Benefits and Challenges of Agroforestry Practices in Igabi Local Government Area of Kaduna State, Nigeria

Ishola, B.F.[1], Ijah, A.A.[2], Ayodele, J.T.[2], Likita, M.S.[2], Awobona, T.A.[2], Omodona, S.[2], Danbaki, C.A[2], Yahaya, U.F[2] and Olukotun, O.[2]

[1]Forestry Research Institute of Nigeria, Jericho Hill, Ibadan,Oyo State, Nigeria
[2]Federal College of Forestry Mechanisation, Afaka, Kaduna, Nigeria

Abstract: **The study was carried out to investigate the benefits and challenges associated with the practices of agroforstry farming in Igabi Local government Area of Kaduna State, Nigeria. Multi- stage in combination with purposive and random sampling techniques were used to select sixty farmers from the study area. Data for the study was obtained through the use of structured questionnaire that were administered to the farmers supported with oral interview of farmers by the researchers. The data collected was subjected to analysis using descriptive stastistics. The results obtained from the study revealed that mal (80.00%) dominated farming activities in the study area. Majority (96.67%) of the farmers were in their active working age group of between 21 and 60 years of age with about 91.67% of the farmers having ability to read and write while 76.67% of the farmers have over 6 years of farming experience. The study also revealed that 66.67% of the farmers are involved in agroforestry practice in the study area with retention of trees on farmland been the most practiced agroforstry type (28.00%) and alley farming been the least practiced agroforestry type(5.00%). The study also revealed that *Parkia biglobosa* and *Vitellaria paradoxa* were the two tree species retained on farmlands while *Eucalyptus camadulensis* was the least grown tree species on farmland in the study area. Income generation (100%), food provision(91.67 %), medicinal purposes (83.33%), source of fuel wood (80%), provision of shade (75%), erosion control (53.33%), fodder for livestock (50%), source of employment (45%), provision of timbers (43.33%), improvement in soil fertility (40%), wind break(38.33%) were the benefits derived from practicing agroforestry by farmers in the study area. However despite of these benefits agroforestry practice is still facing challenges such as lack of farm inputs(86.67%), usage of traditional farm toolsn(80.00%), lack of credit facilities (70.00%), lack of start – up capital (66.67%), scarcity of water(63.33%), high incidence of pests and diseases (60%), lack of awareness concerning agroforestry practice by farmers (55%), problem of land tenure system (36.67%) and poor knowledge about agroforestry practice by the farmers (20,00%). The study therefore recommends that government intervention in the supplying of improved farm inputs should be given to farmers in the study area and farmers are also encourage to form cooperative society to enable them solve problems of lack of start –up capital as well as lack of credit facilities so that they can actively participate in agroforestry practice to combat environmental degradation.**

I. INTRODUCTION

The main aim of practicing agroforestry is to develop a sustainable form of land use that may enhances increase in agricultural productivity as well as improvement in the welfare of agrarian communities, Many authors have gave definition to agroforstry practices. A recent definition by Leakey (2017), defined agroforestry as a dynamic, ecologically based, natural resource management system that involves the integration of trees in farm- and rangeland, diversifies and sustains smallholder production for increased social, economic and environmental benefits. This definition of agroforestry practices incorporate the need to see agroforestry practice as a way to mitigate deforestation and land degradation and thus alleviate poverty. This definition removes the earlier belief that agroforestry is a set of stand-alone technologies that together form various land-use systems in which trees are sequentially or simultaneously integrated with crops and/or livestock. Akinbile *et al.* (2007) described agroforestry as a farming system that integrates woody perennials with agricultural crops and/or animals on the same land management unit deliberately, with the aim of enhancing soil fertility and increasing farmers' income through the use of economic trees. This definition by Akinbile *et al*. (2007) highlight some benefits that may be derived from agro forestry practices.

The benefits derived from agroforestry practices are numerous but they could be grouped into social. economical and environmental benefits. Social benefits derived include the use of some tree species as source of fuel, source of pole, medicinal plants, making of household furnitures and utensil while some tree species also have cultural attachment. Economic benefits include source of food, income generation, source fodders to livestock, uses as timber and some of the products such as gum, resin and others are used as source of raw materials to in cottage industries. Environmental benefits include combating soil erosion, soil degradation, run- off, leaching, mitigating deforestation, improve soil fertility, wind break and provision of shade to young seedlings. Agroforestry

practices improves farmers household income due to the facts that djffrent products can be harvested from both forest trees and food crops at different times of the year. Processing of timbers also brings job opportunities to rural communities and thereby expanding the national economies. Ibrahim *et.al*.(2019) described the benefits derived from agroforestry practices by farmers in New Bussa, Nigeria to include source of income generation, source of food, usage as medicinal plants, source of fodder,source of employments, wind break and better use of land.

Despite the numerous beneficial effects of agroforestry practices to farmers and the communities at large, the practice is faced with various challenges as documented by different scholars. Ibrahim et.al. (2019) observed that agroforestry practices among farmers in New Bussa is limited by the following constraints; limited use of machineries, poor access to credit, fast growing nature of trees, land tenure, marketing challenges, inadequate capital, increase in population, unavailability of labour, high incidence of pests and diseases, poor yield and theft, poor access to extension service, poor soil fertility and d short growing season. : Adedayo and Oluronke (2014) reported problems by local farmers which limit them from adption of agrforestry practices in the study area include land tenure problems, small land holdings, fire outbreak, lack of technical knowhow, non-availability of tree seedlings and trees casting shadow on crops among others.

Given the importance of agroforestry practices to farmers, communities and the nation at large, this study seeks to describe the socio – economic characteristics of the farmers, level of farmers participation in agroforestry practice, types of agroforestry practices, identify common trees retained or grown on the farm, identified the benefits of agroforestry practices and described the challenges faced by farmers in participating in agroforestry practices in Igabi local government area of Kaduna state, Nigeria.

II. MATERIALS AND METHODS

A. 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 10^0 32' and 7^0 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(NPC,2006). Annual rainfall is between 250mm-1000mm 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, cocoyam and sugar cane. 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.

B. 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, three villages which include ,Rigasa, Jaji 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 were randomly selected from the three selected villages each. So the total sample size for study was 60 respondents.

C. 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 farmers participation in agroforestry practice, types of agroforestry practices, common trees retained or grown on the farm, benefits of agroforestry practices and the challenges faced by farmers in participating in agroforestry practices in Igabi local government area of Kaduna state, Nigeria.

D. Method of Data Analysis

Descriptive statistics were used to analyse the data. Descriptive statistics such as frequency distribution, percentages and mean were used to analysed the socio – economic characteristics of the farmers, level of farmers participation in agroforestry practice, types of agroforestry practices, common trees retained or grown on the farm, benefits of agroforestry practices and the challenges faced by farmers in participating in agroforestry practices in Igabi local government area of Kaduna state, Nigeria.

III. RESULTS AND DISCUSSION

A. 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 (80.00 %) 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 (2017) 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 (96.67 %) of the respondents is in age bracket that ranged between 21 – 60years old. This shows that the farmers are in their active age group which may influence their willingness to participate in agro forestry practice. Table1 also showed that 91.67 % of the respondents are educated with 50.00% of them having secondary school certificate, followed by 31.67 % with primary certificate while 10.00% had tertiary education and 8.33 % had no formal education..This suggests that majority of the farmers in the

study area could read and write. The ability of the majority of the farmers to read is expected to have positive influence on them participating in agroforestry practice. United States Agency for International Development, USAID (2010), reported that the chances of farmers adopting new innovations increases with their level of education. About 50.00 % of the farmers have farm size that ranged between 1.00 - 2.99 hectares of land, followed by 40.00 % with farm size of less than 1.00 hectare, 6.67 % had farm size that ranged between 3.00 – 4.99 hectares while 3.33 % had farm land that is over 5.00 hectares. This finding corroborates the study of Akinwalere (2017), 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 35.00 % of the farmers had 6 – 10 years of farming experience, 31.67 % had 11 – 15 years of farming experience, 23.33 % had 1-5 years of experience while 10.00 % of them had 16 years and above years of farming experience. It is expected that good years of farming experience should influence the level of farmers participation in agroforestry practices in the study area. The result indicates that about 76.67 % of the farmers had farming experience that is 6 years and above. The result in Table 1 also revealed that majority (60.00%) of the farmers owned their farm land while 40.00% 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 (2018), 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

B. Level of Participation in Agroforestry Practice by the Farmers in the Study Area

Table 2 shows the level of farmers participation in agroforestry practice in the study area. The result showed that 66.67 % of respondents were involved in agroforestry practice, while 33.33% 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 farmers participation in agroforestry practice was associated with the multiple benefits the farmers can gain from the practice 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.*(2007), 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

Table1: Socio – economic characteristics of the farmers

Socio – economic variable	Frequency (n= 60)	Percentage (%)
Gender		
Male	48	80.00
Female	12	20.00
Total	60	100.00
Age (year)		
21 – 30	6	10.00
31 - 40	28	46.67
41 – 50	20	33.33
51 - 60	4	06.67
6 1 and above	2	03.33
Total	60	100.00
Level of education		
No formal education	5	08.33
Primary	19	31.67
Secondary	30	50.00
Tertiary	6	10.00
Total	60	100.00
Farm size(ha) Less than 1.00	24	40.00
1.00 – 2.99	30	50.00
3.00 – 4.99	4	06.67
Greater than 5.00	2	03.33
Total	60	100.00
Years of farming experience		
1 – 5	14	23.33
6- 10	21	35.00
11 – 15	19	31.67
Above 16	6	10.00
Total	60	100.00
Land ownership		
Yes	36	60.00
No	24	40.00
Total	60	100.00

Table 2. Level of participation in agroforestry practice by the farmers in the study area

Level of Participation	Frequency	Percentage (%)
Yes	40	66.67
No	20	33.33
Total	60	100.00

C. Type of Agroforestry Practices in the Study Area.

The types of agro-forestry practices in the study area include taungya farming, retention of trees on farmland, improved bush fallow, alley farming, planting of trees on farmland, shifting cultivation, shelter belt / wind break and home gardening. Retention of trees on the farmland was the most agro forestry practice that the farmers were involved(28.00 %), followed by 15.00 % of the farmers that participated in planting of trees on farmland, 13.33 % of the farmers participated in home gardening, 11.67 % practiced taungya

farming, 10.00 % participated in improved bush fallow and shifting cultivation, respectively. 6.67 % participated in shelter belt/wind break while alley farming was practiced by 5.00 percent of the farmers. The most participated agroforestry practice in this study area was the trees retention on farmland while the least is alley farming. The findings in this study negates the findings of Akinwalere (2017) as well as Adedayo and Oluronke (2014). Akinwalere (2017), reported that shelter belt and wind break was the most participated agroforestry practice by farmers in the southwest, Nigeria while Adedayo and Oluronke (2014), also reported that shifting cultivation was the least participated agroforestry practice in Osun State,Nigeria.

D. Common Tree Species Retained or Grown in the Study Area

Common tree species retained or grown in the study area by farmers were presented in Table 4. Sixteen tree species were identified to either be retained or grown on their farmland by the farmers in the study area. The sixteen tree species belong to nine families. The table revealed that four of the tree species namely Africa locust bean tree, River tamarind tree, Gliricidea tree and Gum Arabic tree belong to the family *Fabaceae,* Three of the tree species namely Teak, Gmelina tree and Black plum tree belong to the family *Lamiaceae.* Two of the tree species namely African baobab tree and Kapok tree belong to the family *Malvaceae.* Similarly two species namely Mango tree and cashew tree belong to the family *Anacardiaceae.* Other families have one tree specie each, they are *Moringaceae* (drumstick tree), *Meliaceae* (Neem tree), *Myrtaceae* (River red gum tree),*Pinaceae* (Caribbean pine tree) and *Sapotaceae (Shea butter tree).* Ten of the trees namely *Moringa oleifera, Azadirachta indica, Tectona grandis, Eucalyptus camaldulensis,Gmelina arborea, Pinus caribaea, Leucaenia leucocephala, Mangifera indica, Anacardium occidentale* and *Gliricidea sepium* are exotic species while six of the tree species namely *Adansonia digitata,Parkia biglobosa,Ceiba pentandra,Vittellaria paradoxa, Vitex doniana* and *Acasia nilotica* are indigenous species . According to the study the farmers identified that most of the exotic tree species were grown by them while the indigenous species natural trees retained on their farmland.

Among the tree species found in the study area *Vittellaria paradoxa and Parkia biglobosa* were the two most tree species retained by all the farmers (100 %) of the farmers in the study area probably due to their economic value in the production of shea butter paste and locust bean condiment respectively while *Eucalyptus camaldulens* was the least tree specie cultivated or retained by the farmers on their farmland . Other tree species cultivated or retained by the farmers include *Moringa oleifera* (80%), *Acasia nilotica* (76.67 %), *Azadirachta indica* (75%), *Anacardium occidentale* (70%), *Mangifera indica* (66.67 %) and *,Gmelina arborea* (55%), *Leucaenia leucocephala* and *Adansonia digitata* were either cultivated or retained by 50% 0f the farmers respectively in the study area. Other common tree species identified in the study area includes *Gliricidea sepium* (46.67%), *Ceiba pentandra* (35%), *Vitex doniana* (30%), *Tectona grandis* (20%), *Pinus caribaea* (15%) and *Eucalyptus camaldulensis* (11.67%). All these trees are of economic benefits to the farmers and they also important in the areas of acting as wind break, erosion control, add nutrients to the soil and also some serves as food source to the farmers. Most of the tree species identified in this study were reported to be the economic trees found among farmers in New Bussa area of Niger state, Nigeria by Ibrahim *et.al.*(2019). Adedayo and Oluronke (2014) also reported most of these tree species identified in this study as the common trees planted or retained by farmers in Osun state, Nigeria.

Table 3: Types of agroforestry practices in the study area

Agroforestry Practice	Frequency	Percentage(%)
Taungya system	7	11.67
Retention of trees on farmland	17	28.33
Improved bush fallow	6	10.00
Alley farming	3	05.00
Planting of trees on farmland	9	15.00
Shifting cultivation	6	10.00
Shelter belt and wind breakHome gardening	4 8	06.67 13.33
Total	60	100.00

Table4. Common tree species retained or grown in the study area

Common Name	Scientific Name	Family	Nativity	Frequency	Percentage
Drumstick Tree	*Moringa oleifera*	*Moringaceae*	Exotic	48	80.00
Neem Tree	*, Azadirachta indica*	*Meliaceae*	Exotic	45	75.00
Teak Tree	*Tectona grandis*	*Lamiaceae*	Exotic	12	20.00
River Red Gum Tree	*Eucalyptus camaldulensis*	Myrtaceae	Exotic	7	11.67
Gmelina Tree	*Gmelina arborea*	*Lamiaceae*	Exotic	33	55.00
Caribbean Pine Tree	*Pinus caribaea*	*Pinaceae*	Exotic	9	15.00
River Tamarind	*Leucaenia leucocephala*	*Fabaceae*	Exotic	30	50.00
Mango Tree	*Mangifera indica*	Anacardiaceae	Exotic	40	66.67

Cashew Tree	*Anacardium occidentale*	Anacardiaceae	Exotic	42	70.00
Gliricidea Tree	*Gliricidea sepium*	Fabaceae	Exotic	28	46.67
African Baobab Tree	*Adansonia digitata*	Malvaceae	Indigenous	30	50.00
African Locust Bean Tree	*Parkia biglobosa*	Fabaceae	Indigenous	60	100.00
Kapok Tree	*Ceiba pentandra*	Malvaceae	Indigenous	21	35.00
Shea Butter Tree	*Vittellaria paradoxa*	Sapotaceae	Indigenous	60	100.00
Black Plum Tree	*Vitex doniana*	Lamiaceae	Indigenous	18	30.00
Gum Arabic Tree	*Acasia nilotica*	Fabaceae	Indigenous	46	76.67

Multiple Responses

E. Benefits of Agroforestry Practice in the study Area.

The result of benefits derived from practicing agroforestry farming system by farmers in the study area is presented in Table 5. The table revealed that eleven benefits were identified with all the respondents (100%) recognizing that the practice of agroforestry serves as source of income to them. This was followed by 91.67 % of the farmers that said they derived their food needs from agroforestry practice, Other benefits derived from agroforestry practice in the study area according to this study were medicinal purposes (83.33%), source of fuel wood (80%), provision of shade (75%), erosion control (53.33%), serves as fodder for livestock (50%), source of employment (45%), provision of timbers for construction and building (43.33%), leads to improvement in soil fertility (40%) while the trees serves as wind break(38.33%). The results revealed that farmers participation in agroforestry practices in study area is beneficial to them economically, socially and environmentally. The benefits identified in this study were earlier reported by different authors as benefits associated with agroforestry practices in their various studies. Ibrahim *et .al.* (2019) identified source of income(81.70%), medicinal herbs (98.30%), fodder (43.30 %), food (80.30 %), employment (12.50%), wind break (37.50%) and better use of land (33.30%) as benefits derived by farmers from agroforestry practice in New Bussa, Niger state of Nigeria. The findings of this present study were in conformity with the study of Ibrahim *et .al.* (2019) except that the present study had higher percentage of farmers who see participation in agroforestry farming as source of employment compare to low percentage reported by Ibrahim *et .al.* (2019). Similarly Mustapha and Jimoh (2012) reported that farmers in Ijebu Notrh Local Government Area of Ogun state, Nigeria identified food source, firewood surce , shade provision, medicinal purposes, income generation and alleviation of environmental degradation as benefits derived from agroforestry practice.Ogunkalu *et.al.*(2017) in their study showed that erosion control is the highest benefits derived from planting trees in the Urban areas which was closely followed by recreational purposes, windbreak, aesthetic values, improve climate conditions, medicinal uses, provision of fruits and seeds, while source of fuel wood is the least benefits.

F. Challenges Facing Agroforestry Practice in the Study Area

Challenges facing farmers in participating in agroforestry practice in the study area is presented in Table 6. The result in the table revealed that nine challenges were identified facing farmers participation in agroforestry practice .The challenges were ranked. Lack of farm inputs such as seeds, seedlings, fertilizers, pesticides and herbicides ranked first among the challenges with 86. 67% of the farmers claimed to be suffering from inadequate farm inputs. This was closely followed by the 80% of the farmers who complained that they find it difficult participating in agroforestry practice due to lack of modern machineries such as tractor and its implements such as plough, harrow and ridger since majority of them still uses traditional farm tools such as cutlass and hoe for farming activities which mostly resulted to drudgery among the farmers. Lack of credit facilities came third with 70% of the farmers claimed not to have access to credit facilities to enable them participate actively in agroforestry practice. This was followed closely by 66.67% of the farmers who do not have the start – up capital to establish agroforestry farms. Other challenges identified from this study were scarcity of water(63.33%), high incidence of pests and diseases (60%), lack of awareness concerning agroforestry practice by farmers (55%), problem of land tenure system (36.67%) while only 20% of the farmers claimed not to have knowledge about agroforestry practice. These challenge may be attributed to the reason while about 33.33% of the farmers in the study area are not practicing agroforestry farming. This result is similar to the constraints identified facing agroforestry practice among farmers in New Bussa as reported by Ibrahim *et.al.*(2019). The result is also in conformity with some barriers identified by FAO (2013) to be militating against agroforestry practice.

Table 5. Benefits of agroforestry practice in the study area

Benefit	Frequency	Percentage
Source of employment	27	45.00
Provision of fodders for livestock	30	50.00
For medicinal purposes	50	83.33
Erosion control	32	53.33
Source of fuelwood	48	80.00

Source of timber	26	43.33
Provision of shade	45	75.00
Serves as wind break	23	38.33
Source of income generation	60	100.00
Source of food	55	91.67
Improve soil fertility	24	40.00

Multiple Responses.

Table 6. Challenges facing agroforestry practice in the study area

Challenge	Frequency	Percentage	Ranking
Lack of awareness on agroforestry practice	33	55.00	7th
Lack of credit facilities	42	70.00	3rd
Lack of Start – up capital	40	66.67	4th
Farmers poor knowledge of agroforestry practice	12	20.00	9th
Scarcity of water	38	63.33	5th
High incidence of pests and diseases	36	60.00	6th
Lack of farm inputs	52	86.67	1st
Land tenure system	22	36.67	8th
Usage of traditional farm tools	48	80.00	2nd

Multiple Responses

IV. CONCLUSION

The study revealed that male farmers participated in agroforestry practice than their female counterparts and that majority of the farmers about 92% are educated with about 97 % of the farmers in their working age group of between 21 years and 60 years which showed they are young and active which serves as a boost in participating in agroforestry practice. Only 66.67% of the farmers in the study area that are actively involved in the practice of agroforestry. Retaining trees on farmland was the most practiced agroforestry (28%) while alley farming was the least participated agroforestry (5%). Sixteen tree species were identified as the common tree species retained or grown by the farmers in the study area with all the farmers (100%) retaining Shea butter tree and African locust bean tree respectively probably due to ther economic importance and River red gum is the least grown tree by farmers on their farm probably due to its allelopathic effect on the growth of food crops. The study revealed that farmers derived benefits such source of income, food, medicinal purposes (83.33%), source of fuel wood (80%), provision of shade (75%), erosion control (53.33%), fodder for livestock (50%), source of employment (45%), provision of timbers (43.33%), improvement in soil fertility (40%) while the trees serves as wind break(38.33%). However despite of these benefits agroforestry practice is still facing challenges such as lack of farm inputs such as seeds, seedlings, fertilizers, pesticides and herbicides, tlack of modern machineries such as tractor and its implements such as plough, harrow and ridger, lack of credit facilities, lack of start – up capital to establish agroforestry farms, scarcity of water(63.33%), high incidence of pests and diseases (60%), lack of awareness concerning agroforestry practice by farmers (55%), problem of land tenure system (36.67%) and poor knowledge about agroforestry practice by the farmers. The study therefore recommends that government intervention in the supplying of improved farm inputs should be given to farmers in the study area and farmers are also encourage to form cooperative society to enable them solve problems of lack of start –up capital as well as lack of credit facilities so that they can actively participate in agroforestry practice to combat environmental degradation.

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