Multipurpose Uses of on-Farm Plants and Hedge Row Trees in Small Scale Farms of Atiba Local Government Area of Oyo State

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Abstract
This research looked into the analysis of smallholder farms with on-farm trees in Atiba Local Government area of Oyo state, Nigeria. The tree types, their uses and incentives to make them more abundantly available to combat carbon emission in and around smallholder farms were also studied.
Structured questionnaire and field verification were tools used to elicit information.
Data collected were analyzed using simple percentages and graphs. Logit regression model was used to measure the contribution of variables that aided farmers resolve to leave in-situ plants and hedge row trees on farms and even plant new ones.
Results showed that only old age farmers living in villages in the study area nurse on-farm trees on their farms (78.78%). All the farmers with trees on their farms are men (100%) with no women representation. Looking at the canopy diameter values of agro-forestry trees in the study area they are so wide and cover large expanse of farm lands.
Using on-farm trees for soup or condiments takes prime importance for the farmers at 100%. Other uses such as for food, timber, charcoal, firewood and shade fell to 80% each while using the trees for essential oil, antiseptic and chewing stick was lowest at 70%. The only variable with significant value at $P < 0.05$ is LAN (Loan for small scale farmers with trees on their farms). However in the study area, the presence or absence of carbon credit (2.2), Training (3.1) and improvement on environmental effects of trees (2.4) effectively determine allowing hedgerow plants in farms by farmers. With the odd ratio of 2 for carbon credit, 3 for training and 2 for improvement on the environmental effects of trees, there is likelihood that farmers will indicate support for plants 2 times for carbon credit availability, 3 times if training is available to farmers and 2 times if there is improvement on the environmental effects of trees through hybridization.
Keywords: Agro-forestry, hedgerow plants, hybridization, Social forestry, recreational forestry

INTRODUCTION

In Nigeria, on farm plants and hedgerow trees are neither invention nor new concept. The practice of combining tree species with crops had been practiced in one form or the other in most parts of the country. However agro-forestry as a concept in applied science is of recent origin. With increase in population of both cattle and human beings in geometrical progression and the land area remaining finite, there is no other alternative but to grow more food and fodder for fibre in an integrated manner on the same unit of land. Consequently, agro forestry is progressively emerging as a new discipline of human knowledge. The recent emphasis on agro-forestry which includes the concept of co-existence of farm and forest is the outcome of the change of people's attitude borne out of dire necessities. Agro-forestry has been defined as a sustainable land management system which increases the overall yield of the land, combines the production of crops (including tree crops) and forest plants and/or animals simultaneously or sequentially, on the same unit of land, and applies management practices that are compatible with the cultural practices of the local population (King and Chandler, 1978). Another definition given by Meigstu (1983) stated that agro-forestry is the deliberate combination of trees with crops plantation or pastures, or both, in an effort to optimize the use of accessible resources to satisfy the objectives of the producer in a sustainable way.
The national commission on agriculture has enlarged the scope of social forestry in view of the socio-economic imperatives of forests for the rural community as well as in the management of forest resources. Consequently the Torres (2006) included the following under the ambit of social forestry:

a. Farm forestry (Agro forestry). Raising rows of trees on bunds or boundaries of farms and individual trees in private agricultural lands.
b. Extension forestry
   i. Mixed forestry comprising creation of fuel, fodder fruit and woodlots in the village common lands and government waste lands.
   ii. Raising of shelter belts and wind breaks.
   iii. Planting of trees on road, canal and rail sides.
   iv. Reforestation of degraded forest lands situated in around human habitats which lost their floristic and faunastic glory because of anthropogenic intervention and biotic interferences.
   v. Recreation forestry
   vi. Urban Forestry

This clearly proves that social forestry is an umbrella subject and we can define it differently, depending on the objectives of the programmes.
Moreover, on-farm plants and edge row trees are an approach to land use that combines raising trees together with agricultural crops and *or* animals (Wikipedia, 2011). Multipurpose trees in agro forestry can yield wood for construction, fuel wood, fodder and fruits and stand in the gap for reduction of carbon emission that could not be adequately done by reserved forests that has gone through excessive deforestation.
The level at which small scale farmers demand for multiple benefits from their farming venture outstand the production size and the situation remain unchanged (IFAD, 2009). The projected level of demand for fuel wood, fodder and fruit is always higher than the cultivated. The policy statement of forest conservation is to maintain between 20% to 25% of the land area under forest cover for the well-being of the nation, regional and global environment (Sohpic *et, al*.; 2002)). There is therefore, the need for further revolutionary strategies to address the issue. Future study is required to determine how to expand the non-wood uses of tropical forests and include them in regional development plans while avoiding over exploitation (Sohpic *et, al*; 2002).
In spite of the fact that over the years, farmers have utilized the benefits of non-timber forests product found on their arable lands, an account has not been made of the increase or decrease productivity, biodiversity, ecological importance and the biometric features of on farm trees (Wesley, 1990). There is therefore the need to identify the type of on-farm trees, the multipurpose use to which the on-farm trees are put as well as incentives that the farmers need to be encouraged in keeping trees on their arable lands in the study area. Environmental Services of Agro-forestry Systems addresses global concerns with an essential collection of presentations on biodiversity and climate change from the First World Congress in Agro-forestry (Orlando, 2004). Respected experts discussed the latest research and data on how agro-forestry systems can help solve environmental problems through carbon sequestration and biodiversity conservation. Dissemination of information on activities of smallholder farmers can be a driving force as an incentive for farmers in this category. ICTs have great potential to boost rural development in developing countries and in general, farmers prefer specific media for the dissemination of particular information (Masuki, 2010).

METHODOLOGY
Methodology is the procedure by which adequate materials were used to have effective findings in this research.

MATERIALS
The following tools were used for the research:

a. Structured questionnaire.
b. Tape/meter rule.
c. Binoculars.
d. Global Positioning System (GPS).
e. Protective equipments e.g. uniform, fitted appendages, jungle boots etc.
f. Survey poles for marking out areas covered by on-farm trees.

QUESTIONNAIRE ADMINISTRATION
Structural packets of questionnaire were designed and administered to cover the following areas:

i. Village dwellers
ii. Farmers with On-farm plants and hedgerow trees on their farms.

The questionnaire administration spread to Villages within the local government that served as the study area.

FIELD VERIFICATION
There were field visits to farms where on-farm plants and hedgerow trees are indicated. This was to ascertain:

i. plants and hedgerow trees type
ii. Crop type
iii. Farm size
iv. Position (GPS) of trees within the farm

THE STUDY AREA
The Atiba Local Government Area of Oyo State is the study area. Atiba Local Council Area has a geographic co-ordinate of Latitude of 7°, 50', 30" and longitude of 3°, 57', 00" and covers a land mass of about 2, 197.53sqkm.

FIELD PROCEDURE
A total enumeration of all on-farm trees were made on the farms that were selectively sampled. The total farm size was measured. Also, the measurement of the plants and edge row trees were made. This included (i) The height of the tree (ii) The crown diameter of trees (iii) the basal diameter of the tree (DBH).

SCOPE OF THE STUDY

The study was centered on three (3) villages of Atiba local government area of Oyo state namely: (i) Elegbo village (ii) Asunle village and (iii) Elete village.

RESULTS AND DISCUSSION

Analysis of Data

The data collected for the study were analyzed using tables and graph(s).

TABLE 1: AGE OF FARMERS IN THE STUDY AREA

AGE RATE	FREQUENCY	PERCENTAGE%
<35	0	0%
36-50	0	0%
51-65	32	22.22%
> 66	112	77.78%

Source: Field Survey, 2012

It is obvious that only old age farmers living in villages in the study area nurse on-farm trees on their farms. This portends a great danger for the future of farming generally and agro-forestry practices in particular.

TABLE 2: GENDER OF FARMERS IN THE STUDY AREA

Gender	Frequency	Percentage%
Male	144	100%
Female	0	0%

Source: Field Survey, 2012

It was discovered that the number of women present and keeping on-farm trees on their farms in the villages in the study area is very low while the number of men is very high.

TABLE 3: LEVEL OF EDUCATION OF FARMERS IN THE STUDY AREA

Education level	Frequency	percentage
No formal education	82	56.94%
Primary education	60	41.67%
Secondary Education	2	8.33%
Tertiary Education	0	1.39%

Source: Field Survey, 2012

In table 3, it was discovered that up to 56.94% of farmers have no formal education. So there should be training programme for these farmers. So that the need for agro-forestry practices can be better explained to the farmers.

TABLE 4: ANALYSIS OF PLANTS IN VISITED FARMS

S/N	Farm Type in group	Type of on-farm trees	Average Basal area of Trees (M^2)	Average farm size	Coordinates of farm centrally located among the group	Average Canopy Diameter (M)
1	Garden egg farms	*Bligha sapida*	0.1875	1,290M^2	Elevation 298m above sea level Longitude: 3°55'38.3" Latitude: 7°53'57.7"	8.85
2	Tomato farms	*Parkia biglobossa*	0.55	1926.25M^2	Elevation 283m above sea level Longitude: 3°55'36.8" Latitude: 7°54' 1.3	22
3	Guinea corn farms	*Elieas guinensis*	0.3	3,640M^2	Elevation 265M above sea level Longitude: 7°54'1 1.2" Latitude: 3°55'20.1"	7
4	Jute mallow farms	*Mangifera Indica*	0.455	3,383.5M^2	Elevation 285M above sea level Longitude: 7°53'57.3" Latitude: 3°55'55.8"	20.5
5	Cocoyam farms	*Anarcadium occiddentales*	0.275	655.5M^2	Elevation 284m above sea level Longitude: 7°53'58.8" Latitude: 3°55'54.2"	13
6	Pepper farms	*Ficus capensis*	0.145	8,81,25M^2	Elevation 284m above sea level Longitude: 7°53'51.9" 12.5 Latitude: 3°55'54.8"	12.5
7	Maize farms	*Azardirachta indica*	0.125	181,25M^2	Elevation 284m above sea level Longitude: 7°53'51.7" Latitude: 3°55'55.0"	8.25
8	Yam farrms	*Khaya ivoriensis*	0.295	2,340M^2	Elevation 301m above sea level Longitude: 7°57'41. 9" Latitude: 4°4'0.9"	14.5
9	Okra farms	*Morinda lucida*	A- 0.15 B-0.11	30,600M^2	Elevation 312m above sea level Longitude: 7°57'47.7" Latitude: 4°3'53.2"	11.5
10	Cassava farms	*Anthodeista vogelic*	0.775	22,100M^2	Elevation 301m above sea level Longitude: 7°57'53.P" Latitude: 4°3 '50.9"	24.75

Source: Verification of field activity, 2012.

In table 4 above, the farms were grouped to ten based on the type of arable crops and the on-farm trees found on them. Looking at the canopy diameter of agro-forestry trees, they are so wide and cover large expanse of farm lands, effective pruning as a form of management of trees will prevent them from competing with arable crops for sunlight and water.

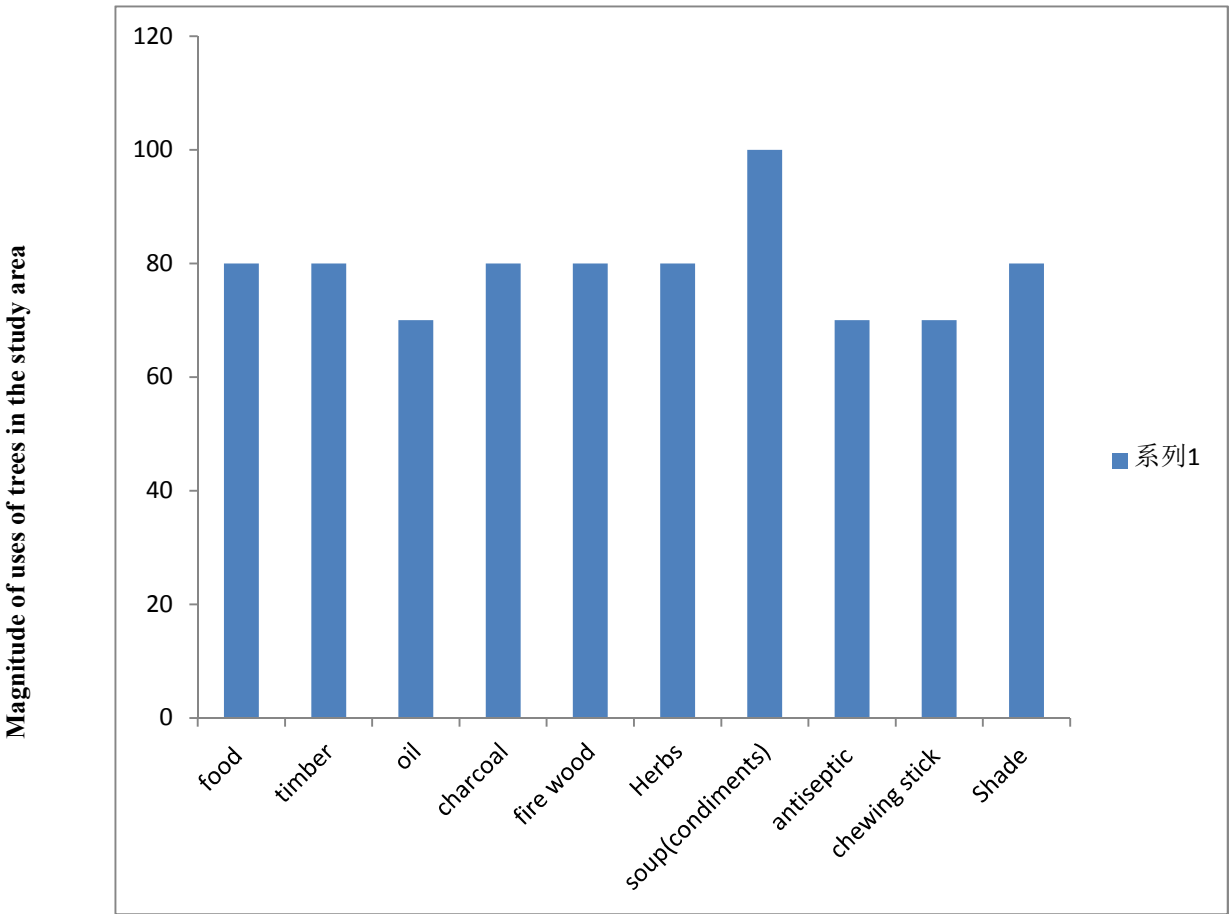

Fig 1: Preference of the use of on-farm plants among farmers

Critically looking at fig. 1 above, using on-farm trees for soup or condiments takes prime important for the farmers at 100%. Other uses such as for food, timber, charcoal, firewood and shade fell to 80% each while using the trees for essential oil, antiseptic and chewing stick was lowest at 70%. Farmers can be better encouraged to tend trees found on their farms if these uses can be made easier for them. That is operations leading to the products listed are made easier through improved technology.

EXPECTED CONTRIBUTION OF FACTILITIES TO KEEPING PLANTS/ AND HEDGEROW TREES ON FARM

Variables used in logit Regression Model

1. The outcome variables (Z): The outcome variable is keeping plants/ hedgerows on small scale arable farms.
2. The independent variables (i-n) The variables used in the model are in the form of dummies:

CAC means carbon credit
TRA means Trainings
IMO means improvement on environmental effects of the species
LAN means Loan for boosting small- scale agro forestry farms
SAM means standard market for sale of products (plants and farm produce within the farms)
Logit regression model is given as:

$Z=\beta_0+ \beta_1x_1+ \beta_2x_2\ldots\ldots\ldots\ldots\ldots\ldots \beta_nx_n$

Where:

β_0=Constant

$\beta_0+ \beta_n$= change in park plant trees population brought about by element 'i' to element 'n'

The expanded logit equation line is given as:

$\text{Ln}\left[\frac{\Pr(T1=1)}{1-\Pr(T1)}\right]$ b_0+b_1 (CAC) + b_2 (TRA) + b_3 (IMO) + b_4 (LAN) + b_5 (SAM)

Z = 1.3 CON + 3CAC- 0.82TRA+ 2.12 IMO + 1.2 LAN + 0.6SAM.

	CAC	TRA	IMO	LAN	SAM
p-value:	0.15	2.10	3.15	0.02	0.12
Odd Ratio:	2.2	3.11	2.4	0.4	0.77

The only variable with significant value at P <0.05 is LAN (Loan for small scale farmers with trees on their

farms). However in the study area, the presence or absence of carbon credit (2.2), Training (3.1) and improvement on environmental effects of trees (2.4) effectively determine allowing hedgerow plants in farms by farmers. With the odd ratio of 2 for carbon credit, 3 for training and 2 for improvement on the environmental effects of trees, there is likelihood that farmers will indicate support for plants 2 times for carbon credit availability, 3 times if training is available to farmers and 2 times if there is improvement on the environmental effects of trees through hybridization.

Multipurpose uses of on farm plant and hedgerow trees

Main Benefits

1. To supplement the farmers income, timber, fuel wood, medicines, green manure, tooth picks, human food, animal folder, flower for bees, shade, and shelters, condiments, chewing stick, oil, charcoal, herbs, antiseptic making paper, roofing, electrifying poles, bridge construction and raw materials for industries etc. all this uses is common in the study area.

Other Benefits of plants and hedgerow trees

1. To make use of the land to the best advantage
2. To gain maximum degree of self adequateness
3. Supply of nutrients to the intercrops
4. Conservation of soil and water.
5. It reduces weeds on the farm land.
6. Pest and disease can also be best managed be selection of entomologically and pathologically desirable mixture of trees and agricultural crops.
7. Rainfall interception: Under agro-forestry system we need not worry much about the rainfall interception because we select tree species having following characteristics: multipurpose, fast growing deep rooted with narrow root zone, deep canopy formation and light canopy to allow sunlight penetration, ability do grow back after cutting e.t.c.
8. Soil Physical Properties: Trees coppice regularly so that roots of trees dies back, thus helping in improving physical properties of soil.
9. Soil organic matter: Report of added organic matter through leaf litter in plantations, improvement of cation exchange capacity, water holding capacity, bulk density, moderate soil pH and improved yield of successive crops have been made in some researches.
10. Fire resistant: act as a fire break
11. Wind breaks can provide protection to crops and soil from the detrimental effects of winds
12. Agro-forestry incorporates at least several plant species into a given land area and creates a more complex habitat that can support a wider variety of birds, insects and other animals

CONCLUSION

Based on the interaction with farmers, farmers should prune hedgerows regularly to prevent them from competing with nearby crops for sunlight and water. When pruned regularly, hedgerows can provide a reliable source of animal fodder and fuel. Farmers can cut the trees when they become competitive and carry the branches to pens where animals are sheltered. Strengthening research, training and extension for successful transfer of technology in farm lands should be encouraged. Provision of credit facilities at concessionary rate to extend the area under cultivation of on farm plants in needed.

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