



ORIGINAL ARTICLE

ADOPTION OF TECHNOLOGIES AIRED ON SOLID FM RADIO BY FARMERS IN SOUTHERN AGRICULTURAL ZONE OF NASARAWA STATE, NIGERIA

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ABSTRACT

The study assessed the crop farmers' adoption of agricultural technologies aired on Solid FM Radio in Southern Agricultural Zone of Nasarawa State, Nigeria. A multistage sampling procedure was used to draw 277 crop farmers who listened to agricultural programmes of Solid FM Radio. A structured questionnaire was used to obtain information on the stated objectives. Data were analysed using descriptive and inferential statistics (Linear regression). The result on socio-economic characteristics of the respondents shows that majority (52.0%) were in the age range of 38 years and above, had one form of formal education or the other (81.2%) with a mean household size of 5 persons. The mean farming experience was 9 years with majority (90.3%) having a farm size of between 1-5 hectares. Also, majority (60.3%) had contact with extension agents, and had no access to credit facilities (64.3%) and all of respondents owned or had access to a radio set. The study revealed that all the respondents were aware of and listen to the two popular agricultural programmes of Solid FM radio, mu koma gona and noman shinkafa jari. Results on adoption of agricultural technologies aired on the radio revealed that climate change mitigation practices (89.9%) best practices in rice production (87.9%) safe use/handling of agrochemicals (85.6%) were the technologies highly adopted by the respondents. The result further shows that age, household size, extension contact, amount of loan obtained, annual income and ownership of radio had a significant influence on adoption of agricultural technologies aired on the radio. Short duration of the programmes, ($m=2.60$) lack of feedback/inability to ask questions ($m=2.56$), wrong timing of the programmes were the major constraints to adoption of agricultural technologies aired on the radio. It was recommended that the radio station should allot more time to agricultural programmes, time of airing programmes should be changed to night.

KEYWORDS: Farmers, Adoption, Agricultural. Technologies, Solid FM, Nigeria

INTRODUCTION

Agriculture remains central to Nigeria's economy, providing employment, income, and food security for most rural households (FAO, 2023). Yet, low productivity, limited access to information, and slow adoption of improved technologies continue to constrain the sector (Smith *et al.* 2024). Bridging this gap requires effective extension communication to transfer research-based innovations to farmers. Radio has long been a powerful medium for agricultural information dissemination, particularly among smallholder farmers with limited literacy or access to extension agents (Adeyeye *et al.* 2020). It provides timely and practical messages on improved farming techniques, pest control, soil

management, and climate-smart practices (Adejo, et al. 2016; Duncan et al.2024). Its affordability and wide reach make it vital for promoting agricultural technologies in rural Nigeria. In Nasarawa State, Solid FM broadcasts agricultural programmes that share expert advice and farmer experiences to enhance awareness and adoption of improved technologies. Solid FM designed two agricultural programmes. *Mu koma Gona* (let's go back to farm), and *Noman Shinkafa jari* (Rice farming, a profitable venture). All the programmes are presented in Hausa language every Tuesdays and Saturdays respectively. The programmes cover various aspects of agriculture. However, the extent to which these programmes influence actual adoption among crop farmers is not well documented. Examining farmers' exposure, perceptions, and adoption levels is essential for improving programme content and impact.

Previous studies have shown that agricultural radio programmes positively affect farmers' knowledge and innovation uptake (Orifah et al. 2025; Abdulaziz and Ibrahim 2024). Nonetheless, variations in socio-economic factors, access to radio, and relevance of technologies can influence adoption outcomes. Therefore, this study examines crop farmers' adoption of agricultural technologies aired on Solid FM in the Southern Agricultural Zone of Nasarawa State. It identifies technologies disseminated, determines adoption levels, and analyses factors influencing adoption. The findings will inform better agricultural communication strategies and promote technology uptake among crop farmers.

METHODOLOGY

The study was conducted in the Southern Agricultural Zone of Nasarawa State, Nigeria. The zone shares boundary with Benue State to the South, Taraba State to the east, Plateau State to the North east, Nasarawa Eggon local government area to the North and Nassarawa local government area to the West. The area covers a land area of 10,644 square kilometres (Nasarawa state government, 2020) with a population of 811,020 people (National Population Commission, 2006). The study area is characterised with a period of rainy Season from May- October. The average rainfall is approximately, 1750 mm and an annual temperature range from 22.7⁰Cto 39.0⁰C (Nasarawa State Government, 2020). Agriculture is the dominant occupation of the inhabitants of the area. The zone has five local government areas namely, Lafia, Obi, Awe, Keana and Doma.

The target population for this study comprised all the crop farmers in the Southern Agricultural zone who listen to Solid FM Radio. A multi-stage Sampling technique was employed to obtain the sample size of 277 crop farmers. Stage 1 involved a random selection of three (3) Local Government Areas from the five Local Government areas in the study area. Stage ii, was random selection of three villages from each of the three selected Local Governments to give a total of nine villages. Lastly, stage iii, involved a purposive selection of 277 crop farmers from the selected villages based on the list of 906 farmers obtained from the Nasarawa agricultural Development Programme. The list was subjected to Yamane's (1967) formula. This was to ensure proper selection of the respondents.

The formula is presented in equation 1 According Yamane (1967) formula;

$n = \frac{N}{1 + N(\alpha)^2}$ to get the sample size n----- eqn. 1.

Where, n = desired sample size

N = population under study (906)

α = margin of error (0.05).

Primary data were collected using structured questionnaire. The data were collected by trained enumerators within a period of three months. The data collected were analysed using descriptive statistics such as frequency, percentages means and inferential statistics; linear regression. The explicit form of the model was specified as follows:

$$Y = a + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + U$$

Where

Y = Number of Agricultural technologies adopted by the respondents from Solid FM Radio agricultural programmes

a = Constant term

$\beta_1, \beta_2, \dots, \beta_{10}$ = estimated parameters

X_1 = Age of farmers (Years)

X_2 = Level of formal education (number of years spent in school)

X_3 = Household size (Actual number of people in a household)

X_4 = Farming experience (Years)

X_5 = Extension contact (Number of contact in the last 6 months)

X_6 = Access to credit (amount received in last 2 years).

X_7 = Total annual income (Naira)

X_8 = Farm size (Hectares)

X_9 = Ownership of radio (Dummy; 1 owned 0 otherwise)

U = Well behaved error term

RESULTS AND DISCUSSION

Socio-economic Characteristics of Respondents

The result of the analysis of socio-economic characteristics of respondents are presented in Table 1 and discussed as follows:

Age Distribution: The results revealed that majority (52.0%) of the respondents were above 38 years. The mean age of the respondents was 40 years. This implies that majority of the respondents were still active and strong enough to participate actively in agricultural activities. This finding is in agreement with the findings of Tafida and Sabiu (2021) who studied radio agricultural programmes utilisation among crop farmers in Kano and found that most of the crop farmers were active and in good position to utilise radio agricultural programmes.

Level of Education: The results in Table 1 further showed that majority (80.5%) of the respondents had formal education, while 19.5% had no formal education. This is an indication that most of the respondents could read and write hence understanding and comprehending innovation on the radio will not be difficult. This result agrees with the findings of Yakubu *et al.* (2019) who studied effectiveness of radio agricultural programmes in Jibia Local Government Area of Katsina State and found that most

of the farmers had formal education. Education was found to influence farmers' access, comprehension and adoption of modern agricultural practices (Okwu, *et al*, 2007).

Household Size: The majority (39.0%) of the respondents had a household size of between 1-5 persons. The mean household size of the respondents was 5 persons. This implies that the farmers in the area had a fairly large household size. Reasons behind large family size could be attributed to the polygamous practices among the people and their dependency on family as a source of farm labour. This agrees with the opinion of Tafida and Sabiu (2021) that crop farmers in Kano State, Nigeria had high family responsibilities which demanded them to utilise improve technologies aired on agricultural radio programmes.

Farming Experience: The majority (47.3%) of the respondents had farming experience of between 1-10 years. The mean years of farming experience in the area was 9 years. This indicates that the respondents had considerable experience in crop farming, which may have equipped them with necessary knowledge and confidence to adopt agricultural technologies disseminated through radio programmes. This confirmed the findings of Adikwu (2022) which asserted that substantial number of yam farmers in Benue State, Nigeria had between 7- 15 years' experience in yam farming.

Total Annual Income: The results on annual farm income of the respondents revealed that majority (52.3%) earned between ₦ 501000, - 1000,000. The mean annual income of the respondents was ₦568,077.62. This suggests that the respondents had a moderate earning capacity from their farming enterprises. This level of income could significantly influence their ability to access and adopt agricultural technologies disseminated through radio agricultural programmes. This result disagree with the findings of Tijani *et al.* (2019) who reported that farmers in Niono area of Segou, Mali earned low income from farming and were too poor to satisfy their household needs from farming activities. This could affect farmer's access to radio agricultural programmes and adoption of technologies aired on the radio.

Extension Contact: The result on Table 1 show that 60.3% of the respondents indicated they had no extension contact while 39.7% indicated otherwise. This reasons had made it necessary to find other means to reach farmers with the necessary agricultural information. Radio agricultural programme has been described as the most effective means of reaching farmers with reliable information. This results agrees with the findings of Njoku and Ugboaja, 2019, that farmers in Imo state, Nigeria had very low extension contacts.

Access to Credit: The majority of the respondents (64.3%) had no access to credit facilities while 35.7% had access to credit. The result further showed that for respondents who had access to credit, majority (57.1%) had accessed loan of above ₦400,000. This implies that accessing loan in the study area was difficult. Credit facilities encourages the adoption of technologies that are aired on the radio.

Access to Radio Set: Table 1 further revealed the respondents ownership or access to radio set. The result revealed that all (100%) of the respondents had radio set or access to one. This is an indication that farmers in the study area listen to radio and have access to agricultural information. Antwi *et al.* (2022) indicated that every respondent in their study on communication through radio either personally owned a radio set or had access to one.

Table 1: Socio-Economic Characteristics of Respondents

Socio-economic variable	Frequency	Percentage	Mean
Age (years)			
Less than 28	52	18.8	40.3 years
28-38	81	29.2	
Above 38	144	52.0	
Level of education			
Non-formal education	54	19.5	
Primary education	41	14.8	
Secondary education	94	33.9	
Tertiary education	88	31.8	
Household size (no. of persons)			
1-5	108	39.0	5 persons
6-10	104	37.5	
Above 10	65	23.5	
Farming experience (years)			
1-10	131	47.2	9,3 years
11-20	73	26.4	
Above 20	73	26.4	
Total annual income (naira)			
1,000-500,000	70	25.3	N568,077.62
501,000-1,000,000	145	52.3	
Above 1,000,000	62	22.4	
Farm size (hectares)			
1-5	250	90.3	3.4 hectares
6-10	20	7.2	
Above 10	7	2.5	
Access to extension contact			
Yes	167	60.3	
No	110	39.7	
Number of extension contact (no. of visits received)			2 visits
1-2	128	76.6	
3-4	14	8.40	
Above 4	25	15.0	
Access to credit			
Yes	178	64.3	
No	99	35.7	
Access to radio set			
Yes	277	100.0	

Level of Awareness of Agricultural Programmes of Solid FM Radio

The result in Table 2 shows the level of awareness of agricultural programmes of the ‘Solid FM’ Radio. All the respondents indicated having an awareness of agricultural programmes on the radio. Respondent’s awareness of the various agricultural programmes aired on Solid FM radio station reflects the popularity of the programmes among the respondents.

Table 2: Awareness of Agricultural Programmes on Solid FM Radio by Respondents

Variable	Frequency	Percentage
Awareness of agricultural programmes on Solid FM Radio.		
<i>Mukoma Gona</i>		
Yes		
No	277	100.0
<i>Noman Shikafa Jari</i>		
Yes	0	0.0
No	277	100.0
	0	0.0

Knowledge of a particular programme and its contents will develop interest among listeners which could lead to its adoption. This corroborates the findings of Maurice *et al.* (2019) that farmers in Adamawa State were aware of various agricultural programmes aired on radio stations.

Adoption of Agricultural Practices aired on the Solid FM Radio station

The distribution of farmers by level of adoption of agricultural practices aired on Solid FM Radio is shown in Table 3. The result revealed that 16 improved agricultural practices were disseminated to the farmers via radio agricultural programmes. The radio agricultural programmes had enhanced the adoption of all the practices by the farmers in varying degrees. Technologies such as climate change mitigation (89.0%) had the highest adoption while processing and information on weather forecast had lowest adoption (42.6%).

Table 3 Adoption of Agricultural Technologies Aired by Solid FM Radio station

Variable	Frequency	Percentage
Climate change mitigation practices	249	89.9
Best practices in rice production	241	87.0
Safe use/handling of agro-chemicals	237	85.6
Use of improved seeds varieties	225	81.2
Urea second application	221	79.9
Control/prevention of crops disease and pests	221	79.9
Proper storage methods of farm produce	216	77.9
Organic manuring	199	71.8
Maize production and its value chain	187	67.5
Timely planting of crops	175	63.2
Proper methods of preservation and utilisation of fruits and vegetables	154	55.6
Reputable sources of seeds	133	48.0
Market information	128	46.2
Home gardening/backyard farming	123	44.4
Information on weather forecast	118	42.6

Multiple responses were allowed

The technologies with 61% and above adoption were considered as highly adopted while technologies with less percentage were considered as moderately adopted and technologies with less than 30% adoption were considered otherwise. The reasons for their low adoption could be that the technologies were not properly explained, difficulties in understanding and use of the technologies, farmers’ unwillingness to take risk on some of the new practices among others. Njoku and Ugboaja (2019) reported that farmers in Imo State Nigeria had adopted all the fourteen agricultural practices disseminated on the ‘Radio- Farmer’ agricultural programme.

Determinant of Adoption of Agricultural Practices Aired on Solid FM Radio station

The result of the analysis as shown in Table 4 reveals that six of the nine explanatory variables used in the analysis were significant at varying levels. These includes coefficient of age (.027), household size (-.056), extension contact (.576), amount of loan obtained (3.998), total annual income (4.985) and ownership of radio (.438). The coefficient of multiple determination (R^2) was 0.521 implying that 52.1% of the change in the adoption rate of agricultural technologies/practices aired on the radio was explained by the independent variables used in the model, thus, the variables had fitted well into the model.

The coefficient of age of farmers was positive and statistically significant at 0.05 level. This implies that as farmers get older, the adoption of agricultural practices aired on the radio increased. As farmers become older they gained more experience in farming, and their quest to adopt technologies that will increase agricultural productivity also increase. Thus, they are likely to patronised agricultural programmes on radio that is relevant to their information need. This result is in contrast with the usual negative relationships between age and the usual adoption where a farmer is defined to have adopted an innovation if he is younger. The result of this study agrees with that of Antwi *et al.* (2022) and Maurice *et al.* (2019) who found that age of farmers is strongly correlated with adoption of farm radio programmes.

The coefficient of household size was negative. Indicating a negative but a significant relationship with adoption. As household size grows, the tendencies to adopt agricultural practices aired on the radio decreases. This could be attributed to the fact that larger households may not be able to adopt agricultural practices over the radio due to the fact that such household may not have enough resources to buy radio and adopt technologies aired. Again such household may channel more of their resources towards handling social responsibilities such as school fee, hospitals, foods than on improved technologies aired on the radio. This results disagrees with that of Tafida and Sabiu (2021), who reported positive relationship between household size and adoption of improved agricultural technologies on the radio by farmers in Kano state. The difference may be due to the variations in socio-economic conditions and labour utilisation between the two states. In Nasarawa State large household sizes may increase the dependency burden on crop farmers, thereby, limiting their ability to invest in or implement new technologies. Conversely, in Kano State, larger households may provide more available family labour which could facilitate the adoption of agricultural innovations.

Extension contact had positive influence on adoption of agricultural practices aired on Solid FM Radio at different level of significance. This implies that farmers who had more extension contacts were more likely to adopt agricultural practices than farmers who did not. Extension contact could reinforce and support the information provided through the radio agricultural programmes and can also provide targeted support to farmers, helping them overcome some specific challenges and increasing the effectiveness of radio agricultural programmes. As the frequency of extension contact increases, the likelihood or extent of adopting agricultural practices on the radio also increased. This finding is in line with the findings of Tafida and Sabiu (2021) who reported significant positive relationship between extension contacts and adoption of agricultural practice on the radio by crop farmers in Kano State, Nigeria.

Amount of loan obtained had a positive coefficient which was significant at 0.01 level of significance. This indicated that it had a positive influence on adoption of agricultural practices aired on 'Solid FM Radio. A positive coefficient shows that the larger the loan obtained, the more chances of adopting agricultural technologies. Implying that farmers who obtained larger loans are more likely to adopt the agricultural practices aired on 'Solid FM' radio. The result disagrees with Maurice *et al.* (2019) who reported that access to credit has no significant relationship with adoption of agricultural technologies aired on the radio.

Total annual income had a positive coefficient this indicate it had a positive influence on adoption of agricultural practices aired on 'Solid FM' Radio. It shows that as income increase, the tendencies to adopt agricultural practices will also increase. Farmers with more annual income were more likely to have more opportunities to learn about innovation, have more incentive to adopt it and are able to bear risks associated with early adoption than those with smaller farm incomes.

The coefficient of ownership of radio was positive and also statistically significant at 0.05 level. This implies that owning a radio set will increase the likelihood of farmers to adopt improved agricultural

technologies disseminated via radio. When the programme timing favours the farmer, the tendency is for the farmer to always tune in to the programme. The finding of this study is in line with the findings of Njoku, (2016), Maurice *et al.* (2019) and Tafida and Sabiu (2021) who all reported that radio ownership is a significant factor that influences adoption of technologies aired on the radio.

Table 4: Determinants of the Adoption of the Technologies disseminated through the Solid FM Radio Agricultural Programmes

Explanatory variable	β - value	Standard error	t-value
(Constant)	10.152	.488	20.803
Age	.027	.012	2.250**
Level of education	-.040	.050	-.800
Household size	-.056	.020	-2.800***
Years of experience in crop farming	.017	.014	1.214
Extension contact	.576	.066	8.727***
Amount of loan obtained	3.998	1.118	3.576***
Total annual income	4.985	1.195	4.172***
Farm size	-.079	.055	-1.436
Ownership of radio	.438	.180	2.433**
$R^2 = .521$ (52.1%)			

Note: *** = Significant at 1% level, ** = significant at 5% level; Dependent variable (Y) = Number of Agricultural technologies adopted by the respondents.

Constraints to Adoption of Agricultural Practices Aired on the Solid FM Radio Station

The result of the study on the constraint to adoption of agricultural practices disseminated on Solid FM Radio is presented in table 5. The result showed that out of the possible constraints investigated in this study, five (5) were considered to be serious constraints to adoption of technologies transferred through the radio agricultural programmes of ‘Solid FM Radio. These serious constraints, include short duration of the programmes (mean=2.60) which was ranked first, followed by lack of feedback/inability to ask questions (mean=2.56), wrong timing of the programmes (mean=2.45), high cost of batteries (2.42) and irregular electricity power supply (mean=2.31). This finding supported that of Tafida and Sabiu (2021) who reported that short duration of the programmes as the most important constraint associated with utilisation of agricultural radio programmes by crop farmers in Kano State, Nigeria.

Table 5: Constraints to Adoption of Agricultural Practices Aired on Solid FM Radio

Constraint	Mean	Rank
Short duration of the programmes	2.60*	1 st
Lack of feedback/inability to ask questions	2.56*	2 nd
Timing of airing the programmes	2.45*	3 rd
High cost of batteries	2.42*	4 th
Irregular electricity power supply	2.31*	5 th
Lack of radio set or having access to one	1.81	6 th
The technologies aired are too difficult to understand/use	1.74	7 th
Programme content not relevant to my needs	1.70	8 th
Poor presentation of the programmes	1.68	9 th
Language barrier	1.07	10 th
Lack of awareness of the radio agricultural programmes	1.02	11 th
Poor radio signal in my area	1.00	12 th

Note: * = serious constraint; Decision rule: A weighted mean ≥ 2.0 mean severe constraint, while any weighted mean of < 2.0 mean not serious constraint.

CONCLUSION

Based on the findings of this study, it can be concluded that majority of the farmers surveyed were aware of agricultural programmes of Solid FM Radio. The technologies disseminated on the agricultural programmes were relevant to farmers information needs/ agricultural practices and most of these technologies were adopted by the farmers. Factors such as age of the farmers, household size, number of extension contact, amount of loan obtained, annual farm income and ownership of radio were found to have significant influence on the adoption of agricultural technologies aired on the radio. Short duration of the programmes, lack of feedback/inability to ask questions, wronged timing of the programmes high cost of batteries, and erratic electricity power supply.

The study therefore, recommended that more time should be allotted to the agricultural programmes by the radio stations, time of airing the programmes should be change preferably in the night, Programmes managers should design the programmes in such a way that it can allowed audience participations. In this way, farmers could ask question and expect feedback from the experts. The government should improve the electricity supply of the study areas. Alternative power sources such as the solar power should be considered too. This will reduce the cost of buying batteries always by the respondents

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