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# ADOPTION OF AGROFORESTRY PRACTICES AMONG ARABLE CROP FARMERS IN ONA-ARA LOCAL GOVERNMENT AREA, OYO STATE

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***Abstract***
*This study assessed arable farmers' specific socioeconomic features influencing their decision to adopt agroforestry in Ona-Ara local government area, Oyo State. Multistage sampling technique was used to select ninety arable farmers for questionnaire administration. The collected data were analyzed using descriptive statistics and logit regression analysis. Findings from the study revealed that more than half of the respondents (57.8%) fall within the cohort of 41 - 50yrs. Results further showed that (42%) of the respondents adopted the fruit-tree based agroforestry system in the area. The adoption index scale revealed that respondents generally had low adoption scores with an average mean adoption index score of 0.21 which is critically low. This may be connected to inaccessibility to extension services and low awareness on the benefits of adopting agroforestry practices. This further implies that there is a need for more enlightenment about the potentials of agroforestry practices in increasing agricultural productivity among farmers in the study area. Factors influencing farmers' decision to adopt agroforestry practices in the study area were education, farm experience and land ownership. It could be recommended therefore that improved extension services and policies that will promote agroforestry adoption and tree planting among farmers for a healthy agricultural environment.*
***Keywords:*** *Agricultural productivity, Sustainability, land-use system, tree-planting, rural livelihood*

## Introduction

Sustainable agriculture is an increasingly important issue in rural communities due to their reliance on agriculture for livelihood (Odurukwe, 2004). Many countries, especially developing countries like Nigeria is concerned with the need to produce food for its ever-increasing population. Food insecurity, decreasing forest cover, low productivity, high reliance on rain-fed agriculture, natural resource depletion and environmental challenges have been identified as critical problems confronting Nigerian rural farmers (Adimassu *et al.,* 2014). There is an increased concern at international policy levels about the sustainability of agricultural development and the increase in demand for land for sustainable food production in developing countries (FAO, 2004). This, however, calls for the adoption of an environmental-friendly practice and system that combines the deliberate integration of trees and shrubs with crops and/or animals on farmland for economic, social and ecological benefits. This system or practice is referred to as Agroforestry. Agroforestry is a collaborative term for land-use technologies where woody perennials (trees and shrubs) are purposely incorporated with agricultural crops and/or animals on the same land in some forms of spatial arrangements or temporal sequence with implied ecological, social and economic benefits to enhance sustainability, productivity and profitability (Uleh and Usman, 2020). The International Council for Research in Agroforestry now World Agroforestry Centre defined agroforestry as a dynamic ecologically based natural resources management and conservation system that diversifies and sustains production, enhances social, economic and environmental benefits for land users at all levels through the interactions of trees on farm and in the agricultural landscape.

More than 1.3 billion people in the world over practice this technology ranging from open packed assemblages to dense imitation of tropical rainforests with different levels of human involvement in various management (Dawson *et al*. 2013). It was further noted that agroforestry practice is a climate smart agricultural technique that restores ecological balance and promotes environmental sustainability. Studies have shown that the adoption of agroforestry practices notably has proven capacities to increase food and livelihood security, expand Nigerian forest cover, enhance forest conservation service functions, sequester carbon, improve soil fertility, ameliorate environmental challenges and more importantly too, alleviate rural poverty through employment opportunities (Idumah *et al*., 2020).

Agroforestry practices extends from traditional practices to modern practices such as Taungya, home gardens, improved fallows, agrisilviculture, multipurpose trees, plantation–crop combinations, silvopasture, shelterbelts, windbreaks and alley cropping (Alavalapati and Mercer, 2004). Choosing and practicing the appropriate agroforestry system is crucial to arable crop farmers as it offers practical ways of applying various specialized indigenous knowledge and skills to the development of sustainable food production systems. The need for increased food and sustainable agricultural productivity in Nigeria is pivotal considering the country's rapid population growth. However, efforts to popularize agroforestry among arable crop farmers in Nigeria have not yielded the desired results. There is a great awareness and advocacy for rural farmers to adopt agroforestry owing to the vast potentials of agroforestry. Despite this, a good number of rural framers do not incorporate the technology into food production systems (Adesina and Chianu, 2002). For the likelihood importance and benefits of agroforestry to be realized both at micro and macro levels, a wide adoption of the technology becomes very necessary. This will further provide information for policy strategies that will further enhance the adoption of the technology. This study was carried out to investigate the various agroforestry practices adopted by arable farmers in Ona-Ara Local Government Area of Oyo State; identify the benefits derived from adoption and examine the factors influencing their decision to practice agroforestry in the study area.

## Materials and Methods

*Study Area:* Ona-Ara Local Government Area of Oyo State was established in 1989. It occupies a total land area of 3,570km$^2$ with a population of 305,059 as at 2021 using the population growth rate of the area (NPC, 2006). It lies approximately between latitude 7$^o$ 16′ 60N and longitude 4$^o$ 1′ 60E. The local government shares the same boundaries with Oluyole LGA to the South, Egbeda LGA to the North and to the West by Ogun and Osun States.

### Sampling procedure, Data collection

The respondents of the study were 90 registered arable crop farmers in the study area. They were selected through a multistage sampling procedure. In the first stage, eleven wards were identified in Ona-Ara Local Government and purposive method was applied to select five wards. They are Akanran, Badeku, Ajia, Odi-Odeyale and Ojebode. In the second stage, nine villages were selected based on random method. Sample size was determined utilizing the formula provided by Kabatesi and Mbabazi (2016) after which ten farmers were selected from each of the nine selected villages. Primary data was used to elicit information from the farmers.

### Analytical Technique

Descriptive statistics such as pie charts, frequency count and percentages were employed to describe the socio-economic characteristics of the respondents, investigate the various agroforestry practices adopted by arable farmers and identify the benefits derived from adoption. Inferential statistics such as Logit regression model was used to identify factors influencing farmers' decision to adopt agroforestry practices. The model is expressed as:

$$Ln\left[\frac{pi}{1-pi}\right] = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \ldots\ldots\ldots\ldots \beta_5 X_5 + \varepsilon$$

X1 = Education
X2 = Farm size in hectares
X3 = Farm experience in years
X4 = Access to extension contact
X5 = Land Ownership Status
β0 = Constant term
β1 – β9 = Parameters to be estimated
Ɛ = Error term

The adoption index scale method of scoring was also employed in the study. It was used to estimate the extent of adoption of agroforestry practices as used by Malabe *et al.* (2021) with some modifications. The tool categorized adopters into low, moderate and high adopters of agroforestry practices depending on the

score obtained between 0-0.99. The index scale was presented as: 0 = non adoption, 0.1-0.33 = low adoption practice and 0.34-0.59 = moderate adoption practice while a scale of 0.60-0.99 connotes a high adoption practice.

**Results and Discussion**

Table 1 shows the socio-demographic characteristics of the farmers. It was revealed that more than two-third of the respondents (81.1%) were males. This indicates that male farmers were the dominant arable crop producers in the study area. More than half of the respondents (57.8%) fall within the cohort of 41 - 50yrs. This is an indication that the older population is actively involved in arable farming activities in the study area. Farming happens to be the mainstay and the fabric of rural societies which contributes to the rural development and means of livelihood. This result aligns with the findings of Ayeloja and Adedapo, (2010) who reported that farmers' who engage in agriculture and all forestry activities fall with the age group 31-50 years. Majority (53.3%) of the respondents have access to secondary education. This signifies that literacy level among the respondents is substantially high. Educational attainment is an important variable because it could affect the level of awareness and also influence their decision to adopt improved modern farming methods. More than half of the respondents (55%) had farm sizes between one and five hectares. This result implies that majority of the sampled farmers are involved in subsistence farming. The result of land ownership status presented in Table 1 indicates that more than half of the respondents (68.9%) purchased their land. Mode of land acquisition is also a determining factor associated with the decision to plant trees on farm lands. Farmers could be discouraged to adopt improved modern farming methods if the accessibility to farm land/tenure system is unfavourable. The findings also revealed that a small majority of the respondents (47.8%) have arable farming experience of 11 – 20 years. Extent of farming experience according to Ayanlade (2009) indicates a higher utilization and adoption of new farming practices. It is envisioned that extent of farming experience would influence farmers' willingness to adopt agroforestry. Majority of the arable farmers (75.6%) do not have access to extension services. Extension services is an important catalyst for sustainable agricultural productivity. Farmers are motivated and educated on innovations through regular contact with extension agents, who provide adequate information on how to use modern agricultural technologies. Without this, accepting and adopting a new technology may be ineffective.

**Table 1: Demographic Characteristics of the Respondents**

| | ***Frequency (n=90 )*** | ***Percentage*** |
|---|---|---|
| **GENDER** | | |
| Male | 73 | 81.1 |
| Female | 17 | 18.9 |
| **AGE BRACKET** | | |
| ≤ 30 | 8 | 8.9 |
| 31 - 40 | 10 | 11.1 |
| 41 - 50 | 52 | 57.8 |
| > 50 | 20 | 22.2 |
| **EDUCATION** | | |
| No Formal Education | 7 | 7.8 |
| Primary Education | 25 | 27.8 |
| Secondary Education | 48 | 53.3 |
| Tertiary Education | 10 | 11.1 |
| **ARABLE FARMING EXPERIENCE** | | |
| ≤ 10 | 19 | 21.1 |
| 11 - 20 | 43 | 47.8 |
| > 30 | 28 | 31.1 |
| **FARM SIZE (Hectares)** | | |
| 1.1 - 5.0 | 55 | 61.1 |
| 5.1 - 10.0 | 9 | 10.0 |
| > 10 | 26 | 28.9 |
| **LAND OWNERSHIP STATUS** | | |
| Inheritance | 10 | 11.1 |
| Purchase | 62 | 68.9 |
| Lease | 6 | 6.7 |
| Rent | 12 | 13.3 |
| **ACCESS TO EXTENSION AGENT** | | |
| Yes | 22 | 24.4 |
| No | 68 | 75.6 |

**Adopted Agroforestry Practices**

Figure 1 reveals the adopted agroforestry practices in the study area. It was revealed that less than half of the respondents (42%) adopted the fruit-tree based agroforestry system in the area, 24%, 11% and 6% of the respondents adopted home garden, scattered trees and alley/hedge row on their various farms respectively. The high proportion of fruit-tree based adopters might be due to diverse and multipurpose functions of trees. This supports the findings of Adewusi, (2006) who revealed that farmers integrate fruit trees on their farm land for food, income generation and environmental amelioration.

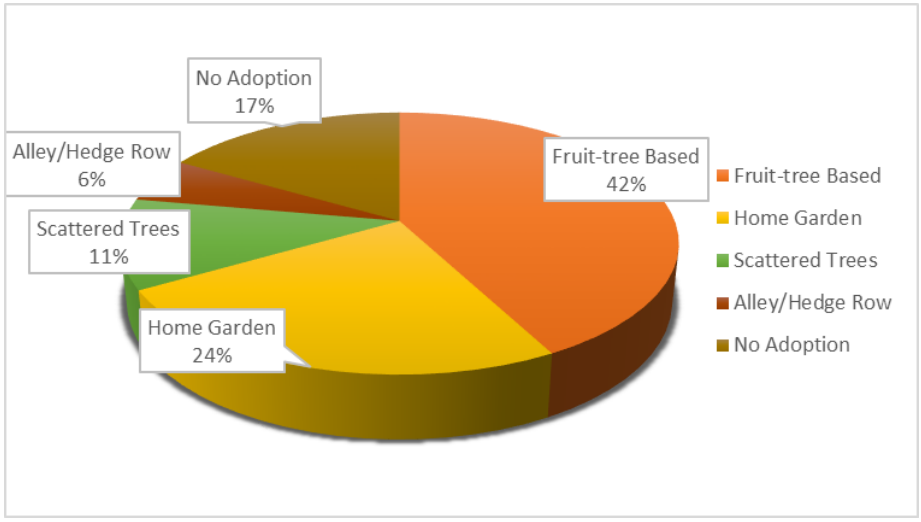


**Figure 1: Agroforestry Practices among the Respondents**

## Adoption Level of Agroforestry Practices

Table 2 shows the extent of adoption of agroforestry practices in the study area. Results of the index scale revealed that respondents had low adoption scores ranging from (0.10 – 0.32) in three agroforestry practices namely: alley/hedge-row intercropping, scattered trees and home garden systems respectively. However, about half of the respondents moderately adopted the fruit tree based system with an adoption score of (0.49). The study further revealed that the average mean adoption index score of the respondents was 0.21 which is critically low. This may be connected to the barriers militating against the adoption of agroforestry such as lack of access to extension services, cost of adoption, low awareness on the benefits of adoption and other socio-economic variables. This further implies that there is need for more enlightenment about the potentials of agroforestry practices in increasing food and agricultural productivity among farmers in the study area.

**Table 2: Adoption Level of Agroforestry Practices by the Respondents**

| Technologies | Frequency | Percentage | Index Scale | Remarks |
|---|---|---|---|---|
| Fruit-tree based | 38 | 42 | 0.49 | Moderate |
| Scattered trees | 10 | 11 | 0.21 | Low |
| Home Garden | 22 | 24 | 0.32 | Low |
| Alley/Hedge-row | 05 | 06 | 0.10 | Low |
| No Adoption | 15 | 17 | 0.00 | Non Adoption |

***Mean adoption index score = 0.21**
**Adoption Index Scale - Non adoption (0) Low adoption (0.1 - 0.33), Moderate adoption (0.34 - 0.59), High adoption (0.60 – 0.99)**

## Benefits Derived from Practicing Agroforestry

Figure 2 shows that while more than one-third of the respondents (43%) indicated that agroforestry practice enhances farm income in the study area, 28%, 18% and 11% of the respondents derive other benefits such as crop protection, medicinal purpose and soil improvement respectively. Tree components of agroforestry systems are viable alternatives for the enhancement and improvement of socio-economic, ecological, livelihood and environmental sustainability of farmers by providing employment, increasing farm income, maintaining soil physical properties and increasing soil organic matter.

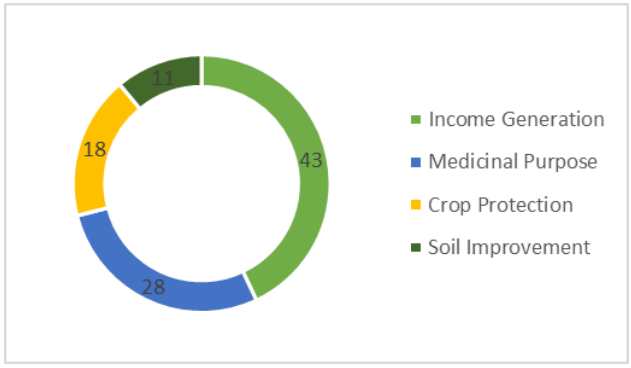


**Figure 2: Benefits of Agroforestry Practices in the Study Area**

Table 3 reveals the factors influencing farmers' decision to adopt agroforestry practices. It was revealed that farm size, experience in arable farming and land ownership status were the socio-economic determinants that influence farmers' intensity and adoption of agroforestry practices. Farm size shows a positive and statistically significant relationship by increasing the intensity of adoption among arable farmers'. This signifies that as farm size increases by 1 hectare, the probability of farmers to adopt agroforestry practice also increases by 0.6%. This is an indication that farmers are more likely to plant or retain trees on their farmland provided the farm size increases. This corroborates the findings of Lambert and Ozioma (2011) who affirmed that farm size influenced agroforestry adoption. The estimated coefficient of experience in arable farming was negative and significant at 10% level of probability. This implies that many years of experience in arable farming has a significant effect on farmers' decision making process and level of adoption of improved agricultural technologies. Farmers' land ownership status was positive and statistically significant ($p<0.05$), implying that increase in the land ownership status by 1 hectare would increase farmers' capacity and adoption probability to engage in tree planting and practice agroforestry. Method of land acquisition influences farmer accessibility to farm land and access to land is also a cognitive factor associated with adoption of modern farming technologies. This validates the findings of Owombo and Idumah (2016) who opined that land ownership increased farmers' intensity of adopting agroforestry practices.

**Table 3: Factors Influencing Farmers' Decision to Adopt Agroforestry Practices**

| Variables | Coefficient (β) | Standard Error | t-Value |
|---|---|---|---|
| Constant | 5.768 | 3.012 | 1.95* |
| Education | 0.406 | 0.525 | 0.77 |
| Farm size | 0.597 | 0.214 | 1.89* |
| Farm Experience | -0.346 | 0.482 | 1.95* |
| Extension contact | 0.284 | 0.146 | -0.70 |
| Land Ownership | 0.629 | 0.138 | 2.27** |

**Note: * p<0.10, ** = p<0.05**

## Conclusion and Recommendations

Findings from the study revealed a greater participation of male gender in arable farming production. The farmers operate on small scale level of production. Majority acquired their farmland through purchase. Also, a high proportion of arable farmers engaged in fruit-tree based agroforestry system. Results revealed that more than one-third of the respondents derived several benefits such as: increased income, crop protection, medicinal purpose and soil improvement respectively. The decision to adopt agroforestry practices was found to be influenced by size of farmland, experience in arable farming production and land ownership status. It could be recommended that improved extension services and tree planting on farmlands should be encouraged for a healthy agricultural environment and sustainable food production. Finally, government should frame sound policies that will facilitate famers' adoption of agroforestry practices.

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