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Adoption of Improved Agro-Forestry Technologies among Small-scale Farmers in the Federal Capital Territory (FCT) and Nasarawa State, Nigeria

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Abstract

This study examined the adoption of improved agroforestry technologies among 200 small-scale farmers in Nasarawa State and the Federal Capital Territory (FCT), Abuja, using a multistage sampling technique and structured questionnaires. Data were analyzed using descriptive statistics and multiple linear regression. The most widely adopted practices in Nasarawa were alley farming (80.9%), multipurpose trees on cropland (77.3%), and indigenous fruit trees (73.6%). Similarly, in the FCT, alley farming (82.2%), multipurpose trees on cropland (76.7%), and indigenous fruit trees (66.7%) showed high adoption rates. Awareness of alley farming was higher in the FCT (77.8%) than in Nasarawa (67.2%), while alley-cropping awareness was higher in Nasarawa (66.4%) compared to the FCT (56.7%). Key information sources included family and friends (87.8%), research institutes (66.2%), and extension workers (62.2%) in the FCT; while in Nasarawa, both extension workers and cooperative societies each accounted for 54.5% of the information source. Reported benefits of adoption were; increased income (80.9% in Nasarawa; 70.0% in FCT), soil erosion control (44.5% in Nasarawa; 73.3% in FCT), and access to firewood (49.1% in Nasarawa; 56.7% in FCT). The major constraints identified were high cost of labour ($\bar{x}$ = 4.47, in Nasarawa; $\bar{x}$ = 4.44 in FCT), land ownership issues ($\bar{x}$ = 4.08 in Nasarawa), and drought ($\bar{x}$ = 4.37 in FCT). The study concludes that while adoption levels for key technologies are high, there is a need for intensive awareness campaigns and training workshops to improve farmers' understanding and promote broader uptake of improved agroforestry technologies.

Keywords: Adoption, improved, agro-forestry, technologies, small-scale, farmers.

Introduction: Agriculture has long been the backbone of Nigeria's economy, supporting a large portion of the population, especially small-scale farmers. However, increasing challenges such as land degradation, deforestation, erratic rainfall, and climate change continue to threaten food security, agricultural productivity, and rural livelihoods. In response to these environmental and socio-economic pressures, the adoption of sustainable land-use practices such as agroforestry has become increasingly important. Agroforestry the deliberate integration of trees, crops, and/or livestock on the same land has been widely recognized for its ability to enhance agricultural productivity, restore degraded lands, and support environmental sustainability (Boni, Goji, Teru, & Njodi, 2022). Agroforestry systems offer multiple benefits, including improved soil fertility, biodiversity conservation, income diversification, fuelwood supply, and climate change mitigation (Akinwalere, 2017; Olujobi, 2018). These systems are ecologically based and dynamic, promoting both short- and long-term resilience for farming communities. Historically practiced across various cultures, agroforestry is now widely accepted as a scientific and sustainable land management approach that increases productivity while preserving natural resources (Mulukh *et al*., 2017; Sageetha, Shanmugam & Usha, 2016). Adoption, defined as the decision to make full use of an innovation (Orisakwe & Agomuo, 2011), plays a critical role in the success and diffusion of agroforestry technologies. These technologies include a mix of agricultural, forestry, horticultural, and livestock-based practices. However, despite the proven advantages of improved agroforestry systems, adoption among small-scale farmers in Nigeria remains limited (Akosim, Tella & Jatau, 2020; Orisakwe & Agomuo, 2011). Several studies have attributed this low adoption to factors such as weak research-extension linkages, socio-economic disparities, cultural beliefs, poor access to credit and inputs, and mismatches between technologies and farmers' needs (Ishola *et al*., 2020; Naibi, 2013). In regions such as the Federal Capital Territory (FCT) and Nasarawa State, where agro-ecological conditions are favourable and land-use pressures are high, there is a need to understand the factors that drive or hinder the uptake of improved agroforestry technologies. While various government and donor-supported agroforestry initiatives have been introduced in

these areas, the extent of adoption and the influencing socio-economic, institutional, and awareness-related factors remain under-explored. Addressing this gap is critical for designing effective extension strategies and policies that will promote wider adoption of agroforestry and enhance both environmental and livelihood outcomes.

Agroforestry technologies such as alley farming, integration of trees on cropland, shelterbelts, windbreaks, home gardens, fodder banks, improved fallows, biomass transfer, and woodlots offer immense potential for enhancing sustainable agriculture. These technologies contribute to improved soil fertility, increased crop yields, climate resilience, environmental conservation, income diversification, and overall rural livelihood improvement. Despite these evident benefits, the level of adoption among small-scale farmers in Nigeria remains suboptimal, particularly in Nasarawa State and the Federal Capital Territory (FCT), Abuja. This low adoption rate raises concerns about the factors influencing farmers' decisions to embrace or reject these technologies. Limited empirical evidence exists regarding the socio-economic characteristics of agroforestry farmers, their level of awareness of improved agroforestry practices, and the sources through which they access such information. Furthermore, the extent to which adoption differs between regions and the specific constraints that hinder wider uptake remain insufficiently explored. Understanding these critical dimensions is necessary to inform targeted interventions that promote broader and more effective adoption. Against this backdrop, this study seeks to: (i) describe the socio-economic characteristics of small-scale agroforestry farmers in Nasarawa State and the FCT; (ii) assess their level of awareness of improved agroforestry technologies; (iii) identify the sources of information available to them; (iv) compare the extent of adoption between the two regions; and (v) identify the major constraints affecting adoption. By addressing these issues, the study aims to generate evidence-based insights that will support the formulation of policies and extension strategies geared toward enhancing adoption, improving agricultural productivity, and ensuring environmental sustainability in the study areas.

Materials And Methods:

Study Area: The study was conducted in Nasarawa State and Federal Capital Territory (FCT) in the North Central Nigeria. Nasarawa state is located within latitude 7^{o} and 9^{0} N and longitude of 8^{0} and 32^{0} E. Nasarawa State was created from the former Plateau State in 1996, and it is located in the North Central of Nigeria. The state has a land mass of about 27,117km^{2} (Wikipedia, 2022). The state has a climate typical of the tropical zone because of its location. It has a mean temperature range from 25^{0c} in October to about 36^{0c} in March while rainfall varies from 137.3mm in some places to 145mm in others (NADP, 2021). The state is divided into three Agricultural Zones (Southern, Central and Western). Agriculture forms the base of the overall development thrust of the state with farming as the main occupation of the people in the area (NADP, 2014). The major crops grown in the zone include maize, yam, groundnuts, rice, sesame, sorghum, millets and cowpea. Other crops produced within the area include cassava, melon, sweet potato, okra, and tree crops such as mango, cashew and shear butter (NADP, 2021).The major ethnic groups in the area include Afo, Egbira, Mada, Nyankpa, Eggon, Gwandara, Rindre, Migili, among many others. The Federal Capital Territory lies approximately within the co-ordinate of latitude 6o 45' and 7o 34'E and longitude 8o 25' and 9o 28'N (FCT, 2020).FCT has six Area Councils namely, Kwali, Kuje, Gwagwalada, Abaji, Municipal and Bwari. It is situated within the North Central agro-ecological zone of Nigeria and it is divided into four agricultural zones which are Western zone, Eastern zone, Central zone and Northern zone. It covers an estimated land area of 8,053 square kilometres with an estimated human population of 8.4 million (NPC, 2021). It lies approximately within the co-ordinate of latitude 6o 45' and 7o 34'E and longitude 8o 25' and 9o 28'N (FCT, 1985). The FACU\FDA 1989 reported that the FCT lies just north of the wide alluvial plain formed by the confluence of the Niger and Benue Rivers and it is favorable for the cultivation of crops.

Population and Sampling Procedure: The population for this study comprised 399 registered small-scale agroforestry farmers in Nasarawa State and the Federal Capital Territory (FCT), as recorded by the Ministry of Environment and Natural Resources, Nasarawa State, and the Federal Ministry of Environment, FCT (2024). A multistage sampling technique was used to select the respondents. Five Local Government Areas (LGAs) in Nasarawa State Awe, Nasarawa, Karu, Wamba, and Toto and three Area Councils in the FCT Abuja Municipal Area Council (AMAC), Kuje, and Gwagwalada were purposively selected based on their active participation in agroforestry practices, giving a total of eight administrative areas. From each of these areas, two communities known for notable agroforestry activities were also purposively selected. In Nasarawa State, the selected communities included Awe town and Tunga (Awe LGA); Nasarawa town and Laminga (Nasarawa LGA); Karshi and Uke (Karu LGA); Mama and Jida (Wamba LGA); and Toto town and Gadabuke (Toto LGA). In the FCT, the communities selected were Karshi and Sauka (AMAC); Pegi and Dafara (Kuje Area Council); and Dobi and Ibwa (Gwagwalada Area Council), resulting in a total of 16 communities. From each of these 16 communities, 50 percent of the registered small-scale agroforestry farmers were randomly selected using simple random sampling. This yielded a total sample size of 200 respondents who participated in the study (Ministry of Environment and Natural Resources, Nasarawa State and Federal Ministry of Environment, FCT, 2024).

Method of Data Collection and Analysis: Primary data were collected using structured questionnaires administered to selected agroforestry farmers in the study areas. The data covered socio-economic characteristics, types of agroforestry technologies practiced, sources of information, level of adoption and challenges faced in adopting these technologies. Trained enumerators assisted in administering the questionnaires. Data were analyzed using descriptive tools such as percentages, frequencies, means, rankings (objective i- iv). A 5-point Likert scale was used to measure the problems militating against the adoption of improved agro-forestry technologies among respondents in the study area.

Five point Likert type scale: A five point Likert type scale was used to measure the problems militating against the adoption of improved agro-forestry technologies among respondents in the study area. Respondents were asked to specify the magnitude of the severity of the level of problems militating against the adoption of improved agro-forestry technologies on the statements using a 5-point likert scale of very serious (VS) =5, serious (S) = 4 Moderately Serious (MS) =3, Not Very Serious(NVS) = 2 and Not Serious (NS) = 1. Weight of 5, 4, 3, 2, and 1 was allocated to each response. A weighted mean of ≥ 3 means serious, whereas any weighted mean of < 3 means not serious. For each response, a weighted average is obtained as follows:

$$\overline{X} = \frac{\sum Fi\,(Ai)}{5 + 4 + 3 + 2 + 1}$$

$$\frac{}{5}$$

Where,

Fi = frequency of respondents who agreed with a particular rating

Ai = value assigned to each rating

N = sample size

∑ = summation

VS = very serious

S = serious

MS = moderately serious

NVS = not very serious

NS = Not serious

Results and Discussion: **Socio-economic Characteristics of Respondents in FCT and Nasarawa States**: The average age of agroforestry farmers was about 42 years in both Nasarawa State (41.7) and the FCT (41.6), with over 65% of respondents aged above 38. This suggests they are within economically productive age groups, a factor shown to influence adoption of technologies (Ibrahim *et al*., 2019). Agroforestry in both areas was male-dominated 77.3% in Nasarawa and 75.6% in the FCT likely due to gendered land ownership patterns and the labour-intensive nature of the practice, which aligns with findings by Ishola *et al*. (2020). Most respondents were married (91.8% in Nasarawa and 92.2% in FCT), a status associated with increased farming responsibilities and rational decision-making (Ibrahim *et al*., 2019). Household size was generally larger in Nasarawa (mean = 9 persons), compared to smaller households in the FCT. Larger families offer more family labour but may also increase financial burdens (Obadimu *et al*., 2020). All respondents were educated, with most having primary to tertiary education, enhancing their capacity to adopt improved practices. This supports findings by Ishola *et al.* (2020), who observed that over 91% of respondents in their study were literate. Farming experience ranged from 1–10 years for most respondents (85.5% in Nasarawa, 80% in FCT), with average experience at 7.7 and 7.8 years, respectively. Experience improves resource use and sustainability awareness (Ishola *et al*., 2020). High levels of cooperative membership were recorded (90.9% in Nasarawa; 87.8% in FCT), reflecting the role of cooperatives in providing access to credit, inputs, and information. About 72% of respondents in both states had contact with extension agents, but frequency was low. This limits access to technical knowledge despite the importance of extension in promoting innovation (Ishola et al., 2020). Access to loans was relatively good 71.8% in Nasarawa and 72.2% in the FCT with most funds sourced from cooperatives and friends. Loans enable investment in technologies and inputs. Farmers in Nasarawa accessed an average of ₦295,636.36,

while those in the FCT accessed ₦335,666.67. Though FCT farmers accessed slightly higher amounts, overall loan size was still modest, potentially constraining investment in agroforestry. All respondents had access to land, mainly through family inheritance (90.0% in Nasarawa; 81.1% in FCT). This reflects the dominance of customary land tenure. Farm sizes were mostly small 1–5 hectares with average landholding at 3.4 ha. This confirms the smallholder nature of respondents, which may limit full-scale agroforestry adoption. Boni *et al*. (2022) reported similar findings with average land size of 2.71 ha, linked to rural poverty. Income distribution showed that nearly half of respondents earned over ₦1,000,000 annually in both states. The average income was slightly higher in Nasarawa (₦1,384,545.45) than in the FCT (₦1,375,000), indicating that agroforestry contributes significantly to household income.

Awareness of Improved Agro-Forestry Technologies in Nasarawa State and FCT: Table 2 presents the level of awareness of improved agroforestry technologies among respondents in Nasarawa State and the FCT. Overall, awareness ranged from moderate to high, with some variation between locations and specific practices. Alley farming and alley cropping had the highest awareness levels 67.2% and 66.4% in Nasarawa, and 77.8% and 75.6% in the FCT indicating these practices are well promoted, likely through extension services or development initiatives. Moderate awareness was reported for shelterbelts/windbreaks, home gardening, and multipurpose trees on cropland, with about 50–55% of respondents in both areas familiar with them. Fodder banks and improved fallows also showed similar awareness levels, ranging from 41.8% to 47.8%, suggesting moderate exposure, especially among farmers engaged in mixed farming systems. In contrast, awareness of Taungya farming and boundary planting was low. Only 39.1% of Nasarawa respondents and 25.6% in the FCT were aware of Taungya, while boundary planting was least known, particularly in the FCT (4.4% awareness vs. 25.5% in Nasarawa). This may reflect limited promotion, land tenure challenges, or lack of inclusion in extension programs. Some technologies, such as biomass transfer, had equal awareness levels in both areas (40.0%), while woodlots and improved fallows showed similar figures (around 41–43%), indicating uniform, though modest, dissemination of information. Overall, farmers in the FCT demonstrated slightly higher awareness of most technologies, likely due to better access to extension services, proximity to research centers, and development programs. In contrast, lower awareness in Nasarawa may result from weaker institutional outreach in rural areas. These findings underscore the need for targeted awareness campaigns, particularly for less-known but beneficial agroforestry practices.

Sources of Information on Improved Agro-Forestry Technologies in Nasarawa State and FCT: The assessment of information sources influencing the adoption of improved agro-forestry technologies among small-scale farmers revealed differences between Nasarawa State and the Federal Capital Territory (FCT). In Nasarawa State, key sources of information included cooperative societies and extension workers (both at 54.5%), fellow farmers (53.6%), family and friends (51.8%), and research institutes (52.7%). Radio also played a notable role, cited by 43.6% of respondents. In contrast, farmers in the FCT relied more heavily on interpersonal networks and institutional support. The most prominent source was family and friends (87.8%), followed by research institutes (66.2%), extension workers (62.2%), and cooperative societies (57.7%). Radio was used by 40.0%, and fellow farmers accounted for a relatively lower share (30.0%) compared to Nasarawa State. Additional, less common sources in the FCT included NGOs (11.1%), with smaller proportions also citing radio and cooperative societies (12.2% each), extension workers (6.7%), and research institutes (5.6%) as supplementary channels of information. These variations suggest that while institutional sources like extension services and cooperatives are vital in both regions, farmers in the FCT tend to rely more on informal personal networks, particularly family and friends, for information related to agro-forestry technologies. They also pose challenges related to misinformation and the need for digital access and literacy. This finding is in line with the finding by Karshie, Dagba and Shomkegh (2017) who stated that 38.57% of the farmers became aware of agro-forestry practice(s) through ADP (extension agents). While 24.05, 19.52, and 15.72% respectively sourced their awareness through radio and through fellow farmers respectively.

Level of Adoption of Improved Agro-Forestry Technologies by the Respondents in the Study Area: Table 4 presents the level of adoption of improved agroforestry technologies in Nasarawa State and the Federal Capital Territory (FCT), showing similar patterns across both regions. High adoption was recorded for alley farming (80.9% in Nasarawa; 82.2% in FCT), multipurpose trees on cropland (77.3% and 76.7%, respectively), and planting of indigenous fruit trees (73.6% in Nasarawa; 66.7% in FCT). These figures indicate farmers' preference for technologies offering immediate benefits like improved soil fertility, income, and food value. Moderate adoption was observed for tauyan farming (43.6% in Nasarawa; 42.2% in FCT), and for shelterbelts/windbreaks with home gardening (41.8% in Nasarawa; 35.6% in FCT), reflecting partial integration possibly due to constraints like land or technical knowledge. Low adoption levels were noted for boundary planting (39.1% in Nasarawa; 38.9% in FCT), biomass transfer (20.9% and 31.1%), and woodlots (17.3% and 20.0%). These practices may be limited by land availability, labor demands, or delayed economic returns. In summary, farmers in both regions tend to adopt agroforestry technologies that provide quicker, visible benefits. To increase adoption of underutilized practices, enhanced awareness, technical training, and support services are essential. Addressing land tenure issues and providing incentives could further

encourage adoption and integration of diverse agroforestry technologies.

Problems Militating against Adoption of Improved Agro-Forestry Technologies: Results in Table 5 show the distribution of respondents according to the factors militating against adoption of improved agro-forestry technologies by respondents in the study area. The results in Nasarawa State revealed that the problems militating against adoption of improved agro-forestry technologies by respondents were high costs of labour ($\bar{x}$ = 4.47), problem of land ownership ($\bar{x}$ = 4.08), lack start-up capital ($\bar{x}$ = 4.06), lack of adequate awareness about agro-forestry technologies ($\bar{x}$ = 3.69), lack of technical skills ($\bar{x}$ = 3.36), high cost of farm inputs ($\bar{x}$ = 3.29), lack of viable seeds/seedlings($\bar{x}$ = 3.27), and inadequate farm inputs ($\bar{x}$ = 3.25). In the FCT, the constraints include high cost of labour ($\bar{x}$ = 4.44), problem of drought ($\bar{x}$ = 4.37), limited access to credit ($\bar{x}$ = 3.81), problem of land ownership and lack of adequate awareness about agro-forestry technologies ($\bar{x}$ = 3.32), lack of technical skills ($\bar{x}$ = 3.14), and lack of viable seeds/seedlings ($\bar{x}$ = 3.07). High labour costs discourage adoption due to the intensive nature of some practices, as noted by Boni et al. (2022) in Adamawa State, where 11.9% of farmers identified this issue. Lack of start-up capital limits farmers' ability to invest in tree planting, land preparation, and equipment, a challenge reported by 26.46% of farmers in Rwanda (Mukundente, 2021). Insecure land tenure also poses a major barrier, with 36.67% of respondents in Kaduna State citing it as a constraint (Ishola et al., 2020). Limited access to credit further prevents farmers from financing agroforestry activities, as highlighted by Ibrahim et al. (2019), who reported 70.0% of respondents facing this issue. Similarly, low awareness levels hinder adoption, with 55.0% of farmers in Kaduna State unaware of agroforestry benefits (Ishola *et al*., 2020). Lack of technical skills affects implementation success, with 14% of Rwandan farmers lacking necessary knowledge (Mukundente, 2021). Other notable constraints include the unavailability of viable seeds or seedlings, reported by 12.3% of farmers in Adamawa (Boni *et al*., 2022), and inadequate access to farm inputs, which affected 86.67% of respondents in Kaduna State (Ishola *et al*., 2020). Finally, the high cost of inputs, including fertilizers and agrochemicals, discourages adoption, with 12.3% of farmers in Adamawa reporting this challenge (Boni *et al*., 2022). These findings highlight the need for targeted interventions to improve access to resources, training, and institutional support in order to enhance the adoption of agroforestry technologies.

Conclusion: The study concluded that small-scale farmers in Nasarawa State and the Federal Capital Territory (FCT) have demonstrated relatively high levels of adoption of key improved agroforestry technologies, particularly alley farming, integration of multipurpose trees on cropland, and planting of indigenous fruit trees. The widespread adoption of these technologies highlights farmers' recognition of their benefits in enhancing income, controlling soil erosion, and improving environmental sustainability. Despite these achievements, adoption of other technologies such as woodlots, biomass transfer, and boundary planting remains low. Furthermore, significant challenges persist, including high labour costs, land tenure issues, limited access to credit, lack of start-up capital, and inadequate availability of viable seeds and farm inputs. These constraints affect the full-scale adoption and long-term sustainability of agroforestry technologies. The study also confirmed that socio-economic factors such as extension contact, education level, farm size, and income have a significant influence on adoption behavior in both regions.

Recommendations: Based on the findings, the study recommends the following:

Improved Access to Inputs: Government agencies, NGOs, and research institutions should ensure the availability of viable seeds and planting materials to farmers at subsidized rates.;

Strengthening Extension Services: Agricultural extension agents should be empowered and more frequently deployed to educate and train farmers on the implementation and benefits of agroforestry technologies.; **Provision of Credit and Start-Up Capital**: Financial institutions and cooperative societies should provide accessible credit facilities tailored to smallholder farmers to enable investment in agroforestry systems;. **Awareness and Capacity Building**: Intensive awareness campaigns and training workshops should be organized to improve farmers' understanding and technical know-how on less adopted technologies like woodlots and biomass transfer.; **Addressing Land Tenure Issues**: Policymakers should work towards resolving land ownership challenges to encourage long-term investments in agroforestry practices.; **Infrastructure Development**: Investment in rural infrastructure, especially roads, will enhance market access and reduce the cost of transporting farm inputs and produce.

Table 1: Socio-economic Characteristics of Agro-Forestry Farmers in Nasarawa State and FCT

	Nasarawa State			Federal Capital Territory (FCT)		
Variable	**Freq**	**%**	**Mean**	**Freq**	**%**	**Mean**
Sex						
Male	85	77.3		68	75.6	
Female	25	22.7		22	24.4	
Age (years)						
18-28	4	3.6		3	3.3	

29-38	31	28.2		28	31.1	
Above 38	75	68.2	**41.7**	59	65.6	**41.6**
Marital status						
Single	9	8.2		7	7.8	
Married	101	91.8		83	92.2	
Household size						
1-5	35	31.8		70	77.8	
6-10	49	44.5		18	20.0	
Above 10	26	23.7	**9**	2	2.2	**9**
Level of education						
Primary education	51	46.4		45	50.0	
Secondary education	27	24.5		19	21.1	
Tertiary education	32	29.1		26	28.9	
Farming experience						
1-10	94	85.5		72	80.0	
11-20	16	14.5	**7.7**	18	20.0	**7.8**
Access to loan						
Yes	79	71.8		65	72.2	
No	31	28.2		25	27.8	
Source of loan						
No access to loan	31	28.2		25	27.8	
Neighbours	11	10.0		7	7.8	
Fiends	22	20.0		13	14.4	
Cooperative societies	35	31.8		34	37.8	
Banks	11	10.0		11	12.2	
Amount of loan accessed (Naira)						
No access to loan	31	28.2		98	79.7	
1,000-200,000	39	35.5		12	9.8	
201,000-400,000	21	19.1		6	4.8	
Above 400,000	19	17.3	**295, 636.36**	7	5.7	**335, 666.67**
Membership of cooperative society						
Yes	100	90.9		78	87.8	
No	10	9.1		11	12.2	
Extension contact						
Yes	79	71.8		67	74.4	
No	31	28.2		23	25.6	
Number of visits received						
No extension visits	31	28.2		23	25.6	
1-5	77	70.0		51	56.7	
6-10	2	1.8		14	13.3	
Above 10	0	0.0	5	0	4.4	5
Method of land acquisition						
Farm on family land	92	83.7		73	81.1	
Farm on purchased land	14	12.7		15	16.7	
Gifted land	4	3.6		2	2.2	
Farm size (hectares)						
1-5	98	89.1		83	92.2	
6-10	12	10.9	3.4	7	7.8	
Total annual income						
1,000-500,000	17	15.5		15	16.7	
501,000-1,000,000	39	35.5		33	36.7	
Above 1,000,000	54	49.0	1,384,545.45	42	46.7	1,375,000.00

Source: Field survey, 2024

Table 2: Awareness of Improved Agro-Forestry Technologies by the Respondents in Nasarawa State and FCT

Awareness of Improved Agro-Forestry Technologies	Freq.	**%**	**Freq.**	**%**
	Nasarawa State		**FCT**	
Alley farming	74	67.2	70	77.8
Alley-cropping (hedge row intercropping)	73	66.4	68	75.6
Shelter belt/wind break and home gardening	57	51.8	50	55.6
Multipurpose trees on cropland	55	50.0	46	51.1
Fodder bank	48	43.6	43	47.8
Improved fallows	46	41.8	39	43.3
Taunya farming	43	39.1	23	25.6
Boundary planting	28	25.5	4	4.4
Biomass transfer	44	40.0	36	40.0
Woodlots	46	41.8	39	43.3

Multiple responses

Table 3: Sources of Information on Improved Agro-Forestry Technologies in Nasarawa State and FCT

Sources of Information	Freq.	**%**	**Freq.**	**%**
	Nasarawa State		**FCT**	
Extension workers	60	54.5	56	62.2
Fellow farmers	59	53.6	27	30.0
Family and friends	57	51.8	79	87.7
Radio	48	43.6	36	40.0
NGOs	17	15.5	10	11.1
Cooperative societies	60	54.5	52	57.7
Research institutes	58	52.7	56	62.2

[1]Multiple responses

Table 4. Level of Adoption of Improved Agro-Forestry Technologies in Nasarawa State and FCT

Adoption of Improved Agro-Forestry Technologies	**Nasarawa State**		**FCT**	
	frequency	**%**	**Frequency**	**%**
Alley farming	89	80.9*	74	82.2*
Tauyan farming	48	43.6	38	42.2
Multipurpose trees on cropland	85	77.3*	69	76.7*
Shelter belt/wind break and home gardening	46	41.8	32	35.6
Planting of indigenous fruits trees	381	73.6*	60	66.7*

Boundary planting	43	39.1	35	38.9
Biomass transfer	23	20.9	28	31.1
Woodlots	19	17.3	18	20.0

Multiple responses

Decision rule: Any percentage between above 70% = very high, 61-70% = high, 51 – 60% = moderate, 41 – 50% low, Less than 41% = Very low

* = High level of adoption

Table 5: Problems Militating against Adoption of Improved Agro-Forestry Technologies by Respondent in the Study Area

Problems	**Nasarawa State**		**FCT**	
	x̄	**Ranking**	**x̄**	**Ranking**
Lack of start-up capital	4.06*	2nd	2.89	8th
Lack of technical skills	3.36*	6th	3.14*	5th
Lack of viable seed/seedlings	3.27*	8th	3.07*	6th
High cost of labour	4.78*	1st	4.44*	1st
Limited access to credit	3.47*	5th	3.81*	2nd
Inadequate farm inputs	3.25*	9th	2.74	9th
High incidence of pests and diseases	2.95	10th	2.94	7th
Lack of adequate awareness of improved agro-forestry				
Technologies	3.69*	4th	3.68*	3rd
Problem of land ownership	4.08*	2nd	3.68*	3rd
Fire outbreak	1.71	12th	0.31	11th
High cost of inputs	3.29*	7th	3.32*	4th
Poor access to extension services	2.10	11th	1.71	10th

Multiple responses

Decision rule: A mean of ≥ 3 means serious, whereas any means of < 3 meant not serious

* = Serious constraint

x̄ = mean

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