Original Research Article

Determinants of willingness to adopt farm service centres among farming households in Abia State, Nigeria

Kingsley Olusola **Olurinde**, Luqman Wole **Agboola,** Olufemi Ajayi **Oladunni**

Agricultural and Rural Management Training Institute, P.M.B. 1343, Ilorin, Kwara State Nigeria

Correspondence to:
L. W. Agboola, Agricultural and Rural Management Training Institute, P.M.B. 1343, Ilorin, Kwara State, Nigeria
+2348139282377, E-mail: agboolawl@gmail.com

Abstract

The uptake of new agricultural technologies/innovations is not devoid of some challenges in Nigeria. However, to increase the production level in the sector, there is a need to enhance the adoption of new technologies/innovations. Therefore, this study examined the determinants of willingness to adopt farm service centres among farming households in Abia State, Nigeria. The study collected primary data from 300 farming households with a questionnaire using a three-stage sampling procedure. The collected data were analysed using descriptive statistics and a binary logistic regression model. Results of socioeconomic characteristics revealed that farming activities in the area were male (58.7%) dominated, mostly married (82%) with a mean age of 50 ± 9.7, having 10.5 ± 5.8 mean years of formal education, operating on 0.87 ± 1.3 hectare of farmland with 21 years of farming experience. Binary logistic model result revealed that age, level of education, and farming experience were the factors determining the willingness to adopt farm service centres in the area. The need to boost farmers' knowledge through an adult literacy programme, and involvement of relatively old farmers in empowerment programme as well as encouraging farmers' participation in farmers' associations in the study area is hereby recommended.

Keywords: agricultural technology; awareness; innovation; perception; smallholder farmers

INTRODUCTION

Agriculture still plays a significant role in the advancement of the economic sector of most developing countries, although their aim of poverty eradication and zero hunger as enshrined in the Sustainable Development Goals (SDGs) remains one of their major challenges (Islam, 2016; Dhahri and Omri, 2020; Diallo et al., 2020). This is not unconnected with the fact that the sector is essential for inclusive growth due to its food production ability as well as economic development potential for many of the world's poorest people that allows for improved livelihoods through better health care delivery, educational development, improvement in infrastructure and greater investment in environmental best practices. In Sub-Saharan Africa, the level of growth recorded by agriculture is eleven times more effective in reducing poverty than gross domestic product (GDP) growth in any other sector. In most developing countries of which Nigeria is not an exception, agriculture is primarily practiced by smallholder farmers, and it has been identified as a crucial means of achieving the aim of the Second Sustainable Development Goal (Rapsomanikis, 2015).

As a result of the significant roles played by this sector (agricultural) in the economic development

of Nigeria, the government at various levels has implemented several policies and programmes aimed at enhancing credit access, input subsidy, market linkage, advisory services, and capacity building to boost agricultural productivity. However, despite these government interventions, Nigerian agriculture is still underdeveloped. Reasons adduced to this in line with Mgbenka and Mbah (2016) could be economic, political, or financial, others that have been attributed to the decimal performance of the sector include but are not limited to inadequate investment in new technologies/innovations and infrastructures, coupled with slow adoption of existing improved technologies/ innovations. For this reason, greater focus has been placed on developing smallholder agriculture in the country (Röttger, 2015). In this context, farmers' awareness and subsequent adoption of technology/innovation cannot be ignored (Ullah et al. 2022a). The awareness of and adoption of agricultural technologies/innovation by farmers will bring about the desired agricultural productivity, and foster employment generation which will contribute to reducing poverty by raising productivity and the income of farmers, ultimately improving their access to food (Edeme et al., 2020). One such agricultural innovation is the establishment of Farm Service Centres in Abia State, Nigeria.

The Farm Service Centre (FSC) model is a one-stop shop, retailing a complete range of inputs, services, information, finance, technology, and market connections that help farmers participate in market-driven agricultural economies and move from subsistence to commercial farm production. The Farm Service Centre model is a public-private partnership arrangement with the shared objective of building a sustainable and resilient market system, empowering farmers to improve their incomes and livelihoods, and strengthening the local food system and security.

Adoption may be defined as an integrated innovation into farmers' usual farming activities over an extended period (Melesse, 2018). The adoption of technology in smallholder agriculture underpins the increase in farm production level, and it is expected to lead to the much-needed transformation of the agricultural sector (Adesugba and Mavrotas, 2016; Bachewe et al., 2018). Additionally, Kaine (2008) suggests that adopting agricultural technology creates multiple direct and indirect benefits for smallholder farmers. It improves farm efficiency and increases farm yield, leading to an increase in food supply and household food intake, creates employment, reduces poverty, increases GDP, and makes a significant contribution to the economic development of Africa (World Bank, 2008).

However, the uptake of new agricultural technologies/innovations is not devoid of some challenges in Nigeria. To increase the production level of the agricultural sector, we need to enhance the adoption of new technologies/innovations. Therefore, understanding the determinants of the adoption of agricultural technologies is essential in planning and executing technology-related programmes for meeting the challenges of food production in Nigeria. Agricultural technology embodies many important characteristics that may influence adoption decisions. Literature on agricultural technology/innovation adoption is enormous and somewhat difficult to summarise closely but none has ever addressed the issue of farm service centres. Conventionally, analysis of agricultural technology adoption focused on imperfect information, risk, uncertainty, institutional constraints, human capital, input availability, and infrastructure as potential explanations for adoption decisions (Obayelu et al., 2017). It is against this backdrop that the study sought to investigate the determinants of willingness to adopt farm service centres in Abia State Nigeria. Willingness to adopt implies readiness to accept agricultural innovation or practices.

Theories of adoption

Various theoretical perspectives explain the behaviour of a potential adopter of new technologies/ innovation: the innovation diffusion theory, the economic constraints theoretical perspective, and the adopter perception theoretical perspective are the three different theories commonly used to explain farmers' adoption behavior and factors affecting the technology adoption (Melesse, 2018; Ntshangase et al., 2018).

This study integrated these three theories in the sense that awareness is an important aspect of the adoption decisions of farmers (Adnan, 2017; Adnan, 2019), any deliberate progress towards the adoption of improved agricultural technology necessitates that the farmers must have an adequate awareness of the technology (Adnan, 2017; Adnan, 2019). Even if a farmer is a potential adopter, he/she may not adopt because of his/her low awareness of the technology and its perceived benefits (Ullah et al., 2020a; Ullah et al., 2020b). This implies that farmers can adopt or not adopt the technology. The farmer's awareness shapes a household's positive or negative perceptions towards a technology (Meijer et al.,

2015), household's positive perceptions about new agricultural technology can lead to the farmers' intentions to adopt it, whereas a negative perception can lead to the opposite, where the farmers do not intend to adopt an improved technology. This means that an important aspect of the farmer's decision to adopt any agricultural technology is the positive perception of the farmer towards that technology, which comes with awareness. Thus, it is hypothesised that socioeconomic and institutional characteristics, such as age and farming experience, influence the household's decision to adopt the technology, with the help of the influence of the farmers' subjective perceptions and attitudes. The socioeconomic characteristics of the farmers directly influence their awareness and exercise an indirect effect on their perceptions, influencing their positive or negative intentions toward the adoption of a technology.

Ifie et al. (2022) assessed farmers' socioeconomic characteristics concerning readiness to adopt hybrid maize using a cross-sectional survey of 173 farmers in Ghana. The empirical model reveals that farmers' readiness to adopt hybrid maize was positively influenced by gender, age, high yield, and constraint variables such as high cost of production, pests, and diseases.

Research hypothesis

There is no significant relationship between socioeconomic variables and the adoption of farm service centre.

MATERIALS AND METHODS

Study area

This study was conducted in Abia State, Nigeria, located in the southeast geopolitical zone of Nigeria. It lies around the latitude 40°40′ and 60°14′N and longitudes 70°10′ and 80°00′E. The state covers a land mass of about 5,243.7 km^2, approximately 5.6 percent of the total land area in Nigeria (INEC 2008). The state has an average population of 2, 833,999 persons (NPC, 2007; INEC, 2008). It shares a common boundary with Rivers State to the south; Imo State to the west; Ebonyi and Enugu States to the north and Akwa Ibom and Cross River States to the east. The state comprises seventeen (17) Local Government Areas (LGAs), with Umuahia as its capital. Agriculturally, the state is divided into three (3) Agricultural zones, namely; Aba, Ohafia, and Umuahia zones. The state is a typical rainforest area, a characteristic of a tropical region. Agriculture is a major occupation of rural people and the average farmland consists of small parcels of land with farm size ranging from about 0.1 to 10 hectares. The major crops grown include yam, cassava, sweet potatoes, plantain, banana, fluted pumpkin, oil palm, garden egg, melon, and small herds of sheep, pigs, goats, and poultry.

Source of data

Primary data were collected using a structured questionnaire from some selected respondents to achieve the objectives of the study. The collected data include respondents' socioeconomic and demographic characteristics.

Sampling technique

A three-stage sampling procedure was employed in selecting farmers/respondents in the study area. First, one (1) LGA was purposively selected from each of the agricultural zones. Second, twenty-five (25) communities were randomly selected from these LGAs based on probability proportion to the size of the LGAs. Finally, three hundred and twenty-five (325) farmers were randomly selected from all the selected communities based on probability proportion to the size of the communities. Out of the 325 copies of the questionnaire administered, 300 copies that were correctly filled and made a good representative of the farmers were used for the analyses. The study was carried out between October to December 2022.

Analytical tools

The method of data analysis includes inferential statistics (binary logit model).

Empirical model

The application of binary choice models such as binary logit and probit models to explain adoption studies has been well documented (Adesiyan et al. 2021; Danladi et al. 2021; Lugamara et al. 2021; Dhungana, 2022; Ifie et al. 2022). The choice of the logit model or probit is based on preference because both models give similar results except that the logit model assumes logistic distribution while the probit model assumes cumulative normal distribution (Dankyi and Adjekum 2007). The logit model is the most convenient model to use when there is a dichotomous response variable (dependent variable) and a mix of continuous and categorical independent variables. This study adopts the binary logit model to explain the probability of a farmer's willingness to adopt farm service centres in the study area. That is, whether a farmer is willing to adopt as one (1) or not

Table 1. Description and measurement of variables used in the study

Notation	Description of variables	Measurement
X_1	Age of household heads	Years
X_2	Level of formal education	Years
X_3	Farm size cultivated	Hectares
X_4	Marital status of household heads	(Married = 1, 0 = otherwise)
X_5	Farming experience (length of time household heads have been farming on his or her own)	Years
X_6	Access to extension (having contact with extension agents)	Dummy (Yes = 1, 0 = otherwise)
X_7	Access to credit (being able to access credit)	Dummy (Yes = 1, 0 = otherwise)
X_8	Membership of Farmers' Association	Dummy (Yes = 1, 0 = otherwise)
X_9	Level of Farmers' awareness of Farm Service Centre	Categorical (Aware = 2, Partially Aware = 1, Not aware = 0)

Source: Authors compilation

willing as zero (0). The explanatory variables include socioeconomic and demographic variables.
The logit model is specified as follows:

$$P(Y)=\frac{\varepsilon\beta_0+\Sigma_{i=1}^{n}\beta_1 X_1}{1+\varepsilon\beta_0+\Sigma_{i=1}^{n}\beta_1 X_1} \quad 1$$

The model can be linearised by taking the natural log as follows:

$$Y=\ln\left(\frac{Pi}{1-Pi}\right)=\beta o+\beta i Xi+\mu i \quad 2$$

where Y is the dependent variable (willingness to adopt or not to adopt farm service centres), Pi is the probability of a farmer's willingness to adopt farm service centres, 1 – Pi is the probability of a farmer not willing to adopt farm service centres, β_0 is the constant term, β_i is the vector of the regression coefficient, Xi is the vector of explanatory variables and μ_i is the error term. The explanatory variables are hypothesised in Table 1.

RESULTS AND DISCUSSION

Socioeconomic characteristics of farmers

The sex of respondents is presented in Table 2. The result shows that farming activities in the study area are male (58.7%) dominated. The dominance of male in the agricultural sector also supports the assumption that men are the breadwinners of their respective families. The result agrees with the findings of Anyaegbunam et al. (2019) who reported 66.7% male participation among root and tuber crop farmers in Abia State.

Farmers' age as presented in Table 2 shows that the majority (42.7%) of them fell into the age bracket 41 to 50 years. The mean age of 49.7 ± 9.6 years indicates that a higher proportion of sampled stakeholders in the study area was mature, economically active and at productive ages. The age is also an incentive for the adoption of the Farm Service Centre model in the study area. The result is in tandem with Nkwachukwu et al. (2022) who reported 49 years as the mean age of female rice farmers adopters of improved technologies in Abia State, Nigeria.

With mean years of education of 11.4 ± 6.1, the result of educational status (Table 2) indicates the farmer's likelihood to desire productivity-oriented information and adoption of the innovation (Farm Service Centre), since the majority of them were literate. The result disagrees with the findings of Nkwachukwu et al. (2022) who reported 7 years as the mean years of education among male rice farmers – adopters of improved technologies in Abia State, Nigeria.

Table 2 indicates that 38.7% of the farmers were aware of the Farm Service Centre, while 61.3% were not. The low awareness among the farmers calls for more sensitization in the state.

Factors determining willingness to adopt farm service centres among farming households

The binary logistic regression was used in determining the willingness to adopt farm service centres in the study area, and nine (9) independent variables were

Table 2. Socioeconomic characteristics of farmers

Socioeconomic variables	Frequency	Percentage	Mean
Sex			
Males	176	58.7	
Females	124	41.3	
Total	300	100.0	
Age			
21–30	6	2.0	
31–40	39	13.0	
41–50	128	42.7	
51–60	78	26.0	
61–70	49	16.3	
Total	300	100	Mean = 50.6
Level of Education			
No formal Education	49	16.3	
Adult Education	7	2.3	
Primary Education	25	8.3	
Secondary Education	118	39.3	
Tertiary Education	101	33.7	
Total	300	100	Mean = 10.5
Awareness about Farm Service Centre			
Aware	96	32.0	
Partially Aware	20	6.7	
Not Aware	184	61.3	
Total	300	100.0	

Source: Author's Computation from Field Survey, 2022

fitted to the model. The results as shown in Table 3 revealed that three (3) out of the nine (9) variables, i.e. age, level of education and farming experience significantly influenced the farmers' willingness to adopt the farm service centre. The remaining six variables: farm size, marital status, extension contact, credit access, and membership in associations and the level of awareness were not significant and were not found to determine the adoption behaviour of farmers. The log-likelihood ratio of –23.48 indicates that the chi-square goodness of fit value of 66.20 was significant at the 1% level. The R^2 value of the logistic regression analysis showed that 58.5% of the regressands were explained by the regressors in the model.

Age was found to exert a positive and significant influence on farmers' willingness to adopt farm service centres in the study areas. This implies that a unit increase in a farmer's age will increase willingness to adopt a farm service centre by .0000913, all other things being equal. The result is consistent with the findings of Ifie et al. (2022) who found a positive and significant influence of age among adopters of hybrid maize varieties in Ghana. In line with *a priori* expectation, the number of years of formal education attained by farming household heads had a positive and significant relationship at a one percent level of significance with the probability of willingness to adopt farm service centres. The marginal value in favour of adoption of farm service centres, other factors being kept constant increased by factor of .0001803 as the educational level of the farmers increases by one unit. This implies that there was a direct relationship between adoption of farm service centres and the education status of farming household heads, indicating that as educational status increases, willingness to adopt also increases among farmers. Educated farmers are more willing to adopt farm service centres than those who are not educated. This may be because educated farmers have better access to information which makes them more aware of new technology/innovation and this awareness enhances the adoption of new technology/innovation. This study agrees with the findings of Dhungana (2022) who reported a positive and significant relationship between education and adopters of foundation rice seed production in Nepal.

Contrary to *a priori* expectation, the farming experience was found to exert a negative but significant relationship at a 5-percent level of

Table 3. Logit model estimate of the factors affecting the willingness to adopt farm service centres among farming households in the study area

Variables	Coefficients	Standard Error	Z	P > |Z|	Marginal Value
Age	.2851273***	.0858054	3.32	0.001	.0000913
Educ	.5628139***	.1742766	3.23	0.001	.0001803
Farm size	1.327828	1.033379	1.28	0.199	.0004253
Maritalst	–.4543303	.4932118	–0.92	0.357	–.0001455
Farmingexp	–.1684395*	.091189	–1.85	0.065	–.000054
Extensioncont	–.5023842	1.262364	–0.40	0.691	–.0001408
Creditacc	–1.721105	1.244313	–1.38	0.167	–.0007642
Association	.5494665	.7031308	0.78	0.435	.000176
Levelofawa	–.7095167	.7515358	–0.94	0.345	–.000137
Constant	–11.41072**	4.683442	–2.44	0.015	
Observations	300				
LR chi² (9)	66.20				
Prob> chi²	0.0000				
Pseudo R²	0.5850				
Log likelihood	–23.476591				

Source: Authors' Computation from Field Survey, 2022
* Significant at 10% ($p < 0.1$) ***Significant at 1% ($p < 0.01$)

significance with the probability of willingness to adopt a farm service centre in the area. The marginal value in favour of adoption of the farm service centre, keeping all other factors constant, decreases by a factor of .091189 as the farming experience of the farmers increase by one unit. This implies that as farmers acquire more experience, their willingness to adopt new technology/innovation decreases. The result is in tandem with Danladi et al. (2021) who reported a negative relationship between farming experience and adoption of premier hybrid maize among maize farmers in Sabon Gari local government area of Kaduna State.

CONCLUSION AND RECOMMENDATIONS

From the study, it can be concluded that farming activities in the study area were male-dominated; the majority of the farmers were married, and they operated at a small-scale level, had one form of formal education or the other, and were more experienced in farming. The willingness to adopt farm service centres in the study area was influenced by age, level of education, and the number of years of farming experience. The null hypothesis of no significant relationship between socioeconomic characteristics and willingness to adopt farm service centre is hereby rejected.

The study therefore recommends that:

Age is positively and significantly related to willingness to adopt, therefore more innovative agricultural projects/programmes should be introduced to farmers as they are getting older.

Since education is positively and significantly related to willingness to adopt, the need to deepen formal education or encourage to go for adult education became imperative.

The need to introduce mechanization is advocated for as an increase in farm size translates into better adoption of a farm service centre.

DECLARATION OF INTEREST STATEMENT

The authors declared that they have no competing interest

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All authors contributed to the conception and design of the study

CONFLICT OF INTEREST

The authors declared no conflicts of interest concerning the research, authorship, and the publication of this article

ETHICAL COMPLIANCE

The authors have followed ethical standards in conducting the research and preparing the manuscript

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