Adoption of Agroforestry Practices by Arable Farmers in Igabi Local Government Area of Kaduna State, Nigeria

O. N. Oladele[1], U. U. Emeghara[1], B. F. Ishola[2], J. T. Ayodele[1], T. A. Awobona[1], and O. Olukotun[1*]

[1]*Federal College of Forestry Mechanization, P.M.B. 2273, Afaka-Kaduna, Kaduna State, Nigeria.*
[2]*Forestry Research Institute of Nigeria, Jericho Hill, Ibadan, Oyo State, Nigeria.*

Authors' contributions

This work was carried out in collaboration among all authors. Authors ONO, UUE and BFI designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors JTA and TAA managed the analyses of the study, proof read the article and co-type the manuscript. Author OO managed the literature searches. All authors read and approved the final manuscript.

Original Research Article

ABSTRACT

The study examined the level of adoption of agroforestry practices among arable farmers in Igabi Local Government Area of Kaduna State, Nigeria. Data was collected from 100 randomly selected farmers with the use of structured questionnaire. The questionnaire focused on socio-economic characteristics of the farmers, level of adoption of agroforestry practices, types of agroforestry practices adopted, factors influencing the willingness of farmers to adopt agroforestry practices and constraints faced by the farmers in adopting agroforestry-based farming. Data was analysed using frequency, percentage, mean and probit model. The study found that male (78.00%) dominated farming activities in the study area, the majority (96.00%) of the farmers is in the age group of 21-60 years, most of the farmers (87.00%) are educated and the majority (76.00%) of them had more than 5 years farming experience. The study revealed that the adoption of agroforestry practices is high (79.00%) in the study areas. Retention of trees on farmland was mostly adopted (31.00%)

_____

Corresponding author: E-mail: oolugoke@yahoo.com;

while shifting cultivation is the least adopted (5.00%) agroforestry practice in the study area. The result of the probit model analysis showed that farm size (1.1122), farming experience (0.0231) and access to credit (0.1103) were the factors that significantly influence farmers' willingness to adopt agroforestry practices at 10.00% probability level in the study area. However the level of adoption of agroforestry practices in the study area was hampered by constraints such as high capital intensive nature of agroforestry practices (87.00%), poor extension service (80.00%), inadequate capital (77.00%), poor technical know-how of agroforestry practices (45.00%), land tenure system (36.00%) and lack of access to credit (13.00%). The study suggests that to enhance the adoption level of agroforestry practices among farmers in the study area, improved agroforestry extension services should be provided to farmers; workshops, seminars and symposia should be organized for adequate training of farmers to understand the techniques of agroforestry; and farmers should be encouraged to form cooperative societies so that they can have access to credit facility to boost their capital.

1. INTRODUCTION

The whole world is faced with environmental degradation and climate change such as soil erosion, run-off, leaching of soil nutrients, infiltration, land deterioration, carbon emission, ozone layer depletion and deforestation among others. All these problems have lead to reduction in agricultural productivity per unit area of land thereby causing food insecurity among the ever increasing populace in all nations of the world. Gamma et al. [1], opined that increasing rate of land degradation, inability of forest to produce the required good and services due to deforestation as well as forest degradation has lead to decrease in agricultural productivity. The increasing rate of using forest products as source of fuelwood, timber and fodder for animals has also resulted in forest degradation .One possible way to address the problem of deforestation is to encourage farmers to adopt agroforestry practices as a mean to sustainable land use especially where there is limited land. Agroforestry practices have been seen as the possible solution to deforestation and environmental degradation in developing countries like Nigeria.

Agroforestry has been defined in various manners by different researchers. Leakey RRB [2], adopted the International Centre for Research in Agroforestry (ICRAF) current definition of agroforestry which describe agroforestry as a collective name for land-use systems and practices in which woody perennials are deliberately integrated with crops and/or animals on the same land-management unit. The integration can be either in a spatial mixture or in a temporal sequence. The woody and non-woody components in agroforestry interacts with each other's both economically and ecologically. This current definition of agroforestry by ICRAF considered it as a system in which trees are sequentially or simultaneously integrated with crops and/or livestock which falls short of its ultimate goal as a way to mitigate deforestation and combat land degradation thus alleviating poverty. A different perspective however, is that agroforestry practices can be seen as phases in the development of a productive agroecosystem, based on normal dynamics of natural ecosystems, that is; an ecologically based, natural resource management system that diversifies and sustains smallholder production for increased social, economic, and environmental benefits. Agroforestry has been recognized as one of the strategies to introduce indigenous and exotic trees into cropping systems and impact on livelihoods of small-holder farmers in Sub-Saharan Africa [3]. Agroforestry practices combine the planting of trees and shrubs with arable crops with emphasis on their mutual benefits to enhance diversity, productivity, profitability and sustainability of the land use system and hence the farmer.

According to Rogers [4], adoption occurs when an adopter has decided to make full use of the new innovation as a best course of action for addressing a need. Rogers [5], developed the adoption and diffusion of innovations theory, which has been widely used to identify factors that influence decisions to adopt or reject an innovation. The author defines an innovation as a "new idea, practice or object that is perceived as new by an individual or other unit of adoption" and said that the perceived newness of the idea for the individual is what determines their reaction to it [5]. Acceptability and adoption of

agroforestry practices involves the farmer to be knowledgeable of some certain factors which includes how the farmers perceive the underlying problem, their attitude, beliefs and practices related to the solutions offered to them by the new innovation. The attitude of the individual farmer to agroforestry is crucial to the success of agroforestry adoption. Farmers' perceptions of the role that the system plays in their farms' production, its costs and benefits culminate in the socio-economic enhancement determine the extent and durability of adoption. Adoption of agro forestry practices will help to enhance socioeconomic well being of the farmers. According to [6], agroforestry enhanced the socioeconomic livelihood of rural farmers by enhancing income earning potentials and overall food and nutritional security as well as provision of fuel wood, fodder for animal consumption and employment. An Agroforestry system improves the farmers' adaptive ability to climate change by acting as microclimate. The adoption of agroforestry practices such as combining the planting of tree in agricultural croplands can provide arable farmers with an additional source of income that helps to strengthen their socioeconomic resilience and increase economic benefits. Farmers' income can also be increased through farm-grown fodder which increases milk production and can substitute for relatively expensive purchased dairy meal.

In view of the benefits associated with agroforestry, this study seek to ascertain the level of adoption of agroforestry practices by farmers; identify the various agroforestry practices adopted by farmer; determine the factors influencing adoption of agroforestry practices by farmers and identify constraints affecting the level adoption of agroforestry practices by the farmers in Igabi Local Government Area of Kaduna State, Nigeria.

2. MATERIALS AND METHODS

2.1 Study Area

The study was conducted in Igabi Local Government Areas of Kaduna state. Igabi is one of the four local government area which constitute Kaduna metropolitan city, an important commercial and administrative centre in Northern Nigeria and comprises of different sets of people with diversified socio-cultural characteristics. Igabi local government is located in Guinea Savannah of Nigeria on latitude 10° 32' and 7° 17' E. The headquarter of Igabi Local Government Area is Turunku. The population of Igabi local government area according to 2006 population census was estimated at 570,000 people [7]. Annual rainfall is between 250 mm-1000 mm and usually begins early May and ends in October and the dry season is between October-April. The major crops produced in the area are cowpea, yam, cassava, maize, millet, guinea corn and cocoyam. The social set up of the place attributes to the natural resources found in the area e.g. forest, granite and timber etc. The Agro- forestry trees that exist in this study area include*Gliricidia sepium, Leucaena leucocephala* and other tree species.

2.2 Sampling Techniques

Multi stage sampling technique was employed in this study. In the first stage Igabi Local Government area was purposively selected out of twenty three local government areas in Kaduna state because of the predominance of agroforestry practices in the area. At the second stage, six villages which include Sabon Afaka, Rigasa, Jaji, Rigachikun, Turunku and Igabi were also purposively selected from the local government area due to existence of agroforestry practices in these areas. At final stage, twenty respondents from Sabon Afaka, twenty respondents from Rigasa, fifteen respondents from Jaji, fifteen respondents from Rigachikun, fifteen respondents from Turunku and another fifteen respondents from Igabi were randomly selected due to the spatial population of the area. So the total sample size for study is 100 respondents.

2.3 Data Collection

The data was collated from primary source and was obtained through the use of structured questionnaire to gather information on the socio-economic characteristics of the farmers, level of adoption of agroforestry practice; factors influencing level of adoption such as farm size, farm distance, farming experience, land ownership status, number of extension contact and access to credit; types of agroforestry practices adopted and constraints militating against the adoption of agroforestry practice.

2.4 Method of Data Analysis

Descriptive and inferential statistics were used to analyse the data. Descriptive statistics such as frequency distribution, percentages and mean were used to analyse the socio – economic

characteristics of the farmers; level of adoption of agroforestry practices and constraints limiting the adoption of agroforestry practices while probit regression model was used to analysed factors influencing adoption of agroforestry practices in the study area.

2.4.1 Probit model

Probit model was employed to analyze the factors influencing the farmers' adoption of agroforestry practices. The dependent variable was the farmers' willingness to or not to adopt any of the agroforestry practice while the factors influencing their willingness to adopt any of the agroforestry practice were the independent variables. Here, the dependent variable takes on the value of 1 if the farmer is willing to adopt any of the agroforestry practice (Y=1), and 0 otherwise i.e. if the farmer is not willing to adopt any of the agroforestry practice(Y=0).

$$Y_i = 1 - X_i \beta_i + e_i$$

The explicit form of the model is

$$Pr(Y=1) = \beta_0 + \beta_1 X_1 + \beta_2 x_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + e$$

Where,

Y = conditional probability with 1 as farmers willingness to engage in Agro- forestry practice, 0 if otherwise.
β_0 = intercept
$\beta_1 – \beta_8$ = coefficients of independent variables.
e = stochastic error term.
The hypothesized factors influencing the farmers' willingness to adopt agroforestry practice include;
X_1 = Age of Farmer (in years)
X_2 = Education level (years in schooling)
X_3 = Extension contact (1 if farmer had contact, 0 if otherwise)
X_4 = Farm distance to farmer's residential area (in kilometre)
X_5 = Farm size (hectare)
X_6 = Land ownership (1 if farmer owns land, 0 if otherwise)
X_7 = Farming experience (years)
X_8 = Access to credit (1 if yes, 0 if otherwise)

3. RESULTS AND DISCUSSION

3.1 Socio-Economic Characteristics of Respondents

The results of the socio – economic characteristics of the respondents is shown on Table 1. The result shows that male (78.00%) dominated farming activities in the study area. The male dominancy in agriculture is expected especially due to great energy required in carrying out farming activities. Akinwalere [8] also reported male dominance among farmers in Southwest, Nigeria in their study with male been 68.00% and female are 32.00%. The result also revealed that majority (96.00%) of the respondents is in age bracket that ranged between 21 – 60 years old. This shows that the farmers are in their active age group which may influence their willingness to adopt agro forestry practice. According to Asiabaka [9], people in this age bracket are active and they can motivate, innovate an adaptive agricultural innovations. Table 1 also showed that 87.00% of the respondents are educated with 52.00% of them having secondary school certificate, followed by 22.00% with primary certificate while 13.00% had tertiary education as well as no formal education, respectively. This suggests that majority of the farmers in the study area were at least lettered (they could read and write). The ability of the majority of the farmers to read is expected to have positive influence on them adopting agroforestry practice. United States Agency for International Development, USAID [10] reported that the chances of farmers adopting new innovations increases with their level of education, in other word, the more educated a farmer is the more chances that the farmer would adopt innovations. About 54.00% of the farmers have farm size that ranged between 1.0-2.99 hectares of land, followed by 33.00% with farm size of less than 1.0 hectare, 9.00% had farm size that ranged between 3.0 – 4.99 hectares while 4.00% had farm land that is over 5.0 hectares. This finding corroborates the study of [8] that reported a mean farm size of 2.7 hectares for farmers in Southwest, Nigeria. This implies that majority of the farmers are small – scale farmers. The result showed that 36.00% of the farmers had 6 – 10 years of farming experience, 32.00% had 11-15 years of farming experience, and 24.00% had 1-5 years of experience while 8.00% of them had 16 and above years of farming experience. It is expected that good years of farming experience should influence the level of adoption of agroforestry practices in the study area. The result indicates that about 76.00% of the farmers had farming experience that is 6years and above. About 19.00% of the farmers claimed to have contact with extension agents while 81.00% had no access to extension service. Majority of the farmers (62.00%) had to travelled a range of 1.0-2.5 kilometres to their farm, followed by 27.00%

of the respondents whom their farms are within the range of 2.6-5.0 kilometres away from their homestead, 10.00% of them had to travelled a distance of less than 1.0 kilometre to their farms and only 1.00% of the farmers had farms that is over 5.0 kilometres away from their residents. The present finding on farm distance showed similarity with the finding of [8], who reported that 83% of the farms are between 1.0 and 2.5 km far away from farmers homestead.

Table 1. Socio – economic chacteristics of the farmers

Socio – economic variable	Frequency (n=100)	Percentage (%)
Gender		
Male	78	78.00
Female	22	22.00
Total	100	100.00
Age (year)		
21 – 30	11	11.00
31 - 40	45	45.00
41 – 50	32	32.00
51 - 60	8	08.00
6 1 and above	4	04.00
Total	100	100.00
Level of education		
No formal education	13	13.00
Primary	22	22.00
Secondary	52	52.00
Tertiary	13	13.00
Total	100	100.00
Farm size(ha)		
Less than 1.00	33	33.00
1.00 – 2.99	54	54.00
3.00 – 4.99	9	09.00
Greater than 5.00	4	04.00
Total	100	100.00
Years of farming experience		
1 – 5	24	24.00
6- 10	36	36.00
11 – 15	32	32.00
Above 16	8	08.00
Total	100	100.00
Contact with extension agent		
Yes	19	19.00
No	81	81.00
Total	100	100.00
Farm distance to homestead(km)		
Lees than 1.0	10	10.00
1.0 – 2.5	62	62.00
2.6 – 5.0	27	27.00
Greater than 5.1	1	01.00
Total	100	100.00
Land ownership		
Yes	62	62.00
No	38	38.00
Total	100	100.00
Access to credit		
Yes	87	87.00
No	13	13.00
Total	100	100.00

15% were between 2.6 and 5 km away while 2% were between 5.1 and 7.5 km from the farmers' homes. The result in Table 1 also revealed that majority (66.00%) of the farmers owned their farm land while 34.00% of the farmers either rented the land or the land is on lease to them. The result of land ownership in this study supported the findings of Amusa and Simonyan [11], they observed that about 82.00% of the farmers owned their farm land through inheritance, gift, purchase and communal while about 18.00 were on rented or lease farmland The study also revealed that 87.00% of the farmers claimed to have access to credit either from friends, families, money lenders and some microfinance organizations while 13.00% had no access to credit.

3.2 Level of Adoption of Agroforestry Practice by the Farmers in the Study Area

Table 2 shows farmers adoption of agroforestry practice in the study area. The result showed that 79.00% of respondents were involved in agroforestry practice, while 21% affirmed that they have never practice agroforestry. This means a higher percentage of farmers are involved in the practice of agroforestry in the study area. The main reason for the high level of adoption was associated with the multiple benefits the farmers gain from the practice It is also a known fact that agroforestry has been an age- long practice among farmers not only in the study area but in the state and all over the country. The result revealed that the farmers may probably be aware of the potentials of agroforestry practices in increasing productivity per unit area. Akinbile et al. [12] noted that

sustainable agricultural development may be achieved in the country through agroforestry practices. This is because agro forestry has the ability to combat the various environmental degradation as well as to mitigate deforestation. The level of adoption of agroforestry practice by the farmers therefore becomes very important since it determines the success of agroforestry practices.

3.3 Type of Agroforestry Practices Adopted by the Farmers

The adopted agro-forestry practices in the study area include taungya farming, retention of trees on farmland, improved bush fallow, alley farming, planting of trees along with retained trees on farmland, shifting cultivation and shelter belt / wind break. Retention of trees on the farmland was the most adopted agro forestry practices (31.00%), followed by 22.00% adopted taungya farming, 18.00% of the farmers adopted planting of trees along with the retained trees, 9.00% adopted alley farming, 8.00% adopted shelter belt and wind break, 7.00% adopted improved bush fallow while shifting cultivation were adopted by 5.00 percent of the farmers. The most adopted agroforestry practice in this study was the trees retention on farmland while the least is shifting cultivation. Akinwalere [8], reported that shelter belt and wind break was the most adopted agroforestry practice adopted by farmers in the Southwest, Nigeria. The least adoption of shifting cultivation in this study supported the work of Adedayo and Sobola [13] that also reported that shifting cultivation was the least adopted agroforestry practice in Osun State, Nigeria.

Table 2. Level of adoption of agrofrestry practice by the farmers in the study area

Level of adoption	Frequency	Percentage (%)
Yes	79	79.00
No	21	21.00
Total	100	100.00

Table 3. Types of agroforestry practices adopted by farmers in the study area

Agroforestry practice	Frequency	Percentage (%)
Taungya system	22	22.00
Retaining trees on farmland	31	31.00
Improved bush fallow	7	7.00
Alley farming	9	09.00
Planting of trees along with the retained trees on farmland	18	18.00
Shifting cultivation	5	05.00
Shelter belt and wind break	8	08.00
Total	100	100.00

Table 4. Factors influencing farmer's willingness to adopt agroforestry practices

Variable	Coefficient	Standard error	Z-Ratio	P>⏐z⏐
Age of farmer	-0.0137	0.2085	-0.25	0.899
Education	-0.0531	0.3512	-1.51	0.130
Extension contact	-0.2562	0.3015	0.78	0.286
Farm distance	-0.1040	0.2923	0.31	0.923
Farm size	1.1122*	0.6030	1.52	0.072
Land ownership	-0.2164	0.2842	-0.56	0.560
Farming experience	0.0231*	0.1111	0.13	0.003
Access to credit	0.1105*	0.1030	0.22	0.011
Constant	-1.4763	1.4860	0.98	0.320

Number of observation = 100, Log likelihood ratio chi^2 (χ^2) = 52.029, Prob > chi^2 = 0.2570, Pseudo R² = 0.2972*
* stands for 10% significance level

Table 5. Constraints to adoption of agroforestry practices by farmers in the study area

Constraints	Frequency	Percentage (%)	Ranking
High capital intensive nature of the practice	87	87.00	1st
Poor extension service to farmers	80	80.00	2nd
Inadequate capital	77	77.00	3rd
Poor technical know –how of the practice by farmers	45	45.00	4th
Land tenure system problem	36	36.00	5th
Lack of access to credit	13	13.00	6th
Total	100	100.00	

3.4 Factors Influencing Farmer's Willingness to Adopt Agroforestry Practices

The result of the probit regression model in Table 4 indicates that different factors such as age, educational status, extension contact, and farm distance to farmers' homestead, farm size, land ownership, farming experience and access to credit influences farmers' willingness to adopt agro- forestry practice in the study area. The likelihood ratio statistics as indicated by χ^2 statistic (52.029) value is significant at 10.00% level of probability, suggesting that the model has a strong explanatory power. The overall goodness of fit as reflected by Prob>Chi^2 (0.2570) was also fair. The Pseudo -R^2 of 0.2972 shows that 29.72% of the variability in the willingness of the farmers to adopt agroforestry practice in the study area is explained by the independent variables included in the model. All the other factors aside farm size (1.1122), farming experience (0.0231) and access to credit (0.1103) showed negative coefficient and were not significant at 10.00% level of probability. The result shows that farm size, farming experience and access to credit have direct and significant relationship at 10.00% level of probability to farmers' willingness to adopt agroforestry

practices in the study area. This implies that farmer with large farm size is more likely to adopt agroforestry practice than those with small farm size since farmers with large farm size have more land area that can be sacrifice for agroforestry practice. The result signifies that as farm size increases by 1hectare, the probability of farmers to adopt agroforestry practice increases by 1.11%. The significant of the farm size in this study negates the report of [8] that showed that farm size was not a significant factor for adoption of agroforestry practice in Southwest of Nigeria. Similarly the result revealed that the more the years of experience gained by the farmers, the more the likelihood for them to adopt agroforestry practice. The significant value for farming experience observed in this study is in agreement with the study of [8], who also obtained a significant value for farming experience. Adequate farming experience increases the ability of the farmer to obtain and use information relevant to production. This study also revealed that access to credit positively influences the probability of farmers' willingness to adopt agroforestry practices. It is expected that farmers who had access to credit facility may have tendency to adopt agroforestry practice than those who do not have access to credit. Accessibility of farmers to credit will provide the

capital required to adopt agroforestry practice. The non significant values for the other five factors namely age; educational status, extension contact, farm distance and land ownership showed that they do not influence farmer's decision to adopt agroforestry practice in the study area, although [8] reported that age was one of the significant factors influencing adoption of agroforestry practice among farmers in Southwest of Nigeria. The author also observed that farm distance does not influence the probability of farmers to adopt agroforestry practice which the current finding agrees with. Educational status was expected to have significant impact on level of adoption of new innovations but this was not so in the present study. The result showed an inverse relationship between education and willingness of the farmers to adopt agroforestry practice. This implies that the more the level of farmers education the less the probability of them adopting agroforestry practice. Land ownership was also expected to encourage farmers to adopt agroforestry practice but the result showed an inverse relationship between land ownership and adoption of agroforestry practice in the study area. Farmers contact with extension agents is a factor that aids the adoption of new ideas but this study also showed an inverse relationship between extension contact and adoption of agroforestry practice in the study area. Amusa and Simonyan [11], reported significant relationship between age, farm size, land ownership, extension visits and access to credit and farmers' willingness to engage in agroforestry-based farming in southwest Nigeria.

3.5 Constraints to Adoption of Agroforestry Practices by Farmers in the Study Area

Data presented in Table 5 shows the constraints to adoption of agroforestry practices by farmers in the study area. They include poor extension service, land tenure problems, high capital intensive nature of agroforestry practice, poor technical know - how of the farmers about agroforestry practice, inadequate capital and lack of access to credit by the farmers. Among all these constraints, high capital intensive nature of agroforestry practice ranked highest. Majority (87.00%) of the respondents were of the view that the high cost involved in establishing agroforestry farm is the most difficult problem influencing the adoption of agroforestry practices in the study area. This shows that high costs associated with the establishment of agroforestry

farm is a strong barrier to the adoption of such practices in the study area especially by the poor farmers, who had no fund. Poor extension service is another problem hindering adoption of agroforestry practices in the study area. About 80.00% of respondents stated that they do not have access to extension services. Inadequate capital came third in the ranking of constrains influencing the adoption of agroforestry practices in the study area. Majority 77.00% of the respondents said they do not have the required capital for them to adopt agroforestry practices. Complexity in the understanding on the technical know- how about agroforestry practices came fourth among the problems militating against the adoption of such practice(s) with 45.00% of the farmers claimed not to understand the technicalities involved in establishing agroforestry based farm. Land tenure system and lack of access to credit were also viewed to be part of the problems influencing adoption of agroforestry practices in the study area. About 36.00% of the respondents stated that land tenure is a constraint to adoption of agroforestry practices because they do not owned land for such practices because farmers on rented or lease farmland cannot used such land for agroforestry practices. Adedayo [14] noted that tenant farmers and squatters find it difficult to plant trees on their farm land due to tenural restrictions. Land owners always view tree planting by tenants as a way of claiming land ownership from them. As such they don't allow them to plant trees. Only 13.00% of the farmers claimed that lack of access to credit prevented them from adopting the practice of agroforestry. It is expected that the more farmers have access to credit the more they can adopt new idea. Adedayo and Sobola [13], identified poor extension service, land tenure system and lack of technical know- how as parts of problems faced by farmers which influence their level of adoption of agroforestry practices in Osun State, Nigeria. This present study align with the study of [11], that identified inadequate extension service, poor technical know – how, low income, high capital intensive nature of agroforestry, land tenure system insufficient knowledge about source of credit and high cost of inputs required for tree planting as challenges influencing farmers willingness to engaged in agroforestry practices in Southwest, Nigeria.

4. CONCLUSION

The study described some socio- economic characteristics of the farmers that influence their

decision to adopt or not to adopt agroforestry practices in the study area, identified types of agroforestry practices adopted in the study area as well as constraints to adoption of agroforestry by farmers. From the findings of the study, it was revealed that male are the majority farmers in the study area, the farmers are in their active age group with majority of them educated and had good years of farming experience. The study revealed that agroforestry practices are highly adopted by the farmers in the study area. Retention of trees on farmland was mostly adopted while shifting cultivation is the least adopted agroforestry practices in the study area. The result of the binary probit model analysis showed that farm size, farming experience and access to credit were the factors that significantly determine the willingness of farmers to adopt or not to adopt agroforestry practices in the study area. However constraints such as poor extension service, land tenure system prblems, high capital intensive nature of agroforestry practice, inadequate capital, lack of credit facility and poor technical know- how of agroforestry practices hinders the farmers willingness to adopt agroforestry practices in the study area. The study suggests that improved agroforestry extension services should be provided to farmers, workshops, seminars and symposium should be organized for adequate training of farmers to understand the technicalities of agroforestry practice and farmers should be encouraged to form cooperative societies so that they can have access to credit facility to boost their capital base which in turn will increase their ability to adopt agroforestry practices in the study area.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Gama BM, Matata P, Otsyina RM, Kitalyi A, Nyadzi GI. Contribution of agroforestry to natural resources management, food security and climate change mitigation. Millennium village project, UNDP, Third RUFORUM biennial meeting, Tabora, Tanzania. 2012;2139.
2. Leakey RRB. Definition of agroforestry revisited. In: Multifunctional agriculture – Achieving sustainable development in Africa, RRB Leakey, 5-6, Academic Press, San Diego, California, USA; 2017.
3. Kwesiga F, Akinnifesi FK, Mafongoya PL, McDermott MH, Agumya A. Agroforestry research and development in southern Africa during the 1990: Review and challenges ahead. Agroforestry Systems. 2003;59:173-186.
4. Rogers EM. Diffusion of innovations (5th Ed.); The Free Press, New York. 2003;500.
5. Rogers EM. Diffusion of Innovations (4th Ed.): The Free Press, New York, USA. 1995;519.
6. Maren O, Carolyn ES. Climate change adaptation using agroforestry practices: A case study from Costa Rica. Stefano C (Ed.) Global warming impacts - case studies on the economy, human health, and on urban and natural environments. In Tech; 2011. ISBN: 978-953-307-785-7. DOI: 10.5772/24172
7. National Population Commission (NPC). Provisional figures for 2006 Nigeria's census. National Population Commission. (Retrieved June16, 2020) Available:http://www.nigerianmuse.com
8. Akinwalere BO. Determinants of adoption of agroforestry practices among farmers in Southwest Nigeria Applied Tropical Agriculture. 2017;22(2):67-72.
9. Asiabaka CC. Agricultural extension. A handbook for development practitioners. Omoku Press Rivers State, Nigeria. 2002;230.
10. United States Agency for International Development (USAID). ICT to enhance farm extension services in Africa. FACET briefing paper, Washington DC. 2010;35.
11. Amusa TA, Simonyan JB. Discrete choice model of farmers' willingness-to-engage in agroforestry-based farming in Southwest, Nigeria. American Journal of Earth and Environmental Sciences. 2018;1(2):41-49.
12. Akinbile LA, Salimonu KK, Yekinni OT. Farmers' participation in agroforestry practices in Ondo State, Nigeria. Research Journal of Applied Sciences. 2017;2:229-232.
13. Adedayo AG, Oluronke S. Farmers' perception and adoption of agroforestry practices in Osun State, Nigeria. Forest Research. 2014;3:127. DOI: 10.4172/2168-9776.1000127

14. Adedayo AG. Assessment of awareness and acceptability of alley cropping among rural farmers in Akure South LGA, Ondo State, Nigeria. Journal of Tropical Forest Resources, 2004;2:99-108.