INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH & DEVELOPMENT

ISSN: 2278 – 0211 (Online)

Adoption of Selected improved Agricultural Technologies by Farmers in Rivers State, Nigeria

Gbegeh, B.D
Department of Marketing, Rivers State Polytechnic
Akubuilo, C.J.C
Department of Agricultural Economics and Extension, Enugu State University of Science and Technology

Abstract:
The study investigated the adoption of selected improved agricultural technologies (yam minisetts, improved cassava stems and fertilizer application) by farmers in Rivers State, Nigeria. Ninety farmers were randomly selected from the area. The main tool for data collection was the questionnaire. Data collected were analysed using descriptive statistics. The findings revealed that farmers' average age, average household size, average farm size, average farm income, average years spent in school and average farming experience were 55.6 years, 8 persons, 1.8ha, ₦148, 255.60, 9 years and 14.8 years respectively. The majority (57.80%, 87.70%, and 61.10%) of the farmers were males, married, and had no access to credit respectively. Majority (66.67%) were members of agricultural cooperative societies. Majority (60.00%) of the farmers had received an extension visit in 2011. Majority of the farmers who received extension visits (53.70%) were visited once in two weeks. More than 80% of farmers were falling in the low and medium level of mass media exposure. Majority (66.67%) of the farmers are aware of improved cassava stems, followed by fertilizer application (57.78%) and yam minisett (50.00%). About 92.00% of farmers were identified of personal communication as a source of information for these innovations. The farmers ranked the extension workers on the top for improved cassava stems, and yam minisett innovations. About 57.78% of the farmers adopted improved cassava stems 44.44% adopted yam minisetts while 33.33% adopted the use of fertilizer. The study indicated that inadequate finance confirmed by 57.78% of the respondents was the main problem militating against adoption of selected technologies (yam minsetts, improved cassava stems and fertilizers). It is therefore recommended that loans by microfinance and commercial banks for the purchase of appropriate number of yam minisetts, improved cassava stems and fertilizers and purchase of inputs should be made available on easy terms.

Keywords: *farmers, adoption, yam minisetts, improved cassava stems, fertilizer, descriptive statistics, socioeconomics characteristics, constraints*

1.Introduction

The population of Nigeria is expected to grow at a rate of more than 3 percent per year, while food production is likely to grow at a rate of 2 percent or less a year (Nweke *et al*., 2004; FAO, 2000; The Comet, 2000). Closing this gap and increasing food production will require intensive agriculture based on use of modern technologies such as improved seed (yam minisett and improved cassava variety cuttings) (Otunaiya and Akinleye, 2010; Sain and Martinez, 1999; Akoroda and Teri, 2004; IITA, 1997; Iwueke et al., 1991; SPORE, 1995) and fertilizer. Such changes are particularly crucial because of decline in soil fertility, resulting from the shortening or eliminating of the fallow period without concurrent effort to increase soil nutrients through fertilizer application or other soil management practices (Sain and Martinez, 1999).

Technology is the systematic application of scientific or other organized body of knowledge to practical purposes (Akubuilo *et al*., 2007). This includes new ideas, inventions, innovations, techniques, methods and materials. Agricultural technologies include all the materials, techniques, practices and innovations used to maximize agricultural production (Akubuilo *et al*., 2007).

Adoption is a decision made by an individual or group to use an innovation in a continuous manner (Akubuilo *et al.*, 2007). Adoption is regarded by Rogers (1995) as a decision to make full use of an innovation or technology as the best course of action available. According to Van den Ban and Hawkins (1996), adoption of innovation is the decision of an individual or group to use or apply an innovation. The importance of these improved agricultural technologies (yam minisett, improved cassava and fertilizer applications) has been numerous but their adoption has not been very encouraging. Modern agriculture requires an innovative technology which systematically adopts scientific knowledge to farming. In many countries farm–level technologies superior to those currently in use are already available. However, as experience has shown over the years, the gap between the existing level of technological knowledge and what is in use in a particular farm setting is not easily closed. Technological change is a difficult, time-consuming process, made even more difficult because many of the technology being promoted are not suitable to a particular locality, complementary services and delivery systems are not available, or unexpected cultural resistance often emerges among the intended beneficiaries, market related problems, shortage of labour (Umeta et al., 2011). However, to what extent this is the case in Rivers State has not been empirically explored. Considering the vitality of above stated facts, the present study was carried out

with main object to investigate the adoption of adoption of yam minsett, improved cassava varieties, and fertilizer applications technologies by farmers in Rivers State.

2.Methodology

The study was carried out in Rivers State Nigeria. Rivers State is located at 4°45'N 6°50'E and 4.75°N 6.833°E. The State covers a total area of 11,077km^2. It is bounded on the south by the Atlantic Ocean, to the North by Imo, Abia and Anambra states, to the East by Akwa Ibom state and to the west by Delta and Bayelsa states (www.rivers.gov.ng, 2011). Administratively, Rivers State has three agricultural zones namely Eleme, Rumuodomaya and Degema and divided into twenty three Local Government Areas (LGAs). The population of Rivers State is 5,185,400 persons (NBS, 2007). Due to its tropical climate, numerous rivers and arable land, the predominant occupation of the people is agriculture especially fishing and farming.

Multistage random sampling technique was adopted for this study. Firstly, the three agricultural zones were selected. In each agricultural zone, two Local Government Areas (LGAs) were randomly selected. In each selected LGA, five communities were randomly selected. Lastly, three farmers were randomly selected in each community from the list of farmers in the communities (sample frame) obtained from the extension agents in the communities. Ninety farmers formed the sample size. Data for the study was collected with the use of structured questionnaire which were administered to the farmers. Data collected were analysed using descriptive statistics.

3.Results And Discussion

3.1.Socioeconomic Characteristics of Farmers

The socio-economic characteristics of the respondents considered include their age, gender, marital status, household size, educational level, farm size, farming experience, annual income, access to credit, social participation, extension contact and mass media exposure.

3.1.1.Age

Age structures of farmers are presented in Table 1. The farmers were grouped into four age categories, which are: 1) 30 - 40 years of age, 2) from 41 to 50 years of age, 3) from 51 to 60 years of age, 4) from 61 to 70 years of age. As shown in table 1, majority

(65.60%) of the farmers fall within the age bracket of 51-60 years. About 21.10% of the farmers are between 61 and 70 years while the young farmers (30- 40 years) who should constitute the major labour force in agriculture were 2.20%. The respondents' mean age was 55.6 years. This implies that the respondents are mainly of the middle age indicating that the middle age farmers could adopt agricultural technologies more than any other group.

Age (Years)	**Frequency**	**Percentage**
30-40	2	2.20
41-50	10	11.10
51-60	59	65.60
61-70	19	21.10
Total	**90**	**100.00**

Table 1: Frequency distribution of farmers by age
Mean age= 55.6 Years

3.1.2.Gender

Figure 1 shows that majority (57.80%) of the farmers were male. This implies that the ADP contact farmers are more of male. Thus, male headed households engage in agriculture more than female headed households. This could be due to the socio-cultural milieu of the area which gives males the access to production resources like land where agriculture is practised more than females.

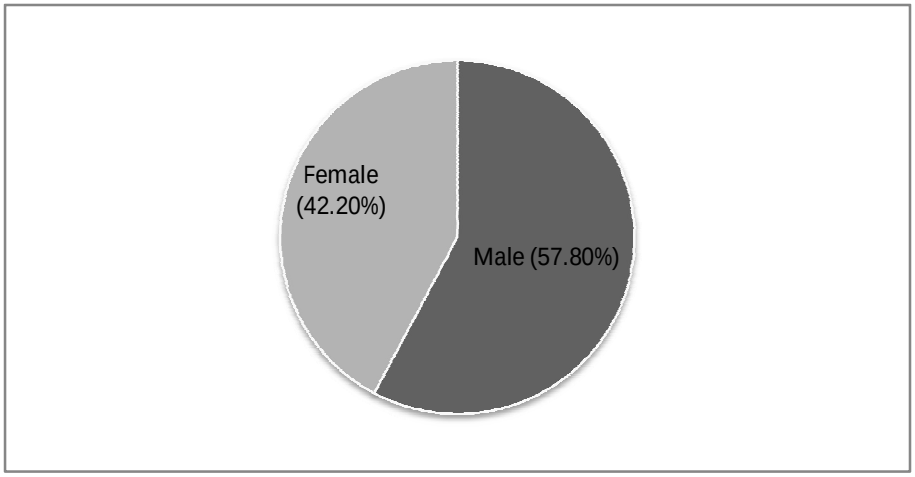

Figure 1: Pie Chart of the frequency distribution of farmers by gender

3.1.3.Marital Status

Figure 2 presents the marital status of farmers in the area. The overwhelming majority of farmers are married with both partners a live (87.70%). This may be as a result of high labour requirement in agricultural production in which they use members of their family as labour force (Obinne, 1989) and partly due to the expected benefits derived in feeding members of their family from what they produce.

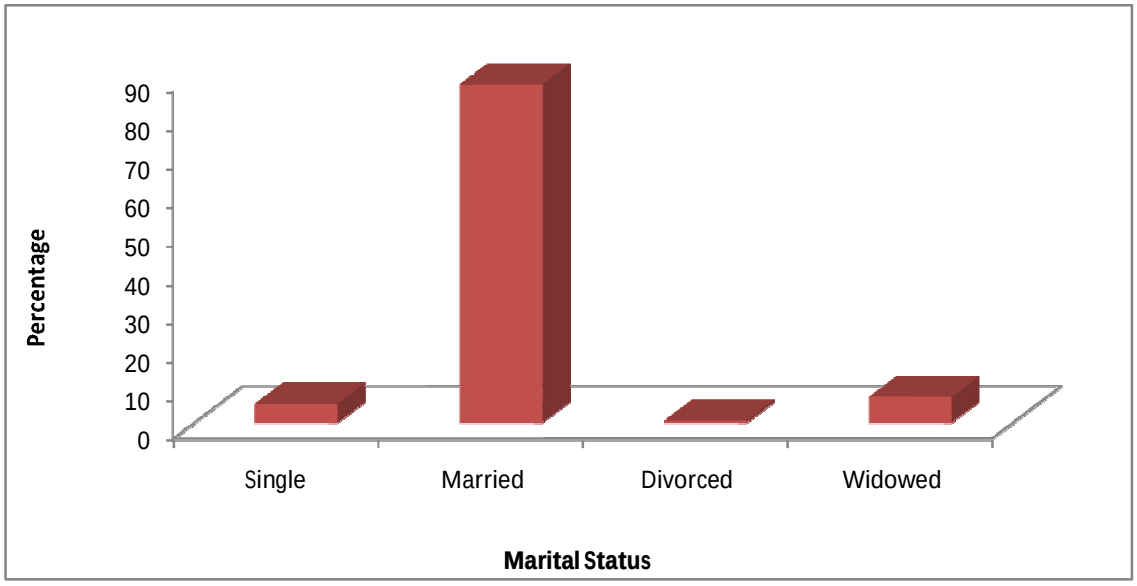

Figure 2: Percentage distribution of marital status of farmers

3.1.4.Household Size

Household size in the study area is compiled in Table 3 giving an overall mean of 8 persons. This strongly suggests that the vast majority of households are complex, with parents and children and excluding grandparents. However, larger families contain more than one household, with brothers and their families sharing the same roof and facilities, but cooking separately. Table 3 shows that majority of the farmers (57.80%) had household sizes of 6-10 persons. Those that had 1-5 persons in a household constituted 26.70% of the respondents. The remaining 15.60% of the respondents had 11-15 persons in their households. This is in line with the findings of Obinne (1989) that large household is advantageous to farming as labour may be derived from the members.

Household Size(Persons)	Frequency	Percentage
1-5	24	26.70
6-10	52	57.80
11-15	14	15.60
Total	**90**	**100.00**

Table 3: Frequency distribution of farmers according to household size
Mean household size = 8 Persons

3.1.5.Level Of Education

The level of education of farmers is indicated in Table 4. A large share of farmers (90%) received formal education, while (10%) of farmers did not receive any formal education. About 22.22% of farmers attended tertiary institutions, 30.00% had primary education while majority (37.78%) had secondary education. The mean years spent in school by farmers 9 years. Following this result, respondents could be said to be mainly literates. This literate proportion of the respondents implies that adoption of innovations like yam minisett, improved cassava stems, and fertilizer application will be favoured as education affects adoption of new technologies positively.

Educational Level	Interval (Years)	Frequency	Percentage
No Formal Education	0	9	10.00
Primary Education	1-6	27	30.00
Secondary Education	7-12	34	37.78
Tertiary Education	13-17	20	22.22
Total	**Total**	**90**	**100.00**

Table 4: Frequency distribution of farmers according to educational level
Mean educational level= 9 years

3.1.6.Social Participation

Membership in organization in the study areas is reported in Figure 3. Professional membership was measured by asking the respondents to mark the professional organization in which they are members: Agricultural Cooperatives, Fish Farmers Association, Association of Vegetable Farmers, Association of Livestock Farmers, and Association of Community Development. About 66.67% of the farmers are members of the agricultural cooperative, which exist in all villages. Membership of these cooperatives is mandatory for those farmers who had reasonable access to it, and even in

satellite villages or hamlets many farmers joined. The cooperatives used to provide farmers with inputs, machinery services and credit. Members of an organization are in a privileged position with respect to access information on agricultural innovations.

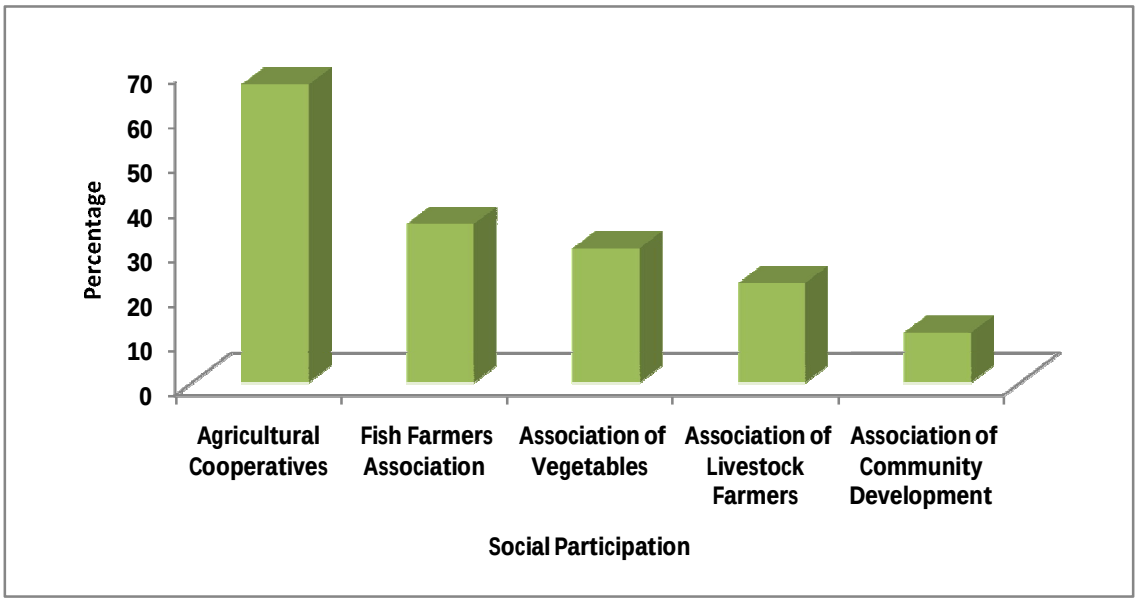

Figure 3: Bar Chart of the percentage distribution of social participation of farmers

3.1.7.Annual Farm Income

The distribution in figure 4 show that majority of the farmers (48.90%) realized between ₦20, 000 and ₦100, 000 per annum from agriculture. About 20.00% and 17.80% of the respondents had farm annual incomes of ₦100, 001- ₦180, 000 and ₦180, 001- ₦260, 000 respectively. The mean annual farm income of the farmers was ₦148, 255.60. This annual income is low. With this result, it is likely that the adoption of yam minisett, improved cassava stems and fertilizer application technologies will be unfavourable because income is very important in adoption process.

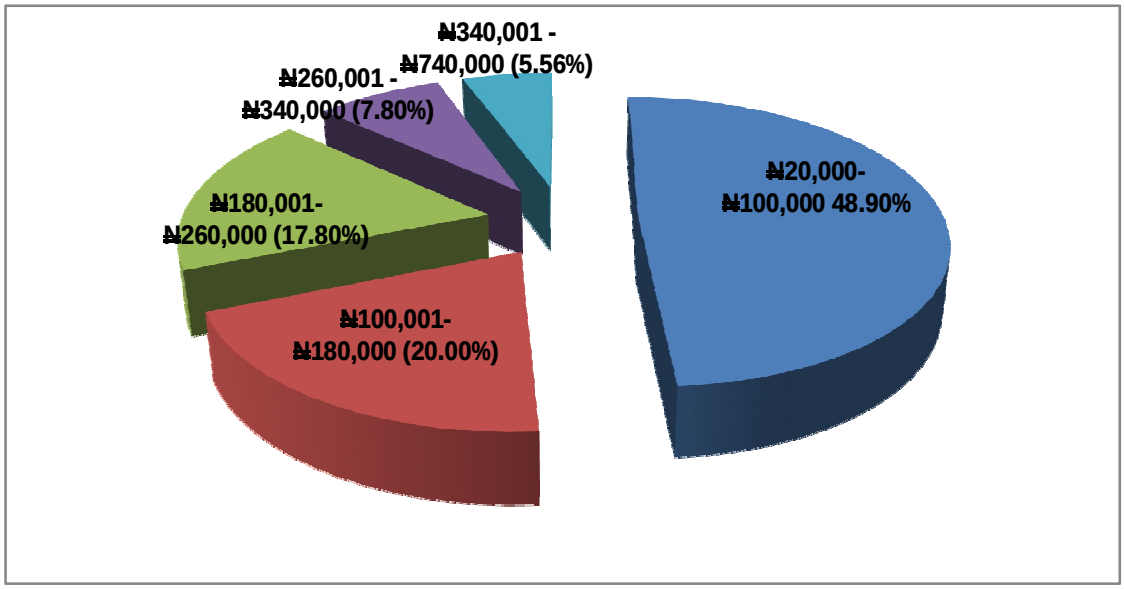

Figure 4: Pie Chart of the frequency distribution of farmers by annual farm income

Mean Annual Farm Income = ₦ 148, 255.60

3.1.8.Farmers' Access to Credit

Table 5 shows that majority of the respondents (61.10%) had no access to agricultural credit while the remaining 38.90% had access to credit. Accessibility to farm credit induces adoption of innovation. Lack of collateral could be the reason why farmers' accessibility to credit is poor. Therefore removal of complex lending conditions is necessary for increased accessibility to credit to farmers to aid adoption of agricultural innovations.

Access to Credit	**Frequency**	**Percentage**
Access	35	38.90
No Access	55	61.10
Total	**90**	**100.00**

Table 5: Frequency distribution of farmers by access to credit

3.1.9.Contact with Extension Workers

Farmers' access to extension services is shown in Table 5. Majority (60.00%) of the farmers had received an extension visit in 2011. Majority of the farmers who received extension visits (53.70%) were visited once in two weeks, 20.40% were visited once a month and 25.90% once every three-months. Regular contact with extension agents

motivates and exposes the farmers to innovations and gives them information how to use the technologies.

Access to Extension workers	**Frequency**	**Percentage**
No access to extension	36	40.00
Access to extension	54	60.00
Total	**90**	**100.00**
Frequency of extension visits		
Once per two weeks	29	53.70
Once per month	11	20.40
Every three months	14	25.90
Total	**54**	**100.00**

Table 6: Frequency distribution of farmers by access to extension services

3.1.10.Farming Experience

As shown in Table 6, majority of the farmers (46.67%) had 11-20 years of farming experience, 33.33% had farming experience of 1-10 years, while the remaining 20.00% had farming experience of 21-30 years. The mean farming experience of the farmers was 14.8 years. This is an indication that the farmers have been in farming for a long period of time. The implication is that they are capable of adopting agricultural technologies like yam minisett, improved cassava stems and fertilizer applications because of their experience in farming and knowledge about the importance of improved agricultural production technologies.

Farming Experience (Years)	**Frequency**	**Percentage**
1-10	30	33.33
11-20	42	46.67
21-30	18	20.00
Total	**90**	**100.00**

Table 7: Frequency distribution of farmers by farming experience
Mean Farming Experience = 14.8 years

3.1.11.Farm Size

Table 7 shows that the majority (55.56%) of the farmers had farm sizes of 1-3 ha, 33.33% had farm sizes of less than 1 ha while the remaining 11.1% had 4-6 ha of farm land. The mean farm size of the farmers was 1.8 ha. This implies that the farmers are mainly smallholder farmers. This small landholding is not really favourable for adoption of yam minisett, improved cassava stems and fertilizer application technologies.

Farm Size (ha)	**Frequency**	**Percentage**
<1	30	33.33
1-3	50	55.56
4-6	10	11.10
Total	**90**	**100.00**

Table 8: Frequency distribution of farmers according to farm size

Mean farm size = 1.8 ha

3.1.12.Mass Media Exposure

Mass media channels are means of transmitting messages involving a mass medium, such as radio, television, newspapers, and so on that enable a source of one or a few individuals to reach an audience of many. Mass media can (1) reach a large audience rapidly, (2) create knowledge and spread information, and (3) lead to changes in weakly held attributes (Rogers, 1995). Mass media exposure was measured by the question "do you watch agricultural programmmes on television and/or listen on radio, do you read newspaper and agricultural magazines. The farmers were asked to choose one of the responses: Always=4, sometimes=3, rarely=2, no=1". Based on the scores of mass media exposure, farmers were classified into three levels: low, medium, and high. Percentage distribution of farmers by mass media exposure is presented in figure 5. More than 80% of farmers were falling in the low and medium level of mass media exposure. The proportions of farmers with a high degree of mass media exposure were 18.80%, and the proportions of farmers with a low degree of mass media exposure were 40.00% while medium was 41.20%. This implies that farmers' exposure to mass media in the area is not high which may affect adoption of innovations negatively.

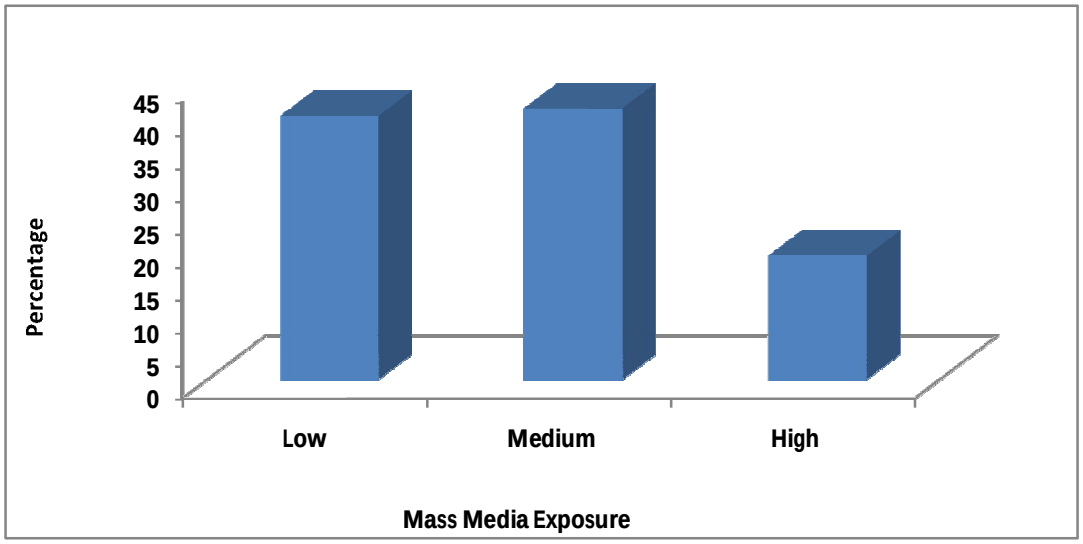

Figure 5: Percentage distribution of farmers by mass media exposure

3.2.Farmers' Awareness On Yam Minisett, Improved Cassava Stems And Fertilizer Application

As shown in figure 6, yam minisett, improved cassava stems and fertilizer application have been transferred to end-users. The figure shows that majority (66.67%) of the farmers are aware of improved cassava stems, followed by fertilizer application (57.78%) and yam minisett (50.00%). Farmers' awareness about the existence of agricultural services is an important step to increase the demand for information and advice. Amongst the significant factors that are involved in knowledge and communication process are, clearly, the innovation itself, information sources, as well as the change agent and early adopters (Rogers, 1962).With the level of awareness of these technologies, there is likely to be high adoption of these technologies, since farmers should be aware of a given technology before adoption.

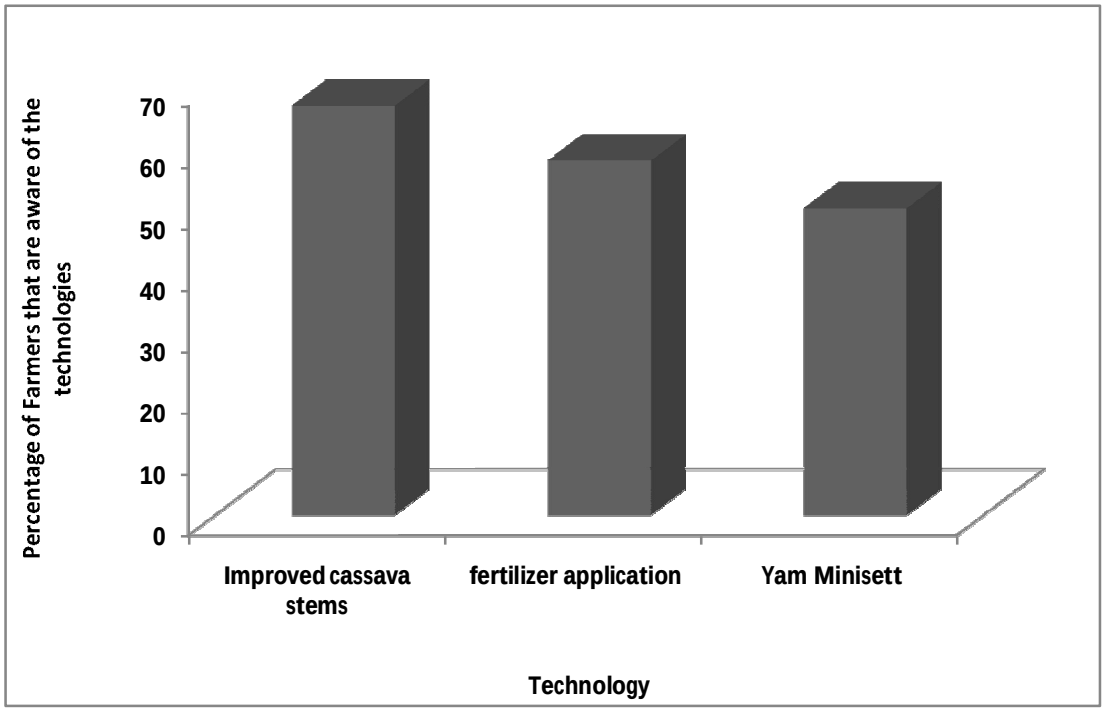

Figure 6: Distribution of farmers' responses on the awareness of the selected agricultural technologies

3.3.Sources Of Information On Yam Minisett, Improved Cassava Stems And Fertilizer Application

The farmers were asked to choose their sources of information on the innovations according to the most important sources (Table 8). Information sources were classified into two broad categories:

- Personal communication, which included extension workers, family members, neighbours, and private sector companies and traders.
- Impersonal communication, which included radio, television (T.V), and extension leaflets.

Personal sources were ranked by farmers much higher than impersonal sources. About 92.00% of farmers were identified of personal communication as a source of information for these innovations compared with 8.00% of farmers who identified impersonal communication. The farmers ranked the extension workers on the top for improved cassava stems, and yam minisett innovations. Non-governmental organizations were ranked as the second most important source of overall of these innovations. Family members and neighbours (14.44% and 10.74% respectively) are also very important sources of information.

Source of information	Agricultural Innovations							
	Improved Cassava Stems		Yam Minisetts		Fertilizer Application		Overall innovations	
	Freq	%age	Freq	%age	Freq	%age	Freq	%age
Extension workers	36	40.00	30	33.33	33	36.67	33	36.67
NGOs	18	20.00	15	16.67	16	17.78	16	18.10
Family members	12	13.33	13	14.44	14	15.56	13	14.44
Neighbours	9	10.00	10	11.11	10	11.11	10	10.74
Traders	5	5.56	6	6.67	7	7.78	6	6.67
Private sector Companies	4	4.44	8	8.89	3	3.33	5	5.56
Radio	3	3.33	4	4.44	2	2.22	3	3.33
Television								
Extension leaflets	2	2.22	3	3.33	1	1.11	2	2.22
	1	1.11	1	1.11	4	4.44	2	2.22
Total	**90**	**100.00**	**90**	**100.00**	**90**	**100.00**	**90**	**100.00**

Table 9: Source of information on yam minisett, improved cassava stems and fertilizer application

3.4.Farmers' Adoption Of Yam Minisett, Improved Cassava Stems And Fertilizer Application

Table 9 reveals that improved cassava stems was the most commonly used technology by the farmers (57.78%) while the use of fertilizer was the least adopted by farmers (33.33%). Moreover, 44.44% of the surveyed farmers reported not to have adopted yam minisetts. The adoption of these technologies is not satisfactory. This could be due to poor delivery system of the extension agents and high cost of adopting the technologies.

Technology	Frequency	Percentage	Rank
Improved Cassava Stems	52	57.78	1st
Yam Minisetts	40	44.44	2nd
Fertilizer Application	30	33.33	3rd

Table 10: Distribution of farmers' responses on adoption of yam minisett, improved cassava stems and fertilizer application
Note: Multiple response

3.5.Constraints To Adoption Of Selected Technologies (Yam Minisett, Improved Cassava Stems, And Fertilizer)

Entries in Table 10 show various problems identified to be militating against the adoption of selected technologies by the farmers. The majority of farmers (57.78%) were constrained with inadequate finance. Other problems are inadequate planting materials, high cost of necessary inputs, farmers' conservativeness, inadequate information about the technologies, and high cost of the packages as these were confirmed by 50.00%, 50.00%, 50.00%, 44.40%, and 43.30% respectively. Other problems identified were poor market outlet for the products, inadequate farm land to practice the technologies, poor extension supervision and contact, and inappropriateness of the technologies. With these problems, there will be a setback in adoption of the selected technologies. This calls for adequate check of these problems to increase motivation of farmers in adopting the technologies

Problems	**Frequency**	**Percentage**
Inadequate Finance	52	57.78
High cost of inputs	45	50.00
Lack of planting materials	45	50.00
Farmers' conservativeness	45	50.00
Inadequate information	40	44.40
High cost of the technologies	39	43.30
Poor market outlet	37	41.10
Inadequate farmland	30	33.33
Poor extension supervision and contact	20	22.22
Inaccessibility to extension services	10	11.11
Inappropriateness of the technologies	9	10.00

Table 11: Distribution of the problems militating against the adoption of selected agricultural technologies
Note: Multiple responses

4.Conclusion And Recommendations

Although the study was limited to Rivers State and farmers in Rivers State constituted the sample of the study, certain reasonable conclusions have been made from the results of the study and could really be generalized with other areas sharing similar socioeconomic conditions with Rivers State. Extension is an on-going process of getting useful information to farmers (communication dimension) of assisting those farmers to acquire the necessary knowledge, skills, and attitudes to utilize effectively this information or technology (the educational dimension) and to analyse farm technology options for future use. Farmers' knowledge and communication are crucial in participation and evaluation processes of extension services. Awareness of the existence of selected technologies is very important in its adoption. Rural clients seek information from multiple sources and often want to test the reliability of information before being applied. Farmers are not exceptional to this behaviour.

Despite the expectations of the research, about the relation of extension services agents and sample farmers, the study found that there was no problem in communicating farmers with extension agents. This is may be due to the extension agents are living in the villages also due to similarity of extension agents' background with the community could have lessened the degree of communication problem perceived by farmers. The final step in this research processes is to indicate the identified problems and the way forward that is alternatively could be managed to increase the effectiveness of the extension system on one hand and increasing the productivity of farmers by adopting more intensively these selected technologies on the other hand. A number of constraints face the farmers in adopting yam minisett, improved cassava stems and fertilizer application technologies. The common one is inadequate finance. Others are high cost of inputs, farmers' conservativeness and poor extension supervision. These made the adoption rate of the technologies very poor in Rivers State.

The inability of farmers to adopt innovations has many causes but lack of resources, inability to access credit and general lack of capital could be cited as the major causes of the lower adoption rates. It is therefore recommended that loans by microfinance and commercial banks for the purchase of appropriate number of yam minisetts, improved cassava stems and fertilizers and purchase of inputs should be made available on easy terms. Policy-makers and financial institutions should carefully target those farmers that need additional capital in order to obtain greatest impact from credit.

5.Reference

1. Akoroda M.O. and Teri J.M. (2004). Food Security and Diversification in SADC Countries. Approach: A case study of Western Nigeria Cassava Farmers Indian Journal of Agricultural Economics 27 (2) 56-66.
2. Akubuilo CJC, Umebali EE, Mgbada JU, Ugwu DS, Egwu WE and, Awoke MU (2007). Readings in Agricultural Economics and Extension, Computer Edge Publishers, Enugu.
3. FAO (2000). Agriculture towards 2015/30. Technical Interim Report, April, 2000, Rome.
4. IITA. (1997). Annual Report; International Institute of Tropical Agriculture. Ibadan, Nigeria
5. Iwueke CC, Okereke HE and Iloka AW (1991). Appraisal of yam minisett technique by farmers in Southeastern State of Nigeria Annual Report of National Root Crop Research Institute, Umudike.
6. National Bureau of Statistics (NBS) (2007). Provisional of State and Local Government Totals of the 2006 Population Census of the Federal Republic of Nigeria. www.nigerianstat.gov.ng
7. Nweke FI, Ugwu BO, Dixon AGO, Asadu CLA and Ajobo O (2004). Cassava production in Nigeria: A function of farmers' access to market and to improve production and processing technologies. COSCA working paper. Collaborative Study of cassava in Africa.
8. Obinne, CP (1989). Communication and Adoption of improved Cassava Production Technologies among Small Scale Farmers in Bendel State Nigeria. Unpublished Ph.D Dissertation, submitted to the Department of Agricultural Extension, University of Nigeria, Nsukka
9. Otunaiya AO and Akinleye SO (2010). Adoption of improved maize production technologies in Yewa north local government area of Ogun state, Nigeria. Unpublished conference paper\
10. Rogers EM (1962). Diffusion of Innovations. 1st edition. The Free Press, New York.
11. Rogers EM (1995). Diffusion of Innovations. 4th edition. The Free Press, New York.

12. Sain G and Martinez J (1999). Adoption and use of improved maize by small-scale farmers in southeast Guatemala. CIMMYT Economic Paper V. 04:99-102.
13. SPORE (1995). Bi-monthly Bulletin of the Technical Centre for Agriculture and Rural Cooperation (CTA). The Netherlands No. 57, pp. 12.
14. The Comet (2000). Exploit cassava and make profit. The Comet Newspaper Publication July 7, 2000 pg 16
15. Umeta G, Hundesa F, Duguma M and Muleta M (2011). Analysis of Goat Production Situation at Arsi Negele Woreda, Ethiopia. Journal of Stored Products and Postharvest Research 2 (8): 156 – 163
16. Van den Ban AW and Hawkins HS (1996). Agricultural Extension 2nd edition. London: Blackwell Science. Ltd.
17. www.rivers.gov.ng, Accessed on 11th August, 2011