
Strategies to Improve the Contributions of Agroforestry Research to the Adoption of Tree Planting Among Rural Farmers in Oyo State Nigeria

Adedayo Adesoji Gideon

Department of Forestry and Wood Technology, Federal University of Technology, Akure, Nigeria

Email address:

agadedayo@futa.edu.ng

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Abstract: Forestry research efforts meant to solve problems in the forestry sector are not meeting the targeted goals. This is due to some problems encountered by forestry research organizations in Nigeria. The situation in the rural communities in the country is such that most rural farmers are not planting trees as expected, resulting in increasing scarcity of wood products. This has resulted to increased call for tree planting. As such this study takes a look at the contributions of agroforestry research to the adoption of tree planting among rural farmers in Oyo State, Nigeria. It examines the problems faced by research organizations in carrying out research and the problems faced by rural farmers that are planting trees. This is with a view to fashioning out strategies that will help to improve the contributions of forestry research organizations to the adoption of tree planting among rural farmers in the study area. Two sets of questionnaires were used to collect data for this study. The first set was administered on forestry researchers at Forestry Research Institute of Nigeria (FRIN) Ibadan and at Oyo State Forestry Department, Ministry of Agriculture and Natural Resources (20 copies each). The second set of questionnaire was administered on rural farmers in the state. Five LGAs out of thirty-three LGAs (14%) were purposively selected. Three rural communities in each sampled LGA were randomly selected to make a total of 15 communities. Twenty local farmers were purposively selected in each sampled community to make a total of 300 respondents. The results of the study showed that the areas agroforestry research has influenced tree planting among rural farmers include tree breeding, forest economics and marketing and forestry extension. Forestry research organizations are however faced with some problems in the conduct of agroforestry research. The most prominent among these problems are lack of funds and poor power supply. Rural farmers are also faced with some problems which hinder them from planting trees. These problems include lack of land, non-availability of tree seedlings and long gestation period of trees. In view of these the following strategies can help to improve the contribution of agroforestry research to the adoption of tree planting among rural farmers in the study area. These include improved forestry extension, improved funding of forestry research, improved training for forestry research personnel and provision of land to rural farmers.

Keywords: Strategies, Adoption, Agroforestry Research, Rural Farmers, Oyo State and Nigeria

1. Introduction

Prominent farming system (shifting cultivation) in Africa can no longer meet the food production needs of the growing population in the continent. As population increases, land resources have to bear enormous demographic pressures from rising demands for products and services which overstretch the carrying capacity of the land base in many

places [1]. Developing a sustainable land use practice that will meet the food need of the people in the tropical countries has therefore become a formidable challenge. Agroforestry systems offer an effective and efficient means of increasing land productivity per unit area [2]. However the adoption of modern agroforestry practice by resource poor farmers on the continent of Africa has not been encouraging. This is due to so many problems the local farmers have been encountering

that have prevented them from either planting trees or adopting agroforestry practices. In an attempt to solve these problems, researches are being conducted into how the adoption of tree planting can be improved among local farmers in Africa in general and in Nigeria in particular. Even though research has been widely accepted as a veritable tool towards solving societal problems worldwide, scientific research efforts in Africa have been very poor. More worrisome is the fact that research efforts in forestry are not only poor, the impact of these researches is also very poor. Jacobson [3] noted that one of the major challenges facing agroforestry among others is lack of scientific research. It therefore follows that scientific research effort by forestry research organizations is either not enough or is not meeting the targeted goals. The major reason for the poor research effort is due to lack of funds and the inability of research outputs getting to the final users. Throughout Africa, funding research has been very poor. Gaillard and Tullberg [4] noted that public research budget in Africa have been cut to such extent that with a few exceptions hardly can research activity be undertaken without foreign aid. In addition, most of the forestry researches are not properly followed up. As a result there is a gap between forestry research organizations and the public who are expected to use the research outputs. As such, forestry research efforts meant to solve problems in the forestry sector are not meeting the targeted goals. Instead of reducing forestry problems through research more forestry problems are rearing its ugly heads due to poor coordination of research efforts. Especially, poor tree planting efforts by rural farmers in Nigeria. The situation in most rural communities in the country is such that most rural farmers are not planting trees as expected, resulting in increasing scarcity of wood products. The increasing scarcity of wood products has made the call for the planting of trees more intense in the past few decades. This is because population is increasing and the demand for wood products is increasing yet the rate of tree planting is very slow. As noted by Gwandu [5] government tree planting programme operating with limited resources is unable to establish trees at a required rate. As such local farmers have been urged to plant trees on their private lands in order to increase the supply of wood products in the country. However, the long gestation period of trees has not really encouraged many local farmers to plant trees. In view of this, efforts are being made by research organizations to fashion out ways by which rural farmers can be encouraged to plant trees. Carrying out research that will help to promote tree planting among rural farmers will therefore help to improve the impact of research activities on targeted audience. It will help to reduce wastage of research efforts and funds and help to improve availability of wood products in rural communities. Agroforestry research is one of the common forestry researches in Nigeria. It will therefore be good if such research efforts are directed towards improving tree planting among rural farmers in Nigeria. This is because research efforts directed to the adoption of tree planting by small scale farmers will help to bring development to forestry at the grass root level. Such

research will help to increase the supply of tree products to the rural communities. It will help to meet many other needs of rural communities (like erosion control and improvement of soil fertility) and provide a good background for rural development.

It is in view of this that this research work is set to assess the contributions of agroforestry research to the adoption of tree planting among local farmers in Oyo State, Nigeria. To identify the problems faced by local farmers planting trees or practicing agroforestry and the problems faced by research organizations in carrying out research and disseminating research out put to local farmers. This is with a view to fashioning out strategies that will help to improve the contribution of forestry research organizations to the adoption of tree planting (agroforestry) among local farmers in Oyo State, Nigeria. These strategies will help both the research organizations and the local farmers to achieve more success in the future and the society will be better off for it.

2. Definition and Concept of Agroforestry

Agroforestry is a science in its own right with the primary goal of optimizing the positive interactions between the woody and non-woody components, so that the production system may be more sustainable and diversified than with conventional approach under given agroecological and socio-economic conditions. Agroforestry has been defined as a collective name for land-use systems and technologies where woody perennials (trees, shrubs, palms, bamboos, etc.) are deliberately used on the same land-management units as agricultural crops and/ or animals, in some form of spatial arrangement or temporal sequence [6,7]. In agroforestry systems there are both ecological and economical interactions between the different components. Agroforestry is a collective name for land use system and practice where woody perennials i.e. trees, shrubs, palms, bamboos etc. are deliberately integrated with crops and / or animals on the same land management unit. The integration can be either in spatial mixture or temporal sequence such that there is ecological and economic interaction between the woody and non-woody components [8]. Although cultivating trees in combination with crops and livestock is considered an ancient practice, factors such as the deteriorating economic situation in many parts of the developing world,; increased tropical deforestation; degradation and scarcity of land because of population pressures; and growing interest in farming systems, intercropping and the environment have contributed to a rising interest in agroforestry since the 1970s. Most research on agroforestry has been conducted from the biophysical perspective, but the socio-economic aspects especially the relationship between research organizations and local farmers has not received much attention.

Agroforestry has been said to be a new name for an old practice as farmers have for a long time used farm trees to

provide an array of products (fruits, fodder, fuelwood, timber, medicine, resins, nuts, oils and cosmetics), to protect soils and watersheds and to recycle nutrients on the farm. Although agroforestry systems have been classified in a myriad of different ways [9], there are only two functionally different types, simultaneous and sequential agroforestry [10]. Simultaneous agroforestry is where the tree and the crop components grow at the same time and in close enough proximity for interactions to occur. Examples of this type are alley cropping (hedgerow intercropping), contour 8 hedges, parklands, boundary plantings, home gardens and several silvopastoral systems. In sequential agroforestry systems the maximum growth rates of the crop and the tree components occur at different times even though both components may have been planted at the same time and are in close proximity. Examples of this type are shifting cultivation, improved fallows, taungya, and some multi strata systems. Interactions between the crop and the tree components are minimized with time in sequential agroforestry.

With the increasing realization of the world's environmental crises and worsening food situation in developing countries; more integrated approaches to food production have begun to emerge. One of this is agroforestry which create space for the precarious ecological balance encountered in so many tropical areas. Growing trees along with crops and livestock will help to enhance crop yields,

conserve soil, and recycle nutrients while producing fuelwood, fodder, fruits, and timber. Sanchez [11] noted that agroforestry is not there yet. Its theoretical underpinnings are yet to be developed in a sufficiently rigorous manner to assure predictive understanding. He noted further that agroforestry is a field of study which involves the combined application of ecology, economics, anthropology, agronomy, forestry, soil science, animal science, tree genetics, biometrics and other applied sciences. Out of this cauldron a recognized science may emerge, and what an exciting one it may be, given its broad interdisciplinary nature. The fundamentals of agroforestry are now being intensively investigated by many institutions throughout the world [11].

3. Methodology

3.1. The Study Area

Oyo State lies between latitude $6^{\circ}45' N$ and $9^{\circ} 10' N$ and Longitude $2^{\circ} 43' E$ and $4^{\circ} 35' E$ with a land area of about 20,500 km². (Figs. 1 and 2) Oyo state is one of the states in south-western Nigeria, with its capital at Ibadan. It is bounded in the north by Kwara State, in the east by Osun State, in the south by Ogun State and in the west by Ogun State and by the Republic of Benin.

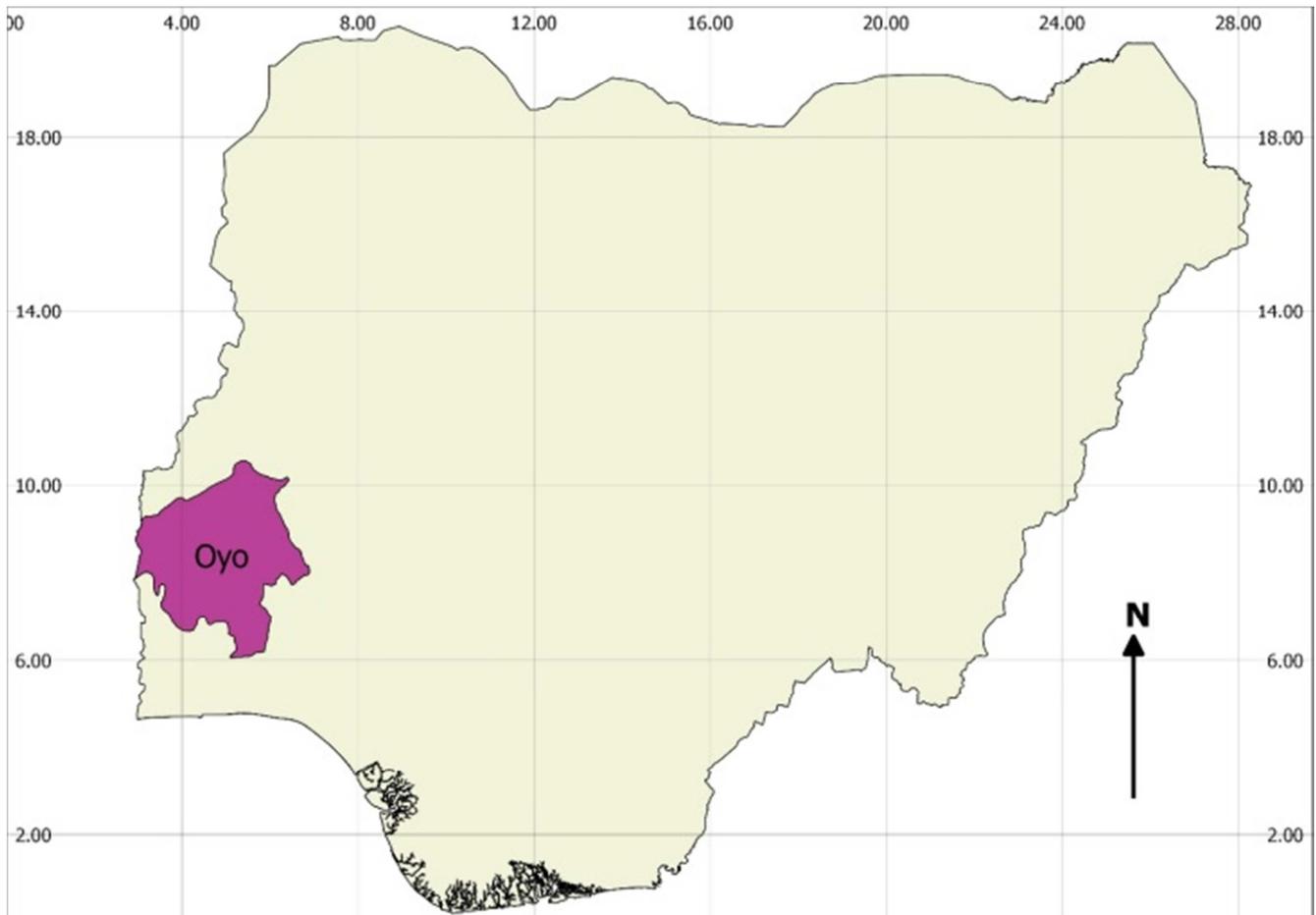


Figure 1. Map of Nigeria showing the location of Oyo State.

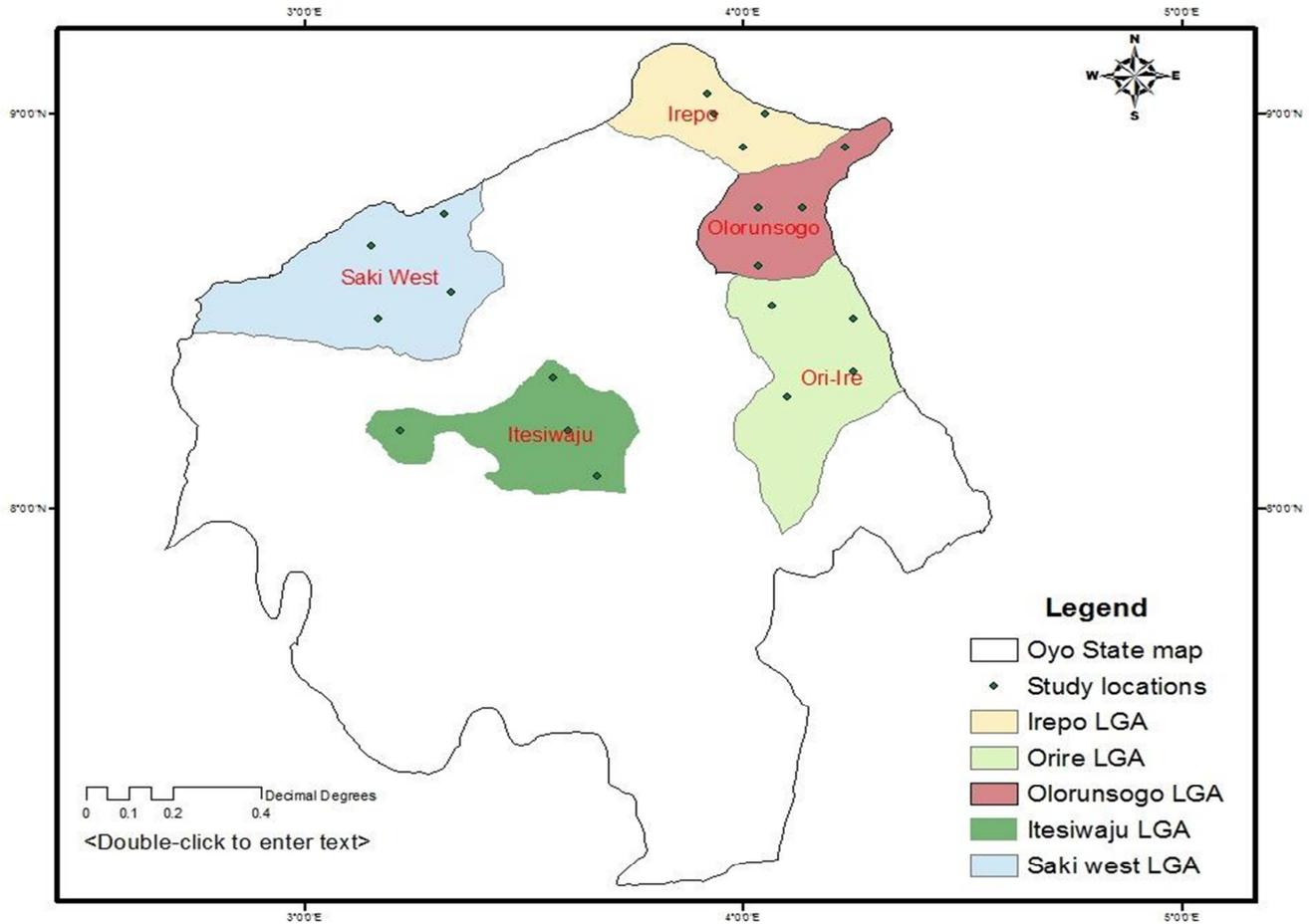


Figure 2. Map of Oyo State showing sampled LGAs.

Oyo state has a typical tropical climate with two distinctive seasons; the rainy season and the dry season. The temperature lies between 24°C and 25°C with relatively high humidity. The average rainfall over the years ranges between 1200mm and 1800mm per annum in the southern part of the state, while at the northern part, it ranges between 800mm and 1500mm per annum.

The southern part of the state is occupied by the low land rain forest. The vegetation thins out into the derived savanna towards the northern part of the state. Common tree species found in the state include *Triplochiton scleroxylon*, *Eucalyptus* species, *Nauclea diderichii*, *Dialum guineense*, *Isobertina doka*, *Anogeissus leiocarpus* and *Adansonia digitata*.

3.2. DataCollection

Data for the study was collected through structured questionnaire. Two sets of structured questionnaires were used.

The first set of the questionnaire was administered on forestry researchers both at the Forestry Research Institute of Nigeria (FRIN) Ibadan and at the Oyo State Forestry Department, Ministry of Agriculture and Natural Resources. Twenty copies of questionnaires were administered in FRIN and another twenty copies at Forestry Department, Oyo state Ministry of Agriculture and Natural Resource (Table1). The second set of the questionnaire was administered on rural farmers in the state. Five local government areas out of thirty-three local government areas (14%) were purposively selected. The LGAs with high concentrations of rural communities were selected. Three rural communities in each sampled LGA were randomly selected from a compiled list of villages in each LGA to make a total of 15 communities in the study area (Table2). Twenty local farmers were purposively selected in each sampled community to make a total of 300 respondents. The purpose was that farmers that are practicing agroforestry were selected.

Table 1. Questionnaire administration among forestry researchers in the Study area.

Name of Forestry Organization	Number of questionnaire administered	Number of questionnaire returned	Percentage
Forestry Research Institute of Nigeria (FRIN)	20	20	100
Forestry Department Oyo State Ministry of Agriculture and Natural Resource.	20	20	100

Table 2. Names of sampled LGAs, Villages, and questionnaire administration in the Study area.

Name of sampled LGAs	Name of sampled villages	Number of questionnaire administered	Number of questionnaire returned	Percentage
Saki West	Igalyere	24	20	83
	Onshe	22	20	91
	Irawolle	20	20	100
Itesiwaju	Temidire	20	20	100
	Itesiwaju	22	20	91
	Odeleye	23	20	87
Ori-Ire	Elelu	20	20	100
	Ajibowu	22	20	91
	Olore	24	20	83
Olorunsogo	Babaloke	20	20	100
	Alagbon	20	20	100
	Obadimu Hill	22	20	91
Irepo	Kanmbi River Akanbi	20	20	100
	Tessi River	20	20	100
	Old Oyo F.R. Olopa	20	20	100

3.2.1. Data Analysis

The data for this study was subjected to descriptive statistics. This is in form of frequency, percentage distribution tables. In addition chi-square test was used to test hypotheses stated.

3.2.2. Research Questions

- 1) What forms of agroforestry practices do local farmers practice in the study area?
- 2) What are the types of agroforestry research embarked upon by forestry research organizations in the study area?
- 3) What are the problems faced by research personnel in conducting agroforestry research in the study area?
- 4) How do research organizations disseminate their research findings to the local farmers in the study area?
- 5) Do the methods of disseminating research outputs by forestry research organizations have a significant impact on tree planting by rural farmers in the study area?
- 6) What problems do local farmers face in trying to use agroforestry research outputs from research organizations in the study area?
- 7) Does the level of income of rural farmers have a significant association with their willingness to plant trees in the study area?

3.2.3. Hypotheses Tested

- 1) Ho—Educational qualification of rural farmers does not have a significant association with their willingness to plant trees in the study area.
- 2) Ho—Economic status of rural farmers does not have a significant association with their willingness to plant trees in the study area.
- 3) Ho—Years of experience of forestry research officers have no significant association with the impact of their research output on tree planting among local farmers in the study area

4. Results and Discussion

4.1. Socio Economic Characteristics of Respondents

The result of the study showed that 10%, 44% and 46% of the respondents (rural farmers) in the study area have their ages between 31–40 years, 41–50 years and 51–60 years respectively. None of the respondents are below 30 years of age (Table3). This shows that all the respondents are matured and are therefore competent to answer questions that are posed to them. However it portrays the fact that many of the young people are not involved in agroforestry practices in the study area.

12% of the respondents (rural farmers) are female while 88% are male (Table3). This shows that more men are involved in agroforestry practices than women in the study area. This is in accordance with the findings in another study [12]. They noted that more men (68%) are involved in the practice of agroforestry than women (32%) in the forest communities of Oyo State.

The result also showed that 61 % of the respondents' (rural farmers) in the study area had no formal education while 36% had primary education and 3% had secondary education. The result of the chi-square test ($p < 0.05$) shows that educational qualification of respondents has a significant association with their willingness to plant trees in the study area. In the same vein chi-square test ($p < 0.05$) also shows that level of income of respondents has a significant association with their willingness to plant trees on their farms in the study area (hypothesis 1 and 2 of Table11). This shows that socio-economic characteristics of rural farmers (especially educational qualification and income level) have a significant impact on the adoption of tree planting in the study area. Cerdan, *et al* [13] noted that one common factor that was noticed to be responsible for the failure of most agroforestry projects was the inadequate attention given to the socio-economic aspects of agroforestry in its development. It therefore follows that the significant impact of the educational qualification and income level of rural farmers on the adoption of tree planting can affect the success or failure of agroforestry

practice in rural communities.

Table 3. Demographic characteristics of respondents in the Study area (rural Farmers).

S/N	Demographic characteristics	Frequency	Percentage
1.	Age		
	Less than 30 years	0	0
	31 -40 years	30	10
	41 -50 years	132	44
	51 – 60 years	138	46
2	Above 60 years	0	0
	Sex		
	Male	264	88
3	Female	36	12
	Educational Status		
	No formal education	183	61
	Primary education	108	36
	Secondary education	9	3
	Tertiary education	0	0
	Annual Income		
<N 120,000.00	66	22	
N 120,000.00 –N160,000.00	84	28	
N161,000.00 – N200,000.00	78	26	
N201,000.00 – N240,000.00	42	14	
N241,000.00 – N280,000.00	20	7	
Above N280,000.00	10	3	

Source: Field Survey, 2017.

Table 4 shows that 10% of the respondents are chief research officers. 25% and 30% of the respondents' are Research Officer I and Senior Research Officers respectively at FRIN Table 4 further shows that at Forestry Department, Oyo State, Ministry of Agriculture and Natural Resources, 30% and 50% of the respondents are Chief forest officers and Principal Forest Officers respectively.

Table 5 shows that 15% of respondents at FRIN have more than 20 years of working experience. 20% in the same research institute had between 16–20 years of working experience while 25% of the respondents in the same research institute had between 5-10 years of working experience. At Forestry Department, Oyo State Ministry of

Agriculture and Natural Resources 30% of the respondents had between 11-15 years of working experience while 60 % had between 5–10 years of working experience. The result of the chi-square test ($p < 0.05$) shows that years of experience of forestry research officers has a significant association with the impact of their research output on tree planting among local farmers in the study area (hypothesis 3 of Table 11). This means that years of experience of research officers has a significant impact on their research competence, skills and outputs. It therefore follows that as research officers get more experience in conducting research the better their research outputs and the better is the impact of the research..

Table 4. Rank of forestry Research personnel in the study area.

Rank of Research Officer	FRIN		Forestry Department Oyo State Ministry of Agric. and Natural Resources	
	n	%	n	%
Chief Research Officer	2	10		
Principal Research officer	4	20		
Senior Research officer/	6	30		
Research officer I	5	25		
Research officer II	3	15		
Chief Forest Officer			6	30
Principal Forest Officer			10	50
Senior Forest Officer			4	20

Source: Field Survey, 2017

Table 5. Years of Experience of Research Officers in the Study area.

	<5 yrs.		5–10 yrs.		11-15yrs.		16-20yrs.		>20yrs.		Total
	n	%	n	%	n	%	n	%	n	%	
FRIN	3	15	5	25	5	25	4	20	3	15	20
Forestry Dept. Oyo State Min. Of Agric. and Natural Resources	2	10	12	60	6	30	0	0	0	0	20

Source: Field Survey, 2017

4.2. Agroforestry Research and Tree Planting

Table 6 shows the various areas that agroforestry research has influenced tree planting among rural farmers in the study area. These include, tree breeding, forest economics and marketing, forestry extension and forest pathology. 20% of forestry research personnel in FRIN stated that their research on tree breeding has influenced tree planting among rural farmers. Research reports from FRIN shows that through grafting and budding a lot of improvement has been brought to the fruits of some trees. These tree species include *Garcinia cola*, *Chrysopyllum albidum* and *Irvingia gabonensis*. The improvements brought to the fruits of these tree species include sweetness to the taste of the fruits, Increase to the size of the fruits and resistance to diseases. In addition, improved stocks of tree species like *Garcinia cola*, *Chrysopyllum albidum* and *Irvingia gabonensis* that are resistant to diseases and pests are being developed through research in forest pathology and entomology. However only 5% of research efforts in forest pathology and entomology has influenced tree planting among the local farmers. The reason for this is because occurrence of diseases and pest is not very common among trees that are planted by the rural farmers in the study area. Tree diseases and pest have not been a threat to farmers as such research on tree diseases and pest has little influence on tree planting among rural farmers.

30% of the respondents in the same organization said their research in forest economics has influenced tree planting among rural farmers in the study area. This is due to the fact that research in forest economics and marketing has helped to enlighten some rural farmers on how they can maximize their profit from tree products. These include selling tree products in urban markets, preserving and selling at a later date seeds of trees like *Parkia biglobosa* and *Vitellaria paradoxum* nuts. 100% of forestry extension officials in Forestry Department, Oyo State Ministry of Agriculture and Natural Resources stated that their extension work has influenced tree planting among the rural farmers in the study area. This high percentage is possible because this is one of the principal works of professional foresters in the State Forestry Department. They disseminate information on innovations as well as distribution of tree seedlings to rural farmers in the study area. Other areas of forestry research are not given priority. As such many foresters in the State Forestry Department have carried out research on when and how it is best to disseminate research findings to rural farmers. The result of the research shows that the best period of disseminating research findings to farmers is evenings of Sundays and the best method is the group method. This is the time when majority of the farmers are at home and it will be easier to call them together as a group to address them.

Table 6. Areas Agroforestry Research has influenced tree planting in the Study area.

Forestry Organization	Tree breeding		Forest pathology		Forest Economics		Forestry Extension	
	N	%	N	%	N	%	N	%
FRIN	4	20	1	5	6	30	9	45
Forestry Dept. Oyo State Min. Of Agric	0	0	0	0	0	0	20	100

Source: Field Survey, 2017

4.3. Ways Agroforestry Research Outputs Are Disseminated

Table 7 shows the various ways by which agroforestry research outputs are disseminated to local farmers in the study area. These ways include extension services, supply of tree seedlings and mass media. 50% and 30% of forestry research personnel in FRIN and in Forestry Department, Oyo State Ministry of Agriculture respectively stated that extension services are the ways their research outputs are disseminated to rural farmers in the study areas. 20% and 50% of forestry research personnel in FRIN and Forestry Department Oyo State Ministry of Agriculture respectively stated that making tree seedlings available to rural farmers is one of the ways their research outputs are disseminated. This result shows that Forestry Department, Oyo State Ministry of Agriculture and Natural Resources are more involved in the distribution of improved tree seedlings to local farmers because this is one of their principal function. There is a lower percentage in FRIN because researchers in FRIN are more pre-occupied in carrying out research than in disseminating research outputs.

Table 8 shows that forestry extension services and supply

of tree seedlings have the greatest influence on the willingness of rural farmers to plant trees in the study area. 50% of the respondents (rural farmers) in Saki West LGA of the study area stated that forestry extension service influenced their willingness to plant trees. 55% of the respondents (rural farmers) in Ori-Ire LGA said forestry extension influenced their tree planting. This shows that extension service is very potent in influencing people to plant trees. 50% and 55% of the respondents (rural farmers) in Olorunsogo and Irepo LGAs respectively said that supply of tree seedlings influenced their willingness to plant trees. This also shows that distributing tree seedlings to farmers is also potent in influencing farmers to plant trees. Chi-square test ($p < 0.05$) shows that method of disseminating research outputs by forestry research organizations has a significant association with the willingness of rural farmers to plant trees in the study area (hypothesis 4 of Table 11). This shows that method of disseminating research outputs can have a significant impact on the willingness of people to plant trees. The methods that involve physical contact with farmers will have greater impact. That is why forestry extension and

distribution of tree seedlings to farmers had a greater influence on tree planting in the study area than the mass media method. The mass media method had an average of 31% impact on the willingness of farmers to plant trees. This percentage is low probably because of all the mass media

methods (television, journals, newspapers and magazines) it is only the radio that the rural farmers can afford to buy. Many farmers may not even listen to the radio when the programme is on because they might be busy with other things. Hence the impact of mass media method is low.

Table 7. Ways Agroforestry Research Outputs are disseminated in the Study area.

Name of Research Organization	Extension services		Supply of tree seedlings		Mass media	
	N	%	N	%	N	%
FRIN	5	50	2	20	3	30
Forestry Dept. Oyo State Ministry of Agric	3	30	5	50	2	20

Source: Field Survey, 2017

Table 8. Impact of Agroforestry Research dissemination method on respondents' willingness to plant trees (RuralFarmers).

LGAs	Extension services		Supply of tree seedlings		Mass media	
	N	%	N	%	N	%
Saki West	30	50	24	40	12	20
Itesiwaju	24	40	27	45	21	35
Ori-ire	33	55	21	35	18	30
Olorunsogo	27	45	30	50	24	40
Irepo	21	35	33	55	18	30

NB: There is multiple choice by respondents. Source: Field Survey, 2017

4.4. Problems Faced by Rural Farmers in Tree Planting in the Study Area

Table 9 shows that non-availability of land and tree seedlings are the major problems that hinders rural farmers from planting trees in the study area. 50% of the respondents (rural dwellers) in Saki West, Olorunsogo and Irepo LGAs said that the problem they face that hinders them from planting trees is non-availability of land. These are the poor landless farmers that are either tenants or squatters that cannot be allowed to plant trees because of tenurial problems or land ownership problems. Adedayo [2] and Adedayo [14] noted that tenant farmers and squatters usually cannot plant trees because of land ownership problems.

60% and 50% of the respondents (rural dwellers) in Ori-ire and Irepo LGAs respectively said non-availability of tree seedlings is the problem that hinders them from planting trees in the study area. These categories of respondents are likely to have their own land holdings. Non-availability of tree seedlings is therefore the problem that hinders them from planting trees. Adedayo and Sobola [15] also identified non-availability of tree seedlings as part of the problems faced by rural farmers practicing agroforestry in Osun State, Nigeria. In the same vein, Haq *et al* [16] also noted that lack of access to good quality planting materials is typically a major constraint that prevents rural and urban farmers from planting indigenous fruit trees in the tropics.

Table 9. Problems faced by respondents in tree planting in the Study area (Rural Dwellers).

LGAs	No land		No tree seedlings		Long maturity period of trees	
	N	%	N	%	N	%
Saki west	12	50	9	38	3	13
Itesiwaju	3	30	4	40	3	30
Ori-ire	3	20	9	60	3	20
Olorunsogo	3	50	0	0	3	50
Irepo	6	50	6	50	0	0

Source: Field Survey, 2017

4.5. Problems Faced by Research Personnel in the Conduct of Agroforestry Research

Table 10 shows that 30% and 70% of respondents in FRIN and Forestry Department, Oyo State Ministry of Agriculture respectively stated that the major problem they face in the conduct of agroforestry research is lack of funds. Lack of funds has been a major problem facing the conduct of research in Nigeria. Quite often government doesn't release funds to carry out research activities. Many times funds are sought from donor agencies outside the country to

carry out research activities.

Poor power supply is another major problem facing the conduct of research in the study area. 40% of the respondents (research personnel) in FRIN said that the problem they face in the conduct of agroforestry research is poor power supply. Public power supply in Nigeria is not only epileptic it has been a persistent problem for a long period of time. Conducting adequate research require steady power supply which is not available in Nigeria. It is therefore a problem.

Table 10. Problems faced by Research Personnel in the conduct of Agroforestry Research in the Study area.

Name of organization	Lack of funds		Poor personnel training		Poor equipment		Poor power supply	
	N	%	N	%	N	%	N	%
FRIN	6	30	2	10	4	20	8	40
Forestry Department Oyo Min. of Agric.	14	70	4	20	0	0	2	10

Source: Field Survey, 2017

Table 11. Statistical Test (Chi-square) for hypotheses tested.

Hypothesis	Chi-square calculated	Chi-square Tabulated	DF	Remark
1.Educational qualification of respondents v/s willingness to plant trees	27.47	21.00	12	*
2.Educational qualification of respondents v/s willingness to plant trees	12.20	6.0	2	*
3.Years of experience of forestry research officers v/s impact of their research output on tree planting among local farmers	8.20	6.0	2	*
4.Methods of disseminating research outputs by forestry research organizations v/s impact on tree planting by rural farmers	65.02	11.10	5	*

NB: *-means significant: ns- not significant

5. Ways to Improve the Contributions of Agroforestry Research to Tree Planting Among Rural Farmers

In view of the findings of this research especially on the problems faced by local farmers in planting trees or practicing agroforestry and the problems faced by research organizations in carrying out research and disseminating research output to local farmers, the following strategies can help to improve the contributions of agroforestry research to the adoption of tree planting by rural farmers in the study area.

5.1. Improved Forestry Extension

If research innovations are to get to the rural dwellers who are the ultimate beneficiary of agroforestry research, then there must be an improvement in the forestry extension methods. Table 8 shows that of all the methods of disseminating research outputs to rural farmers, forestry extension has more impact than others. It therefore follows that if forestry extension methods are improved it will help to disseminate agroforestry research to the rural dwellers and help more rural farmers to plant trees. Ogunsola *et al* [12] noted that not all the farmers are utilizing agroforestry practices due to poor forestry extension. They noted that farmers should be encouraged to make use of improved agroforestry practices through improved forestry extension service that will show case the advantages of agroforestry technology practices.

In addition to this, research organizations should establish demonstration plots at strategic locations in the study area. These demonstration plots are to serve as points where research innovations are demonstrated practically to the local farmers. When research innovations are explained and demonstrated to local farmers it will definitely have more impact and help them to adopt research innovations. Keil *et al*. [17] noted that farmers that are involved in on-farm experimentation of agroforestry technologies with the researchers are more likely to adopt the practice than those who are not

5.2. Improved Funding of Forestry Research Activities

One of the major findings of this study is that forestry research activities are poorly funded by government. Table 10 shows that forestry research organizations face the problem of poor funding. Effective research activities require adequate funding, however the reason why forestry research has been poorly funded is because of over-reliance on government or external source of funding for forestry research activities in Nigeria. It is essential that other sources of funding for forestry research must be sought. Especially, funding from domestic sources. FAO [18] noted that forestry officials in Africa has called for more emphasis on local resources given that prospects for external funding are not encouraging. The domestic sources of funding may include sourcing for funds from Non-Governmental Organizations (NGOs) within the country, appropriating certain percentage of the states forestry trust funds (25%) to research activities and appropriating 25% of tax paid by forestry organizations to forestry research. This will go a long way in making more funds available for forestry research activities in the country.

5.3. Improved Training for Forestry Research Personnel

There is the need for improved training for forestry research personnel. This is because training will improve the research skills of forestry personnel. According to Management Study Guide [19] training enhance the skills, capabilities and knowledge of employees, it moulds their thinking and leads to quality performance. As such improved training for forestry research personnel will make them to be more efficient and effective. Improved training of forestry personnel can be achieved by allowing forestry research personnel to go for further education studies both within Nigeria and outside the country. This can be done by making in-service-training opportunities available to forestry research personnel. Research personnel in forestry can apply for scholarships and grants to undergo training both within and outside the country as well as allowing forestry research personnel to attend conferences, research workshops and seminars which will help to improve their research skills.

5.4. Provision of Land to Rural Farmers

Government should come to the aid of rural farmers by helping them to secure land which they can use to plant trees or practice agroforestry. The reason for this is because this study has shown that land ownership is one of the problems facing rural farmers in the study area in planting trees or in the adoption of agroforestry. Adedayo [20] noted that one of the recognized major obstacles to tree growing in the rural areas of Nigeria is non availability of land to plant trees for those that are interested in planting trees. He noted that tenant farmers and squatters find it difficult to plant trees on their farm lands due to tenurial restrictions. As such for these categories of rural dwellers to plant trees government need to come to their aid by making land available to them to plant trees. This will go a long way in promoting tree planting and adoption of agroforestry practices among rural farmers in the country.

5.5. Distribution of Tree Seedlings to Farmers

Forestry research organizations especially the State Forestry Department, Ministry of Agriculture and Natural Resources should make it a point of duty to distribute tree seedlings to rural farmers. The trees to be distributed must be improved tree seedlings that are outputs of researches conducted by forestry research organizations. For this to be successful there must be a close rapport and linkage between the State Forestry Departments and research organizations especially Forestry research Institute of Nigeria. This will go a long way in helping to encourage local farmers to plant trees and adopt agroforestry practices in the study area and all over the country. Adedayo [20] noted that distributing tree seedlings to rural dwellers is a potent strategy that can boost tree planting among rural dwellers (especially farmers) in Nigeria. When tree seedlings are made available to rural dwellers it will ginger them to plant trees either as farm boundaries or to mark important locations on their farms..

5.6. Formation of Farmers Cooperative Society

The State Forestry Department should make concerted efforts to encourage the local farmers to form farmer's cooperative society. When local farmers form cooperative society it will help them to have access to credit facilities or loans from bank and government. It will also help extension officers to have easy access to them and as such local farmers will be more accessible to research innovations in agroforestry and this will help to boost the adoption of agroforestry and tree planting among the local farmers in the study area. Kumar *et al* [21] noted that cooperatives have inherent advantages in tackling the problems of poverty alleviation, food security and employment generation. They noted further that cooperatives have immense potential to deliver goods and services in areas where both the public and private sector have failed. As such cooperatives have the potential of improving the livelihoods of local farmers, meet their local needs and improve their access to innovations.

6. Conclusion

This study has shown that the areas agroforestry research has influenced tree planting among rural farmers include tree breeding, forest pathology, forest economics and marketing and forestry extension. The method of disseminating research outputs by forestry research organizations has a significant association with the willingness of rural famers to plant trees in the study area. Forestry research organizations are however faced with some problems in the conduct of agroforestry research in the study area. These problems include lack of funds, Poor personnel training, poor equipments and poor power supply, The rural farmers are also faced with some problems which hinder them from planting trees. These problems include lack of land, non-availability of tree seedlings and long gestation period of trees. In view of these the following strategies can help to improve the contribution of agroforestry research to the adoption of tree planting among rural farmers in the study area. These strategies include improved forestry extension, improved funding of forestry research activities ,improved training for forestry research personnel, provision of land to rural farmers, distribution of tree seedlings to farmers and formation of farmers' cooperative society.

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