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Full Length Research Paper

Adoption of improved agricultural technologies disseminated via radio farmer programme by farmers in Enugu State, Nigeria

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The study determined farmers' adoption of improved agricultural technologies disseminated via radio farmer programme in Enugu State, Nigeria. An interview schedule was used to collect data from a sample of 135 farmers. Results show that co-farmers and farm broadcast were the major sources of information to greater proportion of the farmers. Data on relevance of the technologies disseminated showed that almost all the technologies were perceived to be relevant except processing of tomatoes into paste and purée and snail farming. The radio farmer programme enhanced the extent of adoption of six technologies namely; modern land preparation and planting of early season crop, harvesting of yam and storage in barn, site selection/bush burning/packing, processing of cocoyam into chips and flour, improved early maize cultivation, weeding and fertilizer application in yam + cassava + maize intercrop and pest control in the food crop farms. Nevertheless, the adoption of the technologies were generally low. Age, farming experience and social participation significantly influenced adoption of improved agricultural technologies disseminated via radio farm programme. Major constraints identified include short duration of programme, inappropriate scheduling of programme, inability to ask relevant questions and get feed back from the radio presenter and language used in presenting the programme. The study recommends among other things the rescheduling of the radio programme to very late in the evenings when the farmers will be opportune to listen to the programme.

Key words: Improved agricultural technologies, radio programme.

INTRODUCTION

In West Africa, one serious constraint to agricultural development is the limited access to agricultural information (Anthott, 1993). This has given rise to calls for establishment of sustainable agricultural extension policy. However, the concept of information in general and of agricultural information in particular, as a resource for development is only just beginning to gain ground in West Africa. Government policy makers, planners and administrators are increasingly recognizing the fact that information is indispensable to the development process. In spite of this growing realization, the essential social and information mechanisms and infrastructural facilities are not yet sufficiently developed in West African Countries to foster the generation, storage, preservation, repacking, retrieval, dissemination and utilization of information (Hannah, 1991). However, effective communication is seen as an essential tool for the establishment and maintenance of good social and working relationships and it enables people to exercise control over their environment (Braimoh, 1988; Anyanwu, 1992). The purpose of communication is to bring about change of attitude, knowledge, skills and aspiration of the receivers.

In Nigeria, various communication media are being used to transmit agricultural information to farmers in line with national policy on agriculture. The communication media include farm magazine, leaflets, newsletters, newspapers, pamphlets, radio and television, among others (Dare, 1990). Among them, radio is the most preferred tool of mass communication in Nigeria (Zaria and Omenesa, 1992; Omenesa, 1997; Ekumankama, 2000). Omenesa (1997) observed that radio programmes are usually timely and capable of extending messages to the audience no matter where they may be as long as they have a receiver with adequate supply of power. The

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absence of such facilities as road, light and water are no hindrance to radio. Similarly, such obstacles as difficult topography, distance, time and socio-political exigencies do not hinder the performance of radio. He further observed, that illiteracy is no barrier to radio messages since such messages can be passed in the audience own language. Another advantage of radio programme is that it can be done almost anywhere through the use of a tape recorder (Nwuzor, 2000). It is probably because of these advantages of radio that many governments accord high priority to it as a means of reaching farmers.

The Enugu State Agricultural Development Programme (ENADEP) in collaboration with the Enugu State Broadcasting Service (ESBS) has through the radio farmer programme (established in early 1997) transferred ENADEP technologies to farmers. The programme is broadcast in English with the aim of reaching farmers with improved agricultural technologies so as to increase agricultural production in the state. The programme lasts for fifteen minutes starting from three minutes after three in the afternoon of every Monday of the week. The various aspects of the programme include crop production, crop protection, women in agriculture, livestock, livestock/crop enterprises, agroforestry and engineering.

Through this radio programme some technologies were transferred to farmers. The technologies that have been disseminated include land preparation and planting of early season crops (for example early ware yam and cassava), fertilizer application in irrigated rice, soil conservation in food and cash crops, snail farming, poultry keeping, site selection for upland rice, processing of fruits into juice, harvesting of yam and storage in barns, processing of tomatoes into paste and purée, pomade/soap production, vaccination of small ruminants, harvesting and marketing of fruit trees, homestead soap production, processing of cocoyam into chips and flour, early maize cultivation (sole cropping), poultry production, disinfections and restocking of day-old chicks, pruning of trees and hedgerows and site selection for swamp rice. Others include preparation and planting of seed yams (including yam minisetts), nursery preparation for swamp rice, transplanting of fruit tree/seedlings, land preparation and planting of upland rice, stocking of concrete/earthen fish pond, corn starch and flour production, weeding and fertilizer application in yam+ cassava+ maize intercrop, pineapple planting, pest control in food crop farms, bee keeping for honey production, routine vaccination among others (ENADEP, 2000; 2001; 2002; and 2005). At the end of each discussion, interested farmers were advised to consult ESBS or ENADEP for further explanation. However, because of the obvious limitation of radio in overt behaviour change, it then become necessary to determine the farmer's perceived extent to which the programme has enhanced the adoption pattern of the improved agricultural technologies disseminated. The foregoing however raises some pertinent questions such as: how do farmers' perceived relevance of the improved agricultural technologies disseminated through the radio farmer programme? What is the level of adoption of the technologies? To what extent has the programme helped to influence the adoption patterns of the farmers? What are the farmers' extents of satisfaction with the programme? What are the personal and institutional factors that influenced the adoption of improved agricultural technologies disseminated via radio farmer programme? And what problems militate against the effective utilization of agricultural information aired on radio programme?

The overall purpose of this study was to determine farmers' adoption of agricultural technologies disseminated via radio farmer programme in Enugu State, Nigeria. Specifically, this study was designed to ascertain farmers' perceived relevance of the various improved agricultural technologies aired on the radio farmer programme, determine the level of adoption of these technologies among farmers, ascertain the extent to which the radio farmer programme has enhanced farmers adoption of improved technologies, determine farmers' level of satisfaction with the radio farmer programme, determine the personal and institutional factors that influenced the adoption of improved technologies aired on the radio farmer programme and determine constraints to effective utilization of information aired on the radio farmer programme.

METHODOLOGY

The study area

This study was carried out in Enugu State, Nigeria. Enugu State is one of the 36 States of the federation and it is located between latitude $5^0$56N – 706'N and longitude 6 ^{0}53E and $7^0$55E (Ezike, 1998). Enugu State is bounded on the Northeast by Ebonyi State, on the North by Benue and Kogi, on the south by Abia State, on the East by Cross River State and on the West by Anambra State. The state occupies an area of 8022.95 km^2 and has a population of about 2,123,968 people (Enugu State Government Official Gazette No.25, 1997). The state according to ENADEP (2004) has been divided into three agricultural zones namely:

1. Enugu North Zone comprising the following L.G.As Nsukka, Igbo-Etiti, Igbo-Eze South, Igbo-Eze North, Uzo-Uwani and Udenu with the Zonal office at Nsukka.
2. Enugu West Zone comprising of the following L.G.As Awgu, Aninri, Oji-River, Udi and Ezeagu with a zonal office at Oji-River.
3. Enugu East Zone comprising of the following L.G.As Enugu North, Enugu South, Enugu East, Isi-Uzo, Nkanu West and Nkanu East. The Zonal office is in Enugu.

Population and sampling procedure

The population for the study consisted of all farmers in the three agricultural zones of the State. One L.G.A each was purposively selected from each of the three agricultural zones on the basis of

ESBS receptivity. The L.G.As included Enugu East, Udi and Uzo-Uwani.

Communities from Enugu East Zone include Ibagwa Nike, Amaoji, Edem, Amaokpu, Alulu, Nneokpa, Eziams, Onyohu and Amaowere. Out of the whole communities, three communities were randomly selected. Communities from Udi included Abia, Abor, Affa, Amokwe, Akpakume, Awhum, Ebe, Egede Eke, Umulumgbe, Nachi, Ngwo, Nsude, Nze, Obinagu, Obinofia, Obioma, Oghe, Okpatu, Udi, Ukana, Umuabi, Umuaga, and Umoka Also, three communities were randomly selected. Communities from Uzo – uwani include Umulu Okpa, Ukpata Adaba, Igga Asaba, Nkpologu, Adani, Nimbo, Ogurugu, Ojor, Abbi, Ugbene, and Nrobo. Three communities were also randomly selected using simple random techniques. This gave nine communities for the study. In each of the selected nine communities, 15 farmers were randomly selected and interviewed. Therefore, the sample size for the study was 135 farmers.

Instrument for data collection/measurement of variables

Data were collected through the use of interview schedule. Generally, the instrument (interview schedule) was designed to generate information in the following areas: bio-data and farm characteristics of the farmers, information-related variables as well as technology-related variables.

To determine farmers' perceived relevance of the various technologies disseminated through the radio programme, a four point Likert- type scale which was used by Cook and Fish (1981) was applied. The four (4) points on the scale were weighed according to the degree of relevance. The following scaling procedure was adopted: very relevant = 4; relevant = 3; not relevant = 2 and very irrelevant = 1. The values of the four responses were added and further divided by 4 to obtain 2.5, which was regarded as the mean. Technologies, with mean scores below 2.5 were regarded to be irrelevant while technologies with mean scores equal to 2.5 or above were regarded as relevant.

To determine the extent of adoption, improved technologies were listed out and each respondent was asked to indicate the stage he/she was on, in the adoption scale. The 7 – steps (not aware to rejection) adoption model (Madukwe et al., 2000; Agwu, 2000) were used. Also, the extent to which the radio farmer programme has enhanced farmers' adoption was ascertained using a four - point Likert type scale. Each respondent was required to indicate his/her opinion on the extent to which the radio farmer programme has helped in adopting the technologies disseminated by checking any of the four options namely; "to a very great extent", "to a great extent", "to a little extent" and "not at all". Values that were assigned to these options are 4, 3, 2, and 1, respectively. The values were added and further divided by 4 to obtain a mean of 2.5. Technologies with the mean scores of less than 2.5 were regarded as technologies which the radio farmer programme has not enhanced the extent of adoption, while technologies with mean scores equal or above 2.5 were regarded as having a great extent of adoption via the radio farmer programme.

Information on the level of satisfaction with the radio farmer programme was ascertained by asking each respondent to indicate the option that best describe his or her level of satisfaction. The following response options were used: "Very satisfied", "Satisfied", and "Not Satisfied". Also, to determine personal and institutional factors influencing the adoption of improved technologies aired on the radio farmer programme, multiple regression analysis was used. The multiple regression was implicitly specified as follows:

$$Y = f(X_1,X_2,X_3,X_4,X_5,X_6,X_7,X_8,X_9,X_{10},X_{11})$$

Where Y = Adoption index (number of technologies adopted by the respondent), X_1 = age of the farmer (in years), X_2 = level of formal education (number of years spent in school), X_3 = household size (number of household members), X_4 = farming experience (in years), X_5 = farm size (in hectares), X_6 = extension contact (in number of visits paid (contacts) by extension agents in the year), X_7 = gender (1 if the respondent is male; 2 other wise), X_8 = access to credit (1 for access to credit; 0 other wise), X_9 = occupation (1 if farming is major occupation; 0 other wise), X_{10} = organization membership (1 if membership of a cooperative or farmer group; 0 other wise), and X_{11} = ownership of radio (1 if the respondent own a radio; 0 other wise)

To find out farmers' perceived constraints to the effective utilize-tion of the radio farmer programme, a list of possible constraints was listed and the respondents asked to indicate their perceived constraints. The following scaling procedure was adopted; Very serious constraints = 3; Serious constraints = 2; Not serious constraints = 1. From these responses the mean scores below 2.0 were regarded as not serious constraints while mean scores equal to 2.0 or above were regarded as serious constraints to the effective utilization of the radio farmer programme.

Data relating to socio-economic variables of the farmers were summarized using means, frequency counts and percentages. Multiple regression analysis was used to determine the personal and institutional factors influencing the adoption of improved technologies aired on the radio farmer programme.

RESULTS AND DISCUSSION

Socio-economic characteristics of farmers

Data in Table 1 shows that majority (81.5%) of the respondents were males who were mostly (73.3%) married with a greater proportion (47.4%) of the respondents being between 41 and 50 years of age. This is an advantage for increased investment and improved technology utilization and hence innovativeness. Majority (85.4%) of the respondents were literate and this is an advantage for adoption of farm innovations as education has been shown to be a factor in the adoption of high yielding modern farm practices (Obinne, 1991). In other words, the high level of education among the respondents would likely make them more responsive to many agricultural extension programmes and policies. Agwu and Anyanwu (1996) reported that increase in education of farmers positively influence adoption of improved practices. The Table indicates that 48.1% of the respondents had 5-9 household members. The implication of this finding is that more family labour would be readily available since relatively large household size is an obvious advantage in terms of farm labour supply.

Table 1 further shows that 54.8% of the respondents were primarily engaged in farming with majority (86.7%) of the them involved in food crop production like yam, rice, maize, potatoes and cassava while only 13.3% were involved in livestock farming, and reared the following livestock; poultry, cattle, goat and sheep. The average poultry birds kept was 27.8 while the average ruminant kept was 3.8. Amalu (1998) attributed this to the fact that

Table 1. Percentage distribution of respondents by socio-economic characteristics (N= 135).

Socio-economic characteristics	Percentage	$\bar{x}$
Sex		
Male	81.5	
Female	18.5	
Marital status		
Married	73.3	
Single	19.3	
Widow	10.4	
Age (years)		
21 - 30	2.9	
31 - 40	26.7	
41 – 50	47.4	53.1
51 – 60	11.1	
61 - 70	11.9	
Educational status		
Non formal education	12.6	
Primary school level	38.5	
Secondary school level	31.9	
Tertiary institution	17.0	
Household size		
1 – 4	30.4	
5 – 9	48.1	6.2
10 - 14	21.5	
Primary occupation		
Farming	54.8	
Trading/business	7.4	
Civil service/ Retired	34.7	
Artisan	2.9	
Type of farming activities		
Food crop farmer	86.7	
Livestock farmer	13.3	
Farming experience (years)		
1 – 9	25.9	
10 – 19	37.0	17
20 – 29	22.2	
30 - 39	15.8	
Farm size		
< 1 hectare	29.9	
1 – 2 hectares	46.1	1.5
3 – 4 hectares	20.5	
5 – 6 hectares	3.4	
Livestock status		
Poultry		
30 – 50	33.3	
51 – 70	16.6	27.8
71 – 90	6.5	
Ruminant (Sheep, Goat and Cattle)		
1 – 10	27.1	
11 – 30	16.6	3.8

the bulk of livestock and poultry production in Nigeria lies on the hands of Fulani herdsmen and smallholder village dwellers nation wide. Majority (37%) of the respondents had between ten and nineteen years of farming experience. Long farming experience is an advantage for increase in farm productivity since it encourages rapid adoption of farm innovation (Obinne, 1991). The result reveals that a greater proportion (46.1%) of the farmers cultivated between 1and 2 hectares of farm land while 20.5% of them cultivated between 3 and 4 hectares of land. The mean farm size was 1.5 hectares. This implies that the study area comprises of small-scale farmers. This agrees with Olayide (1992) that Nigerian farmers are small-scale farmers that cultivated small areas of land. The relatively small farm size of the respondents will inevitably lead to subsistence farming which do not encourage commercial farming. Relatively small farm land could constitute a major constraint to technology adoption.

Respondents' institutional characteristics

Table 2 shows that majority (70.4%) of the respondents have not had any contact with extension agents, 18.5% had between one to three contacts with extension agents in the last twelve months. From the foregoing analysis, it can be concluded that the respondents were not receiving as much extension support as necessary. This does not augur well for innovation adoption and transfer. The low percentage of farmers visited by the extension agents appear to indicate that the extension service/ agents are not playing their roles in promoting agriculture in the area. A greater proportion (79.2%) of the respondents did not belong to any farm association. This implies low innovativeness among the respondents due to lack of group dynamic effects. Data in Table 2 show that about 86.7% of the respondents did not receive any agricultural credit. Only about 13.3% which were mostly male respondents received agricultural credit. Lack of access to credit facilities constitutes a constraint in purchasing planting materials and farm inputs and leasing more land for farming. Major sources of information on improved agricultural technologies available to the respondents were co-farmers (35.3%); farm broadcast (28%) and co-operative society members (8.8). Agricultural information from co-farmers may be wrong and/or obsolete especially if they were not well informed on appropriate agricultural practice and techniques. The result also shows that majority (92.6%) of them indicated ownership of radio sets and 74.8% asserted that radio is a useful source of information on improved agricultural technologies. In other words it is expected that majority will benefit from the radio broadcast and will be well informed on improved agricultural technologies only if they listen to the programme. However, the table shows

Table 2. Percentage distribution of respondents by institutional characteristics (n = 135).

Institutional characteristics	Percentage	$\bar{x}$
Frequency of Extension Agent contact per year		
Not visited	70.4	
1 – 3	18.5	0.9
4 – 5	7.40	
6 - 7	3.7	
Membership of farmers' association		
Non member	79.2	
1 – 2	19.3	0.3
3 – 4	1.5	
Access to credit facilities		
Yes	13.3	
No	86.7	
Major source of information		
Radio	28.1	
Co-farmers	35.5	
Co-operative society	8.8	
Farmers forum	6.6	
Workshop on Agric	1.48	
IITA officials	2.96	
Extension agents	5.92	
TV	1.48	
None	8.88	
Ownership of radio		
Yes	92.6	
No	7.4	
Usefulness of radio as a source of information		
Yes	74.8	
No	25.2	
Listening to radio farmer programme		
Yes	23.7	
No	76.3	

Table 3. Mean scores of farmers' perceived relevance of improved agricultural technologies disseminated via radio farmer programme.

Technology	$\bar{x}$
Improved land preparation and planting of early season crops	3.3*
Improved fertilizer application in irrigated rice	2.7*
Improved soil conservation in food and cash crops	2.6*
Modernized drying of processed cassava chips for storage	3.0*
Harvesting of yam and storage in barn	3.9*
Processing of tomatoes into paste and purée	1.4
Vaccination of small ruminants	3.2*
Site selection/bush clearing/packing	3.6*
Processing of cocoyam into chips and flour	3.4*
Early maize cultivation	3.2*
Disinfections and restocking of day-old chicks	3.3*
Weeding and fertilizer application in cassava + yam + maize	3.5*
Pest control in food crop farm.	3.7*
Routine vaccination of small ruminants	3.3*
Harvesting, drying and storage of maize in cribs	2.6*
Bee-keeping for honey production.	3.2*
Snail rearing	2.1
Oil palm establishment	3.2*
Improved poultry keeping	3.1*

*Relevant technologies ≥ 2.5.

that majority (76.3%) of the respondents indicated that they did not listen to the radio farmer programme. This could be as a result of lack of awareness of the programme or that the programme is aired when the respondents were in the farm. This finding suggests the need for ENADEP to create more awareness of the programme and possibly reschedule the time of the programme to the time it will be convenient to the primary target audience.

Relevance of the improved agricultural technologies disseminated via radio farmer programme

Data in Table 3 indicate that the relevant improved agricultural technologies disseminated to farmers include harvesting of yam and storage in barn ($\bar{x}$ = 3.9), pest control in food crop farm ($\bar{x}$ = 3.7) and site selection/ bush clearing/packing ($\bar{x}$ = 3.6). This implies that yam is a major crop in the area and farmers need proper knowledge on how to increase the yield, store it and prevent it from pest attack. Other agricultural technologies that were relevant to farmers include weeding and fertilizer application in cassava + yam + maize intercrop ($\bar{x}$ = 3.5), processing of cocoyam into chips and flour ($\bar{x}$ = 3.4), preparation and planting of early season crops ($\bar{x}$ = 3.3), disinfections and restocking of day-old chicks ($\bar{x}$ = 3.3), early maize cultivation ($\bar{x}$ = 3.2), bee keeping for honey production ($\bar{x}$ = 3.2), modernized drying of processed cassava chips for storage ($\bar{x}$ = 3.0), fertilizer application on irrigated rice farm ($\bar{x}$ = 2.7), improved soil conservation in food and cash crops ($\bar{x}$ = 2.6), vaccination of small ruminants ($\bar{x}$ = 3.2), harvesting, drying and storage of maize in cribs ($\bar{x}$ = 2.6), routine vaccination of small ruminants ($\bar{x}$ = 3.3) and oil palm establishment ($\bar{x}$ = 3.2). However, processing of toma-

Table 4. Percentage distribution of respondents by levels of adoption (n = 135).

Technology	Not aware	Aware	Interest	Evaluation	Trial	Using	Rejection
Improved land preparation and planting of early season crops	61.4	2.22	-	-	-	36.2	-
Improved fertilizer application in irrigated rice	76.2	9.62	-	-	-	14.0	--
Improved soil conservation in food and cash crops	96.2	-	-	-	-	3.70	-
Modernized drying of processed cassava chips for storage	81.4	11.1	-	-	-	7.40	-
Harvesting of yam and storage in barn	29.6	14.8	-	-	-	55.5	-
Processing of tomatoes into Paste and purée	96.2	3.7	-	-	-	-	-
Vaccination of small ruminants	83.7	14.0	-	-	-	2.22	-
Site selection/bush clearing/ packing	75.5	2.2	-	-	-	22.2	-
Processing of cocoyam into chips and flour	62.9	7.40	-	-	-	29.6	-
Early maize cultivation	59.2	-	-	-	-	40.7	-
Disinfections and restocking of day-old chicks	86.6	-	-	-	-	13.3	-
Weeding and fertilizer application in cassava + yam+ maize	48.1	7.40	-	-	-	44.4	-
Pest control in food crop farm.	66.6	-	-	-	-	33.3	-
Routine vaccination of small ruminants	97.0	2.96	-	-	-	-	-
Harvesting, drying and storage of maize in cribs	87.4	12.5	-	-	-	-	-
Bee-keeping for honey production	83.7	14.0	1.48	-	0.74	-	-
Snail rearing	88.1	8.14	2.96	-	-	0.74	-
Oil palm establishment	67.4	29.6	2.22	-	-	0.74	-
Improved poultry keeping	92.5	-	3.70	-	-	3.70	-

toes into paste and purée was not considered relevant by the farmers. The reason could be due to management and technicality involved in the technology, which the farmers may not have and/or lack of awareness of the importance of this technology. Snail rearing also was not considered relevant by the farmers. The reason could be that the technology is incompatible with their farming systems. From the table, it can be seen that almost the whole technologies were relevant because the information bothered on the major crops grown and animal reared by the farmers in the study area.

Entries in Table 4 show respondents' different stages of adoption of improved technologies. The result shows that the harvesting of yam and storage in barn has the highest level of adoption (55.5%). This was followed by weeding and fertilizer application in yam + cassava + maize intercrop (44.4%) among others. This could be because yam and cassava are staple food in the state. According to Ekumankama (2000), mixed cropping especially cassava based mixtures are traditionally practiced in many farming systems in the eastern region of the country. Technologies with high levels of unawareness include routine vaccination of small ruminants (97.0%), improved soil conservation in food and cash crops (92.2%), processing of tomatoes into paste and purée (96.2%), disinfection and restocking of day-old chicks (86.61%) and vaccination of small ruminants (83.7). It is worthy of note that the level of adoption of these improved technologies by farmers is low. This might be explained by the fact that radio broadcast has various limitations. For instance, the broadcaster cannot put too much detail on radio because of time limitation (Zaria and Omenesa, 1992). However, the high level of unawareness associated with these technologies and the general low level of adoption of the technologies among the respondents suggest inadequate and insufficient (poor) exposure of farmers to improved agricultural technologies disseminated via radio farmer programme. As a result of low improved technologies employed by most small scale farmers, the desirable level of increase in agricultural productivity has been difficult to achieve (Federal Republic of Nigeria, 1990).

Extent to which the radio farmer programme has enhanced farmers' adoption of improved technologies

Table 5 shows that the radio farmer programme has enhanced the adoption of only six technologies. They include: improved land preparation and planting of early season crops ($\bar{x}$ = 2.6), harvesting of yam and storage in barn ($\bar{x}$ = 2.7), site selection/bush burning/packing ($\bar{x}$ = 2.9), processing of cocoyam into chips and flour ($\bar{x}$ =

Table 5. Mean scores of extent to which the radio farmer programme has enhanced the adoption of improved technologies disseminated as perceived by farmers.

Technology	$\overline{x}$
Improved land preparation and planting of early season crops	2.60*
Improved fertilizer application in irrigated rice	1.90
Improved soil conservation in food and cash crops	1.40
Modernized drying of processed cassava chips for storage	1.70
Harvesting of yam and storage in barn	2.70*
Processing of tomatoes into paste and purée	1.00
Vaccination of small ruminants	1.03
Site selection/bush clearing/packing	2.90*
Processing of cocoyam into chips and flour	2.70*
Early maize cultivation	2.50*
Disinfections and restocking of day-old chicks	1.50
Weeding and fertilizer application in cassava + yam + maize	2.90*
Pest control in food crop farm	2.75*
Routine vaccination of small ruminants	1.00
Harvesting, drying and storage of maize in cribs	1.00
Bee-keeping for honey production	1.00
Modern snail rearing	1.06
Modern oil palm establishment	1.06
Improved poultry keeping	1.31

$\overline{x}$ = > 1.5.

2.7), improved early maize cultivation ($\overline{x}$ = 2.5), weeding and fertilizer application in yam + cassava + maize intercropping ($\overline{x}$ = 2.9) and pest control in the food crop farms ($\overline{x}$ = 2.8).

The technologies that the radio farmer programme has not enhanced its adoption include improved fertilizer application in irrigated rice ($\overline{x}$ = 1.9), soil conservation in food and cash crops ($\overline{x}$ = 1.4), drying of processed cassava chips for storage ($\overline{x}$ = 1.7), processing of tomatoes into paste and purée ($\overline{x}$ = 1.0), vaccination of small ruminants ($\overline{x}$ = 1.03), disinfection and restocking of day-old chicks ($\overline{x}$ = 1.5%), routine vaccination of small ruminants ($\overline{x}$ = 1.0), harvesting, drying and storage of maize in crib ($\overline{x}$ = 1.0), bee keeping for honey production ($\overline{x}$ = 1.0), modern snail rearing ($\overline{x}$ = 1.06), oil palm establishment ($\overline{x}$ = 1.06) and improved poultry technologies ($\overline{x}$ = 1.31). The reason could be that these technologies involve practical demonstration and farmers place least reliance on the radio as a basis for trying out these improved technologies. Before they could accept it they want to see its effectiveness for themselves so that

Table 6. Percentage distribution of the respondents based on satisfaction.

Satisfaction	%
Very satisfied	12.5
Satisfied	32.25
Not satisfied	56.25

the result can easily be verified and the risk of uncertainty avoided and radio obviously cannot do this.

Farmers' satisfaction with the radio farmer programme

Table 6 reveals that 12.5% of the respondents were very satisfied with the radio farmer programme. About 33% were satisfied, while majority (56.25%) were not satisfied with the radio farmer programme in Enugu state. It could be that the time for airing the programme was not suitable to the farmers. The level of satisfaction of individual farmers with the radio farmer programme will largely inhibit or facilitate their utilization of this source of information.

Data in Table 7 show that age, farming experience and social participation had significant influence on adoption of improved agricultural technologies. Age of the farmer had a positive effect on adoption of improved technologies; this may be as a result of the total age proportion of the respondents. Older farmers may not accept new technologies as fast as younger farmers. The younger the farmers, the more active and innovative they will be. Also the social participation of the farmers had positive significant effect on adoption. This implies that the higher the number of social/farmers organizations belonged to by a farmer, the more improved agricultural technologies the farmer would adopt. This could be attributed to the fact that constant interaction and contact with follow members help farmers to become aware of new technologies. Membership however may entitle members to borrow money from the group, hence the possibility of having access to credit to practice the adopted technology. Murphy (1993) stated that farmers communicate most frequently and effectively with those who are most similar to them. These farmers are more likely to obtain information from and be influenced in their farming practices and management decision by other farmers than by extension workers. Farming experience of the farmers had a positive significant influence on adoption of the improved technologies. This can be better explained in terms of age. The older the farmer, the more farming experience she/he gains with increase in years. This finding also shows that the influence of these personal and institutional factors (age, farming experience and social participation) only accounted for about 19%

Table 7. Multiple regression result of personal and institutional factors influencing farmers' adoption of improved agricultural technologies in Enugu state.

Model	B	Std. Error	Standardized coefficients Beta	T	Sig
(Constant)	43.500	13.870		3.136	0.002
AGE	-.478	.249	-.223	-1.921	.050*
EDU	.371	.441	.076	.843	.401
OCC	.452	2.030	.019	.223	.824
FE	.528	.276	.216	1.916	.048*
SP	9.137	4.010	.236	2.279	.024*
EC	2.185	2.041	.110	1.070	.287
AC	6.308	5.417	.101	1.164	.247
OR	2.977	7.729	.031	.385	.701

*Significant at < 0.05.

Table 8. Farmers' perceived constraints to utilization of improved agricultural technologies disseminated via radio farmer programme.

Constraint	Mean scores
Poor reception of radio signals	1.69
Power outage	1.53
Inadequate technological content	1.72
Unavailability/cost of batteries	1.47
Short duration of programme	2.13*
Lack of radio set	1.47
Lack of money to buy batteries	1.38
Inappropriate scheduling of programme	2.75*
Irrelevant contents	1.72
Lack of access of radio set due to family members depending on the same set	1.32
Lack of interest	1.59
Innovation difficult/complicated to understand	1.88
Lack of adequate time to listen to the radio	1.69
Inability to ask relevant question and get the feedback from the radio presenter	2.56*
Language used in presenting the programme	2.25*

*Serious constraints, □ 2.0.

(adjusted R = 0.18) showing that there are still other factors which accounted for this influence. However, education, occupation, extension contact, access to credit and ownership of radio were found to have no significant influence on adoption. Also, the studies of Ajala (1992) and Ikani et al. (1998) show that farmers' age, farming experience and organizational participation significantly influenced adoption while, Agwu (2004) reported that age, membership in farmer/cooperative organizations, farming experience and family size had no significant influence on the adoption of improved cowpea technologies.

Constraints to the utilization of improved agricultural technologies disseminated via radio farmer programme in Enugu State

Table 8 shows that out of fifteen possible constraints listed in the study, four were considered to be serious constraints to the adoption of improved agricultural technologies by farmers. They include: short duration of programme ($\bar{x}$ = 2.13), inappropriate scheduling of programme ($\bar{x}$ = 2.75), inability to ask relevant question and get feedback from the radio presenter ($\bar{x}$ = 2.56) and language used in presenting the programme ($\bar{x}$ = 2.55). The constraints identified above seem to have affected the adoption of the improved agricultural technologies in Enugu State. Findings from the study reveal that many farmers mostly illiterates, cannot follow even the simplified form of technical language used in the broadcasts. Others who can follow the language were troubled by the analytic mode of presentation and again the impersonal nature of radio. The finding further suggests that the time of airing the programme was not suitable to the farmers. The reason is that most of them were often still in their farms while the presentations were made. Those that were back from the day's activities may be having their siesta due to tiredness from the day's work. This finding agrees with the observation of Ekumankama (2000) that farmers were not satisfied with the period of the day they received information on agricultural technologies from the radio. However, the time allocated for presenting the programme is too short for farmers to understand what the presenter teaches.

Conclusion and recommendations

The findings of this study revealed that major source of information on improved agricultural technologies to farmers were co-farmers followed by radio programmes. A greater proportion (96.3%) accepted radio as a useful source of information on improved agricultural technologies. However, only 23.7% of the respondents were found to have listened to the radio farmer programme. The study further showed that the major relevant technologies disseminated were harvesting of yam and storage in barns and pest control in food crop farms. The study also revealed that the radio farmer programme had little effect on enhancing adoption of improved technologies by the respondents. A greater proportion (56.3%) of the respondents was not satisfied with the radio farmer programme. Only age, farming experience and membership of farmers' organization significantly influenced adoption of improved agricultural technologies disseminated through the radio while the major constraints to adoption of technologies include inappropriate scheduling of programme, inability to ask relevant questions and get the feedback from the radio presenter and language used in presenting the programme. Based on these findings, it was concluded that the present level of adoption of the improved agricultural technologies disseminated via radio farmer programme to farmers in Enugu state is low.

On the basis of the finding in this study, the following recommendations were made:

1. Enugu state ADP should improve the adoption of the least adopted agricultural technologies through intensifying their promotional activities. In order to realize this, the management of ESBS should allocate more air time to the radio farmer programme.
2. Future extension package should be aimed at encouraging these farmers to listen to the radio farmer programme as basis for attaining increased agricultural production.
3. Farmers' radio listening groups should be formed and in places where they are in existence, they should be strengthened by the extension agency. ADP should ensure that at least an extension agent (EA) should be attached to each farmer radio listening group. The EA should be with the members of the group from the beginning to the end of the radio programme. After the broadcast, the EA should effectively interact and clarify issues with respect to the technologies disseminated.
4. Policies should be designed to encourage membership of farmers' organization since it was found to have positive significant influence on adoption. This will help to boost the productivity, income and food security in Nigeria.
5. The programme should be aired at the time when the farmers (primary audience) will be able to listen to the programme preferably very late in the evening.

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