DETERMINANTS OF UNWILLINGNESS TO PRACTICE FARM FORESTRY AMONG HOUSEHOLDS IN THE HUMID ZONE OF NIGERIA

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Abstract
Public sector dominance of forestry practices across the globe impedes realization of local and international forestry development targets despite huge local and international investments in the sub-sector. The need for private forestry practice as compliment to public initiatives on forestry development therefore becomes imperative. This paper reports the bottlenecks for private farm forestry practices among households in the humid zone of Nigeria where environmental hazards necessitate urgent tree planting initiatives. Groups/individuals with stakes in forestry were identified through stakeholder analysis across selected communities in Imo State, Nigeria. Relevant information was obtained using a set of questionnaire, which are supplemented with FGDs and IDIs. Baseline data on household forestry-based activities were obtained and analysed using Chi-square test of independence and logit regression models. Unwillingness by indigenous residents and local-based farmers was significantly influenced by their household sizes and conservation awareness. Traditional/religious leaders, landlords (landowners) in both communities surveyed correspondingly expressed resilience to propagate or condone forestry/conservation practices in their domain. Local-based farmers and indigenous residents in the study area expressed fear for any land use change that may contravene existing norms and practices. A robust and integrated grassroots' motivation approach towards re-orientations of different categories of stakeholders' mindset is therefore recommended to encourage private sector forestry entrepreneurship in the study area.

Keywords: Stakeholder analysis, Farm forestry practices, Local norms, Forest entrepreneurship

Introduction
Farm forestry involves the incorporation of commercial tree growing into farming systems. It can take the form of plantations on farms, woodlots, timber belts or alleys within farmlands. Evidences show that it is not its scale of operation, planting pattern, the species or the purpose for growing the trees on the land that makes a farm forest but rather the ownership of such outfit (Liu, 1999). Private forestry proponents like Cary and Webb (2001), Li *et al*. (1988) and Thoai and Ranola (2010) analysed the impact, which full and part ownership will have on decision-making and the manner in which such decisions are taken on the success or otherwise of household farm forestry development. Farm forestry

hence is simply the result of a farmer's decision to practice forestry. How such decisions and practices are executed or implemented and their sustenance however depend on the interest, resources and opportunities available to households and their ability to design and manage the trees and vegetation effectively.

Forestry practice in Nigeria and other developing countries is largely public-sector driven and controlled with insignificant private sector participation (Oriola, 2009). This informed why Fujita (2004) and Whiteman (2004) submitted the forestry sub-sector as increasingly limiting to substantially incite economic development and improve livelihood. In-depth studies are needed at individual household and community levels to identify the factors influencing unwillingness to practice farm forestry and which hitherto hinder commercial and entrepreneurial forestry engagement (Bush-Hansen *et al*., 2006; Forestry Commission of Great Britain, 2011). Forest conservation planners and managers can use the information provided in this research to identify and adopt appropriate measures to incite interest and willingness in private forestry enterprises.

Unwillingness denotes non-readiness to carry out an activity voluntarily without compulsion. The rate of non-readiness and/or estimate of the level of unwillingness to engage in specific forestry activities and their determinants are vital to development-based sociologists and public sector policy makers. More so, the above development-based practitioners are the ones charged with the responsibilities of implementation and allocation of resources in the forestry sub-sector to matching funds as well as evoking local participation in conservation programmes. In spite of the fact that major forestry projects are designed and executed on large-scaled public-owned lands, small and medium scale household involvement and participations are critical for the success of any local or regional forestry development programme.

Empirical and Conceptual Framework
About 70 percent of the all vegetation types in Australia are either under individual/private freehold management or under indigenous communities (IFA, 2008). As submitted by Denyse *et al*. (2008) private landholders are motivated to plant trees for three distinctive reasons: personal satisfaction (producing a legacy for descendants), commercial (income

production) and environmental benefits (land and water protection). Household choices and priorities may vary over the farm or change over time. Farm forestry is all about households choosing to commit their resources to the development and management of forests. Farm forestry can supply timber and other forest products and services to the forest industry from private land. For example, a forest initially established or managed for fruit tree production, wildlife or land protection might later be put into timber production or valued for its aesthetics or biodiversity. Depending on the household choice and scale of operation, trees on farmlands may either displace agricultural crops or increase agricultural crop productivity. The latter seems more operationalized in less developed societies where farm forestry contributes to land sustainability, improvement in economic, social and environmental capital.

Like in other parts of Africa and beyond, Nigerian forests have suffered severe deforestation resulting from both anthropogenic and natural factors whose catastrophic results on biodiversity are manifold especially to vulnerable population groups. The above incidence and the recognition of the benefits of returning land to conditions similar to those of the past has incited the promotion of small scale farm forestry as an attempt towards restoring environmental and ecological balance. In developed countries, there is a range of incentives and assistance schemes for establishing small scale forestry plots available to landholders. Programmes to encourage farm forestry for households are usually the most direct way to help farming households create and strengthen tree management systems at the private sector levels. As this is a form of low intensity forestry strategy/choice which brings financial gain, tree management in farm forestry enterprise will not involve the use of high labour and capital inputs.

Seong-Hoon *et al*. (2005) reported willingness to participate in forestry and land conservation activities among households as a function of the use and value, which they derive from such forestry and conservation activities. German *et al*. (2009) observed weak extension capacity, lack of knowledge in tree cultivation, scarcity of tree seedlings and farmers' resource endowment as major disincentives to tree growing by the household farmers. In the survey, commercial reasons for tree planting were rated lower than personal satisfaction and environmental reasons implying that farm forestry schemes that incorporate personal and environmental values are likely to be more acceptable particularly those which provide base for improvements in household income and cost savings through provision of multiple benefits (German *et al*., 2009).

This paper observed apathy among residence of the study area towards farm forestry despite observed menace of environmental degradation and therefore reports on what could be responsible with the view to finding environmentally sustainable and socially feasible solution the apathy.

Methodology
Study Area
The humid zone of Nigeria covers over 455,000km^2 or approximately half of Nigeria and a third of the ecological zones in West Africa (Jahnke, 1982). The region/zone has five vegetation subzones but the Guinea and derived savanna subzones in the southern region of Nigeria account for about 90%. Imo State (southeastern part of Nigeria) was randomly selected for the study from which four zones were targeted. These include Orlu, Okigwe, Mbaise and Mbano, which experience between 2,250 and 2,500mm of rainfall annually (Njoku-Tony and Nwoko, 2009). Similarly, soils of the area are generally sandy/loam and vegetation is typically rainforest.

There were no records of private forestry establishments across the study area. However, patches of narrow strip of government owned forest plantations can be found in some areas in Mbaise. Poverty, land fragmentation, continuous cropping and low fallow periods influence majority of the farmer decisions of land uses and agro-enterprise activities.

Field Studies
The study included a preliminary survey, which adopted a mix of desk reviews on the trend of forestry practice from documented texts and group discussion with some randomly selected residents in communities across the study sites. This was to identify potential individuals and groups to target in grassroot or household forestry practice programme. Stakeholder analysis was conducted at the end of which a list of major stakeholders were identified and subsequently targeted for the study. Members that made the list from the identified stakeholders met a minimum of half of the following predefined criteria: headship position in their households, reputable community members; decision takers at both the household and community levels; small/medium scale land users. Individuals that met the above criteria formed the respondents (population) for the study (Table 1).

A set of questionnaire (open and closed ended) was used to elicit relevant information. Respondents supplied information (baseline data) on different farm-based forestry activities practiced in their respective areas. The level of (un)willingness and likely reasons for unwillingness were also obtained from the respondents. Apart from these, information

on household capacity to access forestry extension services, size of households, interest for collaboration among households in farm forestry, size of household landholding, education/knowledge about farm forestry and level of access to credit were obtained from group discussions. Gaps identified after the survey and further probe into salient issues of cognate research interest were made up for through in-depth interviews (IDIs) with key informants drawn from local-based farmer groups, unions and cooperatives in the sampling sites.

Chi-square and logit regression models were used to analyse the data obtained from the study. Variables employed in the above analyses were dichotomous obtained from closed-ended questionnaire and continuous numeric data (from open ended responses). Chi-square, in Adesoye (2004) is a fitting model in questionnaire analysis involving discrete and/or continuous data which in this study were compactly coded, presented in cross-tabulated categories and fed in choice statistical software in appropriate format. In each model used (chi-square, logit), respondents' willingness to practice farm forestry (which elicited either Yes or No response) was the controlling question upon which the chi-square and logit analyses were based. In logit, only dichotomous independent data were conditioned for statistical analysis which were coded only in binary terms (1 and 0 for Yes and No responses respectively).

Chi-Square analysis:

$$x^2 = \sum_{i=1}^{k} \left[\frac{(x_1 - m_1)^2}{m_1} \right] \dots\dots\dots\dots\dots\dots\dots$$

..(Equation 1)

x^2 = Chi-square (predictor value) at 5% probability level

k = number of groups recognized

x_1 = observed counts for the ith group

m_1 = expected counts in the ith group

$x_1 \dots x_n$ independent variables considered included household size, level of knowledge/education, level of cultural compatibility of farm forestry within local farming systems, size of landholding and control of decision making in land use.

$$Z = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots \beta_k X_k + E_i \dots\dots\dots\dots\dots (Equation 2)$$

Where:

β_0 = constant

$\beta_1 \dots \beta_k$ = coefficients

$X_i \dots X_k$ = independent variables (access to credits, access to extension services, interest to collaborate, gestation period for forest trees, insecurity of tenure).

E_i = error or random disturbance term

$$Z = \ln\left(\frac{P_i}{1 - P_i}\right)$$

$\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots$ (Equation 3)

Where:

ln = natural logarithm

P_i = estimated probability of a respondent being unwilling to engage in household farm forestry

$1 - P_i$ = estimated probability of a respondent being willing to engage in household farm forestry

Results and Discussion

Indigenous residents and farmers accounted for about two-third (81 out of 138) of the total population of the study. Other categories of respondents included land owners, farmers, forestry staff and traditional/religious leaders.

Table 1: Major stakeholders in household farm-based agroforestry practices in the study area

Stakeholders	Category	Rural	Urban
Indigenes	Indigenous residents	28	21
Forestry Department	Senior staff of the Forestry Department at the sub-zones/community levels	6	14
Traditional/Religious leaders	Ezes, Chiefs, Pastors and Traditional fetish worshippers	12	9
Land owners	Landlords	6	10
Farmers	Subsistent/commercial farmers	14	18
Sub-Total		66	72
Total		138	

Household forestry practices and determinants

The planting of fruit trees and tending of gardens (76.8%) as well as the integration of trees within croplands (44.2%) were forestry-related activities, which cut across different stakeholder groups in the study (Table 2). Preferences were also expressed by respondents for livestock and fisheries/wildlife domestication (33.3%) as well as fallow agriculture/woodlot (31.9%).

Table 2: Baseline information on the level of forestry-related enterprise activities undertaken across the study area by different stakeholder groups

Forestry Activities	Residents	Forestry Staffs	Traditional/Religious leaders	Landlords	Farmers	Total (%)
Integration of trees within croplands	19	3	2	8	29	61(44.2)
Fruit trees and gardens	46	10	9	10	31	106(76.8)
Growing ornamentals for landscaping/horticulture	2	-	-	11	-	13(9.4)
Fallow agriculture/woodlot	13	5	-	2	24	44(31.9)
Bee-keeping/honey production	-	9	-	-	-	9(6.5)
Fisheries, wildlife/livestock domestication	25	-	6	4	11	46(33.3)
Community tree growing/forestry	1	5	-	-	-	6(4.3)
Growing trees in hedgerows for erosion control/land stabilization	33	3	-	-	-	36(26.1)

Interviews with key informants revealed increasing fragmentation of household landholding, centrality of agriculture in most household enterprise activities and the declining trend in land productivity arising from poor land management. In spite of plurality of land users in the agrarian communities, which characterize the informal sector of the Nigeria economy, the highest prevalence in the practice of growing fruit trees and gardens; and intercropping trees with crops by all groups of respondents signified the likely acceptance and compatibility of such forestry enterprise options with household land uses.

Generally the practice of community forestry (4.3%), honey production (6.5%) and landscaping/horticulture (9.4%) was low among identified land uses by the study (Table 2). Where capacity of the staff of the forestry department is strengthened, it can be a useful instrument to encourage household engagement and participation especially in bee-keeping and community forestry. The above baseline information (Table 2) is indicative of possible agro-enterprise land use development in the study area, which could incorporate household farm forestry development targeted at specific stakeholder groups. This is because although among minority, identified land use practices among respondents indicate knowledge and awareness of farm forestry practice.

Levels of household unwillingness to practice farm forestry
Expectedly, comparatively higher number of respondents (43.5%) expressed unwillingness to practice farm forestry showing low acceptability for household involvement in small scale forestry activities within their lands (Table 3). This may not be unconnected with the low awareness and by extension knowledge about the practice.

Table 3: Rate of unwillingness for household farm forestry in the study area

Rate of willingness	Frequency	Percentage (%)
Not willing	60	43.5
Willing	44	31.9
No Response	34	24.6
Total	**138**	**100.0**

Table 4: Perceived reasons which influenced household unwillingness for participation in farm forestry (N=60)

Reasons	Frequency	Percentage
Large household size	34	56.7
Lack capacity to access forestry extension service	43	71.7
Low level of education/knowledge about forestry	13	21.6
Non-compatibility of forestry with traditional land use practices	23	38.3
Resistance for collaboration with other households in joint farm forestry	14	23.3
Insecurity of tenure holdings	29	48.3
None/small size of landholding	33	55.0
Lack of access to credit	24	40.0
Landowners' monopoly of choice of land use	19	31.7
Fear that government will take over such forestland	16	26.7
Own lands are still productive	14	23.3
Long gestation period for forest trees	25	41.6
Slow returns from forestry	6	10.0

Exploiting respondents' unwillingness to engage in farm forestry practice(s) (Table 4), the major reasons adduced include poor access to forestry extension services (71.7%), large household size (56.7%), land dearth/deficiency (55.0%), long duration (gestation) for tree maturity (41.6%), lack of access to credit facilities such as soft loans, subsidies and grants (40.0%) as well as the perceived non-compatibility of forestry concerns with the study area's traditional land use enterprises (38.3%).

In a survey carried out in Queensland as documented by the Cooperative Research Centre (1999), the most significant impediments to tree planting for commercial purposes identified by landholders were: mistrust of government officials, a long wait for harvest (returns), fears that government regulations may prevent future harvest of the proceeds, lack of sufficient household capital and disinterest to remove land from existing profitable use. This early findings did not deviate much from that of the study area (Table 4). An analysis of identified categories of impediments from this study showed structural and economic impediments as major factors, which was followed by government bureaucracy and poor socio-psychological perception of farm forestry practices among landholders. This by inference would include: factors associated with the uncertainty of future cash flows flow from farm forestry practice(s) and the concerns that government intervention will place restrictions on landholders in terms of tree management and harvest.

In Nigeria, forestry incentives often come in forms of improved tree seedlings but are not always backed up with free/subsidized access to forestry extension services (71.7%). Alao (2008) had earlier observed a precarious forest extension manpower deficit across different African countries particularly in sub-Saharan Africa (SSA). He suggested capacity building and access to essential inputs (provision of extension service and seedlings, respectively) as possible stimulant for engagement of households in farm forestry in the region (Alao, 2008).

Given the usually long gestation period of forest trees, 41.6% of households sampled for this study were unwilling to practice farm forestry (Table 4). In some communities in India, for instance, government efforts at demonstrating farm forestry practice using short duration forest trees has significantly improved participation in forestry activities by households (Poffenberger and McGean, 1996). Improved forest tree seedlings, which can grow and mature within short duration could well step up willingness of household to engage in farm forestry practice. The Forestry Research Institute of Nigeria (FRIN), National Biotechnology Development Centre (NBDC) and similar research based organizations in Nigeria can find even easier propagation methods for fruits and other tree types and species, which have potentials of maturing early as well as producing multiple returns/benefits to households.

Results of the inferential analysis (Table 5) showed that household size, level of education and awareness/knowledge about forestry, monopoly/control of decision on the form of activities to undertake are significant factors, which influenced household engagement in farm forestry by some groups of stakeholders'. However, household

size and knowledge level were significant determinants of practicing farm forestry by farmers and other indigenous residents (the dominant stakeholder groups) across the study area. Thus, households with lower dependency ratios will likely engage more in farm forestry than those with higher dependency ratios (Table 5). This finding is in agreement with that of Browder *et al.* (2004), which submitted control over decision-making, household agricultural land quality, farm size, farming experience, distance to market, farm age, off-farm income, participation, initial wealth status of households and technical knowledge as factors responsible for willingness of rural households to engage in farm forestry practice(s). it did not defile logic that decision-making will be faster the lower the number of people involved and knowledge level will determine to a very large extent, the interest in and by participation in any activity.

Table 5: Summary of chi-square test of independence on factors influencing unwillingness for farm forestry

Variables	df (x^2 Tab)	Indigenous Residents	Forestry Department	Traditional/Religious leaders	Landowners	Farmers
Household size	3(7.815)	28.845*	6.782	6.849	8.464	26.374*
Education/Knowledge of forestry	1(3.841)	5.944*	0.105	1.095	1.166	8.122*
Mistrust of government	1(3.841)	3.074	1.474	0.448	1.863	0.655
Size of landholding	3(7.815)	5.008	5.806	5.099	4.909	5.877
Decision taking on forestry land use	1(3.841)	0.154	1.272	6.842*	5.674*	1.287
Rural/Urban communities	1(3.841)	5.450*	5.973*	0.757	7.772*	13.040*

*Chi-square values are significant at p<0.05 probability level

Farm forestry activities for households make sense both at individual household level and at the wider public level where either medium or long term thrust of farm forestry schemes agree with local and cultural priorities and needs. In this case, the prospect of farm forestry practice with promising result will be more assured. Across some regions in Costa Rica where local people are already advanced in traditional agroforestry systems for instance, farm forestry interventions have focused on refining and adapting the local/traditional systems with the view to increasing overall productivity (Harrison *et al.*, 1998). Even in some instances, farmers have volunteered, for example, to test new types of shade trees for use in their perennial crop plantations (Budowski, 1977).

Also, logit regression results (Table 6) shows that out of the five variables considered, access to extension service will most likely limit household involvement in farm forestry in the study area (Odds Ratio=-19.896). Access to forestry extension services can significantly improve household farm forestry in the study area. With respondents preference for integrating tree growing with traditional crop farming and raising fruit trees in the study area (Table 3) comes opportunity for extension of services on ways of incorporating a mix of fast growing exotic and improved indigenous tree species with livestock and food crop with the view to optimize returns. Demonstration plantings will almost certainly play an essential role in establishing local confidence and support. The design and scope of such a programme will be determined and its success evaluated by the extent to which practitioners believe they will benefit from the exercise. Regardless of the theoretical advantages of novel planting techniques or of new species, or the fact that they may be widely used in other parts of the world, local farmers are likely to view such approaches skeptically until amply proven. Once households are convinced of the advantages of new techniques or species, widespread adoption can follow very rapidly.

Table 6: Summary of the binary logistic regression of the effect of selected variables on respondents' unwillingness for farm forestry participation in the study area

Variables	Odds Ratio	S.E.	Z-score	Sig. Level
Access to credit	-0.774	0.668	2.090	0.246
Access to extension service	-19.896	0.315	4.724	0.999*
Eagerness to collaborate	-1.003	0.665	4.033	0.126
Long gestation period	-0.370	0.699	1.814	0.596
Land tenure insecurity	0.761	0.735	0.041	0.301
Constant	-0.021	0.689	9.561	0.975

*Significant at 0.05 level
2-Log Likelihood Ratio = 66.505
Chi-square (5.d.f): 12.092*

There stands to be huge gains derivable from concentrating efforts on making progressive and incremental improvements to existing traditional land-use systems of local people. It provides an important basis for the introduction of other scientific innovations of forestry importance in future land use planning exercise. Interventions, which are compatible with existing practices have the advantage that their impact may be more easily perceived and their effects more readily understood by local farmers (Current *et al*., 1995). It may be useful to investigate if land-use practices in other areas are evolving in a way in which farm forestry can be incorporated. Farm forestry for household production activities, which focus on single benefits has often not proven sustainable in the long run. Programmes, which have incorporated multipurpose trees into agricultural production systems have received broader support. Encouraging farm forestry in order to meet local and most times subsistence needs is especially appropriate where trees may improve the conditions of people living at the margins of rural poverty. Also, where there are commercial markets for wood or for other tree products, farmers will be willing to undertake a more intensive programme of tree management and cultivation to produce goods for sale. Under these circumstances, trees assume the character of many cash crops: they must be planted, harvested and marketed at any stage and this require government support and encouragement.

Resident in urban and rural communities was also found to influence types of farm forestry practice(s) preferred by households in the study area (Table 5). Except among landowners, the residential types tend to influence willingness of other stakeholders' (farmers, residents and traditional/religious leaders as well as staff of the Forestry Department) to practice farm forestry. In urban areas, tree crops can be more profitable than alternative crops; they can allow an economic use of land unsuitable for agriculture; they may be more easily adapted to family labour availability than other farm activities. As they do not perish if not harvested at a particular time, trees can be left growing until market conditions are favourable and can thus be less financially risky than

bi-annual, annual and even bi-ennial crops. Once established, trees may also survive times of drought better than other crops. Studies in Senegal have indicated increases in crop (millet) yields by an average of about 50 percent on land under *Acacia Spp* tree canopy (Felker, 1978). Similar study has also been reported in Burkina Faso in which over 10 percent increases were recorded in millet and sorghum production under tree-enriched plots (Roose *et al*., 1999). In Nepal, farmers tend to grow fruit trees on their own land but rely on their fuelwood supplies from communal forests. This is because of the greater control which household lands permit peasant farmers in terms of management and access to the benefits than in communal lands.

Conclusion
The role which farm forestry can play in arresting diminishing environmental quality in the study area is not lost on some residents. The willingness to embrace some farm forestry practices is not nil as well. However, the lack of knowledge about the practice coupled with the fear of the effect of the unknown on the known and popular land uses is a key issue to be considered, if farm forestry is to be popular as an important rural enterprise. With success stories from similar settlements outside Nigeria and the practice of element of farm forestry by some members of the studied communities, popularizing farm forestry practice will be achievable in the humid part of Nigeria.

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