they discovered that literacy level had positive relationship with the decision to use FYMT.

Table 5: Distribution of respondents according to farm size, farming experience and types of farming

Variables	Frequency	Percentage
Farm size (ha)		
0.1 – 2	61	55.45
2.1 – 4	33	30.00
4.1ha and above	16	15.54
Total	110	100
Farming experience (years)		
Less than 2 years	23	20.91
2 – 10	46	41.82
11 – 12	20	18.18
13 years and above	21	19.09
Total	110	100
Types of farmer		
Part-time farmers	53	48.18
Full-time farmers	57	51.82
Total	110	100

Source: Field survey, 2014

Analysis of data in Table 5 reveals that majority (55.45%) of the respondents had farm

size of between 0.1 – 2 hectares, whereas 30% of them had farm size of between 2.1 – 4

hectares. While 14.54% of the respondents had farm size of between 4.1ha and above. This

According to Federal Office of Statistics (1999) farm sizes below 6 hectares are small scale farms while medium scale farms are farms greater than 6 – 49 hectares. Large scale farms are farms that farm size is greater than 50 hectares. The result of these findings agrees with earlier findings by Arikpo and Adinya (2011) maintained that plantain farmers in Cross River State had plot size of 2 – 4 hectares are majority who farm mainly to augment family income, nutrition supply and improved standard of living in rural area. Further analysis of Table 5

implies that majority of respondents were small-scale farmers.

reveals that 41.82% of the respondents had between 2 – 10 years of farming experience, 18.18% of them had between 11 – 12 years of farming experience, 19.09% of respondents had between 13 years and above farming experience. While 20.91% of the respondents had farming experience of less than 2 years. This implies that majority (79.09%) of the respondents are well experienced and matured in plantain production techniques in the study area. According to Table 5, 51.82% of the respondents are full-time farmers while 48.18% of them are part-time farmers.

Table 6: Distribution of respondents according to type of planting materials

Variables	Frequency	Percentage
Planting materials		
Improved variety of plantain	58	52.73
Local variety of plantain	52	47.27
Total	110	100
Sucker rate per ha		
10 – 50	19	17.27
57 – 100	39	35.45
101 – 150	35	31.82
151 – 200	17	15.45
Total	110	100
Yield of plantain produced (tonnes)		
1 – 2	8	7.27
3 – 4	43	39.09
5 – 6	35	31.82
7 – 8	15	13.64
9 – 10	5	4.55
11 to 0 per ha and above	4	3.64
Total	110	100

Source: Field survey, 2014

Analysis of data in Table 6 shows that 39.09% of the respondents had 3 – 4 tonnes yield of plantain per hectare whereas 31.82% of them had 5 – 6 tonnes per hectare. Sucker rate per hectare and yield of plantain produced.

Table 6 also shows that 52.73% of the respondents used improved variety of plantain while 47.27% of them used local variety of plantain. Further analysis of data in Table 6

reveals that 35.45% of the respondents planted plantain suckers rate between 51 – 100 of sucker per hectare, 31.82% of them planted between 101 – 150 sucker per hectares.

The result of the findings implies that majority of plantain farmers in the study area must have had knowledge of improved variety during the awareness creation by extension agent in charge of zone and have adopted such.

Table 7: Distribution of respondents according to price of fertilizer and farm yard manure in the Bekwarra Local Government

Price of variable	Frequency	Percentage
Fertilizer per 50kg		
Ranges from N4500.00 to N7,000.00		
High price of fertilizer and the activities of middle men who hoard fertilizer force farmers to resort to use FYMT		
Yes	97	88.18
No	13	11.82
Price of 50kg of farm yard manure		
N100.00	48	43.64
N200.00	37	33.64
N300.00	21	19.09
N400.00	4	3.63

Source: Field survey, 2014

Data in Table 7 shows that majority of the respondents (88.18%) resorted to use farm yard manure because of high price of 50 kilogram of fertilizer ranges from N4,500.00 to N7,000.00 as compared to price of 50 kilogram of farm yard manure ranges from N100.00 to

N400.00. Beside that, the activities of middlemen who hoard fertilizers force majority of plantain farmers in the study area to use farm yard manure as substitute for plantain production.

Table 8: Distribution of respondents according to (adopters and non-adopters) and categories of adopters of farm yard manure technologies (FYMT) plantain production in the study area

Variables	Frequency	Percentage
Adopters and non-adopters of FYMT		
Adopter	105	95.45
Non-adopters	5	4.55
Total	110	100
Categories of adopter		
Early adopters	36	32.73
Early majority	45	
Late majority	21	19.09
Laggards	3	2.73
Non-adopters	5	4.55
Total	110	100

Source: Field survey, 2014

Table 8 reveals that 75.45% of the respondents disclosed that they adopted farm yard manure technology (FYMT) in plantain production in the study area while 4.55% of them did not adopt the innovation. The result of the study agrees with the findings of Ofuoku et al (2006) maintained that, the small-scale farmers' decision to adopt farm yard manure were

significantly determined by farming experience (X_1) (0.369), high cost of chemical fertilizer (X_2) (0.3264), level of educational attainment (X_3) (0.225), expected yield from FYMT adoption (X_4) (0.200), farm size (X_5) (0.1498) and frequency of extension contact (X_6) (1.556).

Table 9: Distribution of respondents according to farmers' awareness/level of awareness of use of farm yard manure technologies (FYMT) for plantain production in the study area

Variables	Frequency	Percentage
Farmers' awareness		
Yes	105	95.45
No	5	4.55
Total	110	100
Level of awareness of use of FYMTFor plantain production		
Low level of awareness	33	30.00
Medium level of awareness	42	38.18
High level of awareness	30	27.27
No awareness	5	4.55

Source: Field survey, 2014

Table 9 reveals that 95.45% of respondents were aware of use of farm yard manure technologies and adopted it for plantain production while 4.55% of them disclosed or claimed that they had no awareness of use of farm yard manure for plantain production. This implies that extension agents need to create more awareness and demonstrate how to apply

farm yard manure in plantain farms to apply farm yard manure in plantain farms to enable the remain 4.55% of the respondents to adopt the use of farm yard manure technology in plantain production.

Table 10: Distribution of respondents according to source of farm yard manure

Source of farm yard manure	Frequency	Percentage
Poultry waste	49	44.54
Refuse dump	8	7.27
Cattle dung	19	17.27
Cassava peel	34	30.91
Total	110	100

Source: Field survey, 2014.

Table 10 shows that 44.54%, 7.27%, 17.27% and 30.91% of the respondents' sources of farm yard manure were poultry

waste, refuse dump, cattle dung and cassava peel respectively

Table 11: Distribution of respondents according to roles played by extension agents to ensure farmers adoption of FYMT in plantain production

Variables	Frequency	Percentage
Category A roles		
Monitoring	15	13.64
Evaluation	13	11.82
Establishment of small plot adoption technique (SPAT) /demonstration	30	27.27
Follow-up visit by another extension agents	23	26.36
All of the above	29	26.36
Total	110	100
Category B roles		
Individual contract training or educate farmers in informal training	30	27.27
Provision of improved Plantain suckers	20	18.18
Assisted farmers to apply FYMT in farms	40	36.36
Group contact method extension service delivery	20	18.18

Source: Field survey, 2014

There are various roles played by extension agents to ensure that farmers adopt farm yard manure technology in plantain production. The roles played by extension agents are presented in Table 11. From the Table 10, 27.27% of the respondents disclosed that extension agents established small plot adoption techniques (SPAT) plot and demonstrated application of farm yard manure

technology in plantain farms, 20.91% of the respondents revealed that extension agents carried out follow-up visits to ensure that farmers adopt innovations in the study area. While 13.64% of them revealed that extension agents monitored their farming activities in farms. Only 11.82% of them disclosed that extension agents evaluated their activities/tasks carried out in plantain farms.

Table 12: Distribution of respondents according to source of information

Source of information	Frequency	Percentage
Extension agents	40	36.36
Radio	20	18.18
Television	7	6.36
Friends/relatives/neighbours	15	13.64
Information Communication Technology (ICT)	2	11.82
Handset	27	24.55
Total	110	100

Source: Field survey, 2014

Table 12 reveals that extension agent (36.36) is the major source of information dissemination while handset (24.55%), radio (18.18%), friends/relatives/neighbours

(13.64%), television (6.36%) and information communication technology (1.82%) were ranked second, third, fourth, fifth and sixth respectively.

Table 13: Description of symbols of explanatory variables in the model and result of maximum likelihood estimates of the logit model

Variable symbols	Description	Measurement	Coefficient
X ₁	Farm size	(hectares)	0.579 (1.008)*
X ₂	Frequency of extension contact	(Number) 1.053	(0.912)*
X ₃	Estimated yield from farm yard manure technology adoption	(Kg)	0.364 (0.316)

Source: Field survey, 2014

* = significant at 1%

** = significant at 5%

Footnote = the figures in parenthesis under the coefficients are the corresponding standard error

Farm size (X₁)

Table 13 revealed that coefficient of the farm size entered in the model with a positive sign and significant relationship at 1% level of significant between farm size and farm yard manure adoption decision that was saw as evident in the model. This implies that small-scale plantain farmers in the study area are likely to choose farm yard manure adoption escalated price of fertilizers because of the activities of middlemen that hoard fertilizer

unavailability or late arrival of fertilizer is, insufficient quantities of fertilizers, lack of information on correct usage, lack of incentives and low benefit cost ratio forced farmers to use farm yard manure that are cheaper and always available.

Frequency of extension visit (X₂)

The coefficient of frequency of extension contact entered the model with a prior expected positive sign. The variable turned out to be a significant determinant of farm yard manure adoption decision in the study area. The positive sign associated with the variable in the model, implies that farm yard manure adoption decision of plantain farmers in the study area, would depend significantly on the information they get through the extension agent and the frequency of such information on farm yard manure technology. Frequency of extension contact to disseminate information encourages early adoption. However, adoption of an innovation is the decision of a farmer or group of farmers to use or

as their farm size increases because of lack of fund to purchase fertilizer, they choose to use farm yard manure as alternative. The result of this findings agrees with Ofuoka et al (2006), they posited that farmers are faced with several constraints in the use of fertilizers. These constraints include among others;

apply innovation. Farmers are said to go through a logical, problem – solving process known as adoption process when considering any technology. A farmer's decision about whether or not to adopt a recommended agricultural/farm practice is recognized to occur over a period of time in stages rather than instantaneous (Adekoya and Tologbonse, 2005).

Estimated yield from farm yard manure technology (X₃)

The coefficient of estimated yield from farm yard manure adoption (X₃) entered the model with a prior expected positive sign. This implies that farm yard manure adoption is positive in conformity with a prior expectation that farm yard manure adoption would increase crop yields. The result of this findings is in line with the earlier findings of Van den Ban Hawkin (1996); Arikpo and Adinya (2011) reported similar result in line with adoption behaviour of farmers.

Table 14: Distribution of respondents according to constraints against the adoption of farm yard manure technology by farmers in the study area

Constraint	Frequency	Percentage
Lack of information/awareness	5	4.55
Offensive Odour	89	80.90
Poultry farms were distance from farmers' plot/farms	16	14.55
Total	110	100

Source: Field survey, 2014

Table 14 revealed that 80.90% of respondents claimed that offensive odour of farm yard manure militate against the use of FYMT while 14.55% of them disclosed that poultry farms were located very far from their plantain farms and they do not have money to pay to drivers to convey farmyard manure to their plots. Only 4.55% of the respondents disclosed that lack of information/awareness militated against adoption of farm yard manure for plantain production

Table 15: Benefit – cost ratio analysis of plantain production in the study area

Items produced (N)	Quantity	Unit price (naira)	Total value of plantain
Labour (man-days)	3,300 (man-days)	62.5	206,250.00
Quantity of farm yard manure applied (kg/ha) (100 x 105) that used FYMT	10500kg/ha	200	2,100,000
Sucker of plantain planted (200 X 110)	22,000	30	660,000.00
Transportation COST		3800	3,800.00
Total variable cost			2,970,050.00
Fixed cost			
Rent for land (ha)	110	1,500	165,000.00
Depreciation of farm implement/tool		8,00.00	720.00
20% of interest on loan	1,000	200	10,000.00
Total fixed cost			175,720.00
Sales/total revenue			
Plantain produced (tonnes)			
1000kg = 1ton) 1100 tonnes x 1000 = 110,0000	50		55,000,000
Gross margin			
GM = (TR – TVC)			52029950.00
Profit π = (GM – TFC)			51,854,230.00
(Benefit – cost ratio) = $\frac{\text{Gross Revenue}}{\text{TC}}$		$\frac{51854230}{3145770} = 16.48$	

Source: Computed from field survey data, 2014

Benefit – Cost Ratio is defined as gross revenue divided by total cost of production (Benefit-cost ratio analysis here represents the ratio of the present value of benefits from a management strategy to the present value of the flow of expenditure.

The benefit-cost ratio analysis is shown in Table 15. The total variable cost (TVC) for plantain produced in the study area stood at ₦2,970,050.00 while the total fixed cost (TFC) was ₦175,720.00. The gross margin value was ₦52,029,950.00.

Table 15 reveals that plantain production yielded a profit figure of ₦51,854,230.00. The benefit-cost ratio was ₦16.48k. This implies that ₦16.48k was made on every naira invested in plantain business in the study area.

Summary of Findings

The main objective of this study was to analyze farmers' awareness and adoption of farm yard manure technology (FYMT) for plantain production in Bekwarra Local Government Area of Cross River State, Nigeria. Data for this study were collected from one hundred and ten (110)

respondents from the study area. Data collected were analyzed using descriptive statistics such as frequency distribution and percentage. While logit model was used to determine if farmers adopted farm yard manure technology (FYMT) in plantain production in the study area or not. Finally, Benefit-Cost Ratio (BCR) was also used to determine if farmers operated at breakeven point. The Benefit-Cost ratio of 1.0 means that plantain farmers operated at breakeven point, any amount of money realize above breakeven point is addition profit. The result of maximum likelihood estimates of logit model showed that the coefficient of the farm size (X_1) entered the model with a positive sign and significant at 1% level between farm size and farm yard manure adoption decision. This implies that Small-scale plantain farmers are likely to choose farm yard manure adoption as their farm size increases because of lack of fund incentives to purchase fertilizer, they choose to use farm yard manure as alternative that is cheaper. While the coefficient of frequency of extension contact (X_2) entered the model with a prior expected positive sign. The variable turned out to be a significant determinant of farm yard manure adoption decision in the study area. This implies that farm yard manure adoption decision of the plantain farmers in the study area, would depend significantly on the information they get through the extension agents. The coefficient of estimated yield from farm yard manure adoption (X_3) entered the model with a prior expected positive sign, implies that farm yard manure would increase crop yield.

The result of the study also shows that the total variable cost (TVC) for plantain produced in the study area stood at N2, 970,050.000. While the total fixed cost (TFC) was N175, 720.00. The gross margin value was N52, 029,950.00, Table 16 reveals that plantain production in the study area yielded a profit figure of N51, 854,230.00. The return to investment was N16.48k. This implies that N16.48k was made on every naira invested in plantain business in the study area.

Table 12 reveals that extension agent (36.36%) is the major source of information dissemination while handset (24.55%), radio (18.18%), friends/relatives/neighbours (13.64%), television (6.30%) and Information Communication Technology (ICT) were ranked second, third, fourth, fifth and sixth respectively.

Finally, the findings of the study reveals that several constraints militates against the adoption of farm yard manure technology by farmers in the study area.

Conclusion

The transformation of agriculture from low productivity traditional inputs to high productivity modern inputs, there is need for extension agents to bridge the gap between farmers and research station, so as to encourage adoption of farm yard manure technology for sustainable plantain production because farmers buy farm yard manure at cheaper cost or in some cases farmers do not buy farm yard manure, since their own poultry farm that provide the farm yard manure, so it reduce cost of production and maximizes profit.

If more plantain farmers adopt farm yard manure in the present condition of high cost of chemical fertilizer or scarcity of inorganic fertilizers, there will make profit as shown in this study.

Recommendations

Extension agents should encourage plantain farmers to make friends with poultry farmers, this will enhance disposal of the waste for poultry farms.

Unemployed youths should start plantain farming as a business.

Extension agents should integrate method demonstration with result demonstration. If method demonstration is done first, so that farmer would acquire the technical know how, and at the same time, get convinced by the result of the demonstration done on any innovation

References

- Adenikinju, S. A. (1983). The importance of plantain to cocoa production and to peasant farmers. *Fruits*. 38:348-350.
- Adeoye, K. B. (1985). Effect of some management practices on soil crusting in the savannah soils. Proceedings of International Conference on soil fertilizer, soil tilth and post-clearing of land in the Humid tropics. *Soil Science Society Nigeria*. pp 302 – 309.
- Adinya, I. B. (2001). Factors influencing labour utilization in small-scale cassava production: A case study of Uyo Agricultural Zone of Akwa Ibom State, Nigeria. Unpublished M.Sc Dissertation, Dept. of Agricultural Economics and Extension, University of Uyo. Pp 1-60.
- Adinya, I. B. (2011). Econometrics analysis of resource poor fish farmers in loan acquisition, utilization and repayment in Nigeria. *econometric Views in Aqua-Field Research Journal* 1(1): 1-16.
- Adinya, I. B., Agba, O. A., Eze, A. N., Ahong, E. A. and Nyienakuna, M. G. (2010). Adoption of new technologies in yam production recommended to farmers: A gender analysis of yam production technologies adopted by small-scale farmers effective participation in Yakurr New Yam Competition. A paper submitted to *Journal of Extension, University of Ibadan*.
- Adinya, I. B., Idio, A. D. and Kuye O. O. (2007). Farmers' Awareness of Sources of credit for Improved Farm Practices in Cross River State, Nigeria. *Global Journal of Social Sciences*. 6(2): 5-8.
- Agboola, A. A. (1988). The importance of maintaining soil organic matter in African farming systems 1st African Soil Science Congress, Kampala, Uganda, December 5 – 10, 1988.
- Agromisa (1999). Duck keeping in the tropics, CTA: Agrodok-Series No. 33. 78pp.
- Aiyelaagbe, I. O. O., Odeleye, O. M. O. and Akinyemi, S. O. S. (2001). Effects of plantain population on the productivity of a plantain/cocoyam mixture in Southwestern Nigeria. *Nigerian J. Hort. Sci.* 5:82-85.
- Ajayi, A. R. and Mbah, G. O. (2003). The major causes of economic losses to banana and plantain fruits women-marketers in Ebonyi State, Nigeria. p. 138-143. In: A. S. Fasina, A. O. Olufolaji and V. C. Umeh (eds.), Proceeding of the 21st Annual Conference of the Horticultural Society of Nigeria. Ess-Jay Business and Publishing Centre, Lagos.
- Akinyemi, S. O. S. and Makinde, J. O. (1999). Effect of sweet potato and melon intercrop on weed interference and productivity of plantain. *Nigerian J. Weed Sci.* 12:29-33.
- Akinyemi, S. O. S. and Tijani Eniola, H. (2000). Effect of cassava density on productivity of plantain and cassava intercropping system. *Fruits* 55:17-23.
- Akyeampong, E. (1999). Plantain production, marketing and consumption in West and Central Africa. Proc. International Symposium on Banana and Food Security. Douala, Cameroon 10-14, November. P. 353-359.
- Arikpo, J. D. (2010). Analysis of selected variables affecting plantain (*Musa* sp.) mono cropping system of production by small – scale farmers in Central Cross River State, Nigeria. Unpublished B.Agric. Project Department of Agricultural Economics and Extension CRUTECH Obubra Campus. Pp1-20.
- Arikpo, J. D. and Adinya, I. B. (2011). Impact of training and extension visit on yield of plantain (*Musa* sp) in Central Cross River State, Nigeria In: Issues in Sustainable Food Production and Rural Transformation edited by Adinya, I. B. (2011) (eds) published by Carigo Publisher, Lagos. Pp116.
- Bamire, A. S., Ola, A. O. (2004). Determinant of poultry manure in small-holder land management decisions in the rainforest zone of Osun State, Nigeria. *The Ogun Journal of Agricultural Science* 3(1): 1-12.
- Bayeri, K. P. and Nwachukwu, I. (2003). Storage methods influenced occurrence and severity of crown rot and anthracnose diseases on plantain (*Musa* spp. ABB) fruits during storage and

- post storage. P. 201 – 204. In: A. S. Fasina, A. O. Olufolaji and V. C. Umeh (eds.) Proceeding of the 21st Annual Conference of the Horticultural Society of Nigeria. Ess-Jay Business and Publishing Centre, Lagos.
- Blake, F. (1994). Organic food production in world agriculture. In: Organic farming and growing. Crowood Press, Wiltshire: UK, 221pp (Ed.).
- Central Bank of Nigeria (2012). Central Bank of Nigeria Statistical Report.
- Central Bank of Nigeria (CBN) (2005). Report for 2005 year.
- Dauda, S. N., Ajayi, F. A., Ndor, E. (2008). Growth and yield of water-melon (*Citrullus lanatus*) as affected by poultry manure application. *Journal of Agriculture and Social Science* 4:121 – 124.
- Delgado, C. L., Hopkins, J. and Kelly, V. (1994). Agricultural linkages in Sub-Saharan Africa: A synthesis in: Proceedings of the 8th World Congress of the International Economic Association, Delhi, India, Vol. 4 London Macmillan Press. Pp10 – 110.
- Eboh, E. C. (2000). "Rural informal savings and credit associations as risk. Auto Century Publishing Company Enugu. Pp 1-6.
- Eboh, E. C. and Lamechi, J. L. (1994). Population pressure and indigenous land tenure in eastern Nigeria: implication for land administration and titling. *J. Rural Devel. Adm.* 26:67-77.
- Egbuchua, C. N. (2007). Pedological characterization and fertility evaluation of some wetland soil in Delta State. Ph.D Thesis, unpublished. Abraka: Delta State University, Abraka, Nigeria. 257pp.
- Ellinnger, P. N. and Barry, A. (2005). A farmer's guide to agricultural credit. Published by University of Illionsie Press.
- Eluagu, L. S. and Anunuebuwa, K. H. (1983). Outline lectures note on Calabar.
- Emuh, F. N., Agboola, A. A. (2000). The effect of intercropping sweet potato and pigeon pea on some growth parameters and yield of maize. *Nigeria Agricultural Journal* 31: 1-12.
- Enya, V. E. and Adinya, I. B. (2008). Efficiency of commercial banks' credit utilization in Nigeria (1986 – 2005). *Continental Journal of Social Studies* 1(1): 24-27.
- Enya, V. E. and Alimba, J. O. (2007). Analysis of factors affecting demand for agricultural credit from commercial banks. *Journal of Agriculture, Forestry and the Social Science (JOAFSS)*. 5(1): 52-57.
- Enya, V. E. and Bime, M. J. (2008). Analysis of the influence of agricultural and non-agricultural sectors performance on the Nigeria Economy (1986 – 2004). *Global Journal of Agricultural Science* 7(1): 7-9.
- Famoriyo, S. (1980). Improved agricultural credit in Nigeria. *Agricultural Administration*. Vol. 1 Applied Science, Essex Publisher Limited. Pp 113-121.
- Food and Agriculture Organization (1990). Production Yearbook 1990. FAO, Rome.
- Food and Agriculture Organization (2006). Production Yearbook 2004. FAO, Rome.
- International Fertilizer Development Centre, IFDC (1995). Soil, fertilizer and fertilizer management in Semi-arid tropics of India. Proceedings of Colloquium, held at ICRISAT Centre, Patancheru, India. Pp 153-154.
- International Institute of Tropical Agriculture (1989). Research Briefs Vol. 9, No. 2. IITA, Ibadan.
- Malla, P. B. (1983). Logit analysis of technology adoption by Rice farmers in Dhanusah District, Nepal. HMG-USAID-ADC Project on strengthening institutional capacity in the food and agricultural sector in Nepal. *Research paper series* No 22.
- Marriot, J. and Lancaster, P. A. (1983). Bananas and plantains. P.85-143. In: H. T. Chan (ed.), Handbook of Tropical Food. Dekker, New York.
- Nnaji, G. U., Asadu, C. L. A., Mbagwu, J. S. C. (2004). Influence of organic manure on cassava yield and some chemical properties of ultisol in Nsukka area of South Eastern Nigeria. proceeding of the 19th Annual Conference of Soil Science Society of Nigeria held on 6th – 10th December 2004 at Abeokuta, Nigeria, pp 206 – 212.

- Nsikak-Abasi, L. A. E. L., Edet, J. U. and Awoyemi, T. T. (2005). Measuring Technical Efficiency of Urban Farms in Uyo Metropolis. *Global Journal of Agricultural Sciences* 4(1): 91 – 95.
- Nweke, F. I., Njoku, J. E. and Wilson, G. F. (1988). Productivity and limitations of plantain (*Musa spp*, cv AAB) production in compound gardens in Southeastern Nigeria. *fruits* 43:161 – 166.
- Ofuoku, A. U., Emuh, F. N., Osuagwu, C. N. (2005). Adoption of improved varieties of soybean (*Glycine max*) among rural female farmers in Ndokwa West and Ukwuani Local Government Areas of Delta State, Nigeria. proceeding of the 9th Annual Conference of Farm Management Association of Nigeria held between 18 – 20th October 2005 at Delta State University, Asaba Campus, Asaba, Nigeria. pp 257 – 261.
- Ogar, G. O. (2008). An evaluation of the impact of micro credit financing on cocoa production in Obubra Local Government Area of Cross River State. A case study in Nkum – Yala and Onyenokpon in Obubra. Unpublished B.Agric. Project, Department of Agricultural Economics and Extension, Cross River University of Technology, Obubra. Pp1-34.
- Olorunda, A. O., Meheriuk, M. and Leone, N. E. (1978). Some post harvest factors associated with the occurrence of chilling injury in banana. *J. Sci. Food Agric.* 29:210-213.
- Owan, B. O. (2010). The demand for and supply of formal credit facilities among cassava growers in Obubra Local Government Area of Cross River State, Nigeria. Unpublished B.Agric. Project, Department of Agricultural Economics and Extension, Cross River University of Technology, Obubra. Pp1-20.
- Population Census 2006. “Spread, State by State, In: *MOFINews Jan. –Feb, 2007*, 6(3):7.
- Quarterly Newsletter of the Ministry of Local Government Affairs Cross River State (2006). Pp4-8.
- Robinson, J. C. (1996). Bananas and plantains. CAB International, Wallington.
- Seibel, H. D. (2000). Financing the rural sector: The role of rural and Agricultural Banks. Paper presented at the conference on Micro and Rural Finance, NICON Hilton Hotel, Abuja September 12th – 15th.
- Serna, M. D., Pomares, F. (1991). Comparison of Biological and Chemical methods to predict Nitrogen mineralization in Animal waste. *Biology and Fertility of Soils* 12(2): 89-94.
- Stover, R. H., W. W. Simmonds (1987). Bananas, Longmans, London, UK.
- Swanson, B. E. (1996). Strengthen Research-extension-farmer linkages. In: Swanson, B. E., Bentz, R. P., Sofranko, A. J. (Eds). *Improving Agricultural Extension: A reference manual*. FAO. Pp165-172.
- Swennen, R. (1990). Plantain cultivation under West African conditions; a Reference Manual, IITA, Ibadan, Nigeria.
- Ugbomeh, G. M. M. (1991). An appraisal of fertilizer adoption: A case study of Ndokwa Local Government Area of Bendel State of Nigeria. *Abraka Journal of Agriculture* 1(1): 92-102.
- Van den Ban, A. W., Hawkins, H. S. (1996). *Agricultural Extension*. 2nd Edition. London: Blackwell Science Ltd. Pp96.
- Wilson, G. F. (1986). Status of banana and plantain in West Africa. Proc. Workshop on Banana and Plantain Breeding Strategies. Cairns, Australia 13-17, October. P.29-35.

