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FACTORS PROMOTING AGROFORESTRY PRACTICES AMONG SMALLHOLDER FARMERS IN SHASHA FOREST RESERVE OF OSUN STATE, NIGERIA

Abstract. This study assessed factors promoting agroforestry practices among rural smallholder farmers in the Shasha Forest Reserve of Osun State. A purposive sampling procedure was used to select four (4) adjoining communities within the Shasha Forest Reserve and the sample size. A well-structured questionnaire was employed to collect data from 99 respondents. This study focussed on the factors influencing agroforestry practices among smallholder farmers in the study area, the benefits derived from agroforestry practices, and the constraints to adopting agroforestry practices in the study area. Both descriptive and inferential statistics were applied for data analysis in the study. The study found that about 50.5% of respondents were involved in improved fallow practice as an influencing factor in adopting agroforestry, 54.5% revealed limited fertile land, crop resilience (60.6%), land tenure/landowner disagreement of the lease contract (61.6%), low income/financial challenges (63.6%), and early reward from the forest-based collection of multipurpose tree species (65.7%). The benefits derived from agroforestry practices were set up as a source of increasing soil fertility (98.0%), enhancement of erosion reduction (95.9%), generation of herbs for treatment in alternative medicine (86.0%), fuelwood for domestic and industrial use (91.0%), and reduction of pests and diseases (82.0%). However, agroforestry practices in the study area were impeded due to constraints such as the high cost of management (77.9%) and the dearth of information on tree/crop cultivation integration (59.5%). The study recommends training Shasha Forest Reserve smallholder farmers and creating awareness on the latest agroforestry practices to arouse their interest and enhance the adoption of agroforestry practices.

Keywords: agroforestry, smallholder farmers, Shasha Reserve, benefits

INTRODUCTION

Agroforestry is a term used to describe an age-long practice of land use technology and an interface between agriculture and forestry, especially in developing countries of the tropics and subtropics (ICRAF, 1997). Increased concerns at the highest international policy levels about the sustainability of agricultural development, in the light of the apparent rapid depletion of the natural resources base, have brought agroforestry even further into the limelight (FAO, 2004). In a loose sense, agroforestry began when man first turned from the hunting and gathering lifestyle and took up planting culture. The term agroforestry for social scientists represents

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a combination and interrelationships between people, domestic animals, crops, and trees, designed to rehabilitate land or sustain and increase production of certain desired social benefits. Thus, agroforestry concerns the structure and functioning of the human ecosystem and not merely the biophysical system (Khot, 1999).

However, Abdallah (2017) observed high adoption of agroforestry practices by farmers. While in a separate study, Ajayi (2007) shows that adoption of these practices is low. Keil et al. (2005) also considered information and knowledge about a given technology as key to adopting agricultural practices, especially ones associated with ecological benefits. In addition, Phiri et al., (2004) exemplify the benefit of mulch from woody tree species contributing to an increase in the active organic matter pool of the soil. Ecology concerns the relationship between organisms, their habitat, and the environment. It outlines the various inter-relationships existing among the components of the system. Agroforestry is a land management practice with consideration for the natural process of soil nutrient renewal. This is in addition to the protection from erosion and fire provided by the trees (Hochberg et al., 1994). Agroforestry, therefore, contributes toward maintaining the ecological balance, which is the basis for environmental sustainability. Furthermore, Anderson (1990) emphasized that agroforestry plays a major role in the reclamation of degraded or abandoned lands and is a workable approach to mimic natural succession and increased biodiversity. Agroforestry practices contribute to the maintenance of soil fertility through enhanced nutrient cycling or nutrient pumping in agroforestry practices that use deep-rooted tree species (Pickergill, 1983).

More so, the socio-economic status of farmers has also played a role in the level of agroforestry adoption (Gangadharappa et al., 2003). Therefore, adoption is defined as a decision to make full use of agroforestry technology or evergreen agriculture as the best course of action (Rogers, 2003). According to Kabwe et al. (2009), among many factors influencing forestry technology adoption, the most prominent are lack of knowledge, limited lands, lack of seeds for cultivation, and other factors relating to farm production and farmer's characteristics. Earlier studies by Binswanger (1980) and Antle (1987) suggested that farmers in developing countries are risk-averse and therefore tend to delay the decision to adopt new technologies. A clear understanding of the influential factors in farmers' decision-making regarding the adoption of agroforestry is crucial to improving land management practices for sustainable livelihoods.

In view of the foregoing, the following objectives were formulated to assess factors promoting agroforestry practices, including determining the factors influencing agroforestry practices among smallholder farmers in the study area, establishing the benefits derived from agroforestry practices, and identifying hindrances to adopting agroforestry practices in the study area.

METHODOLOGY

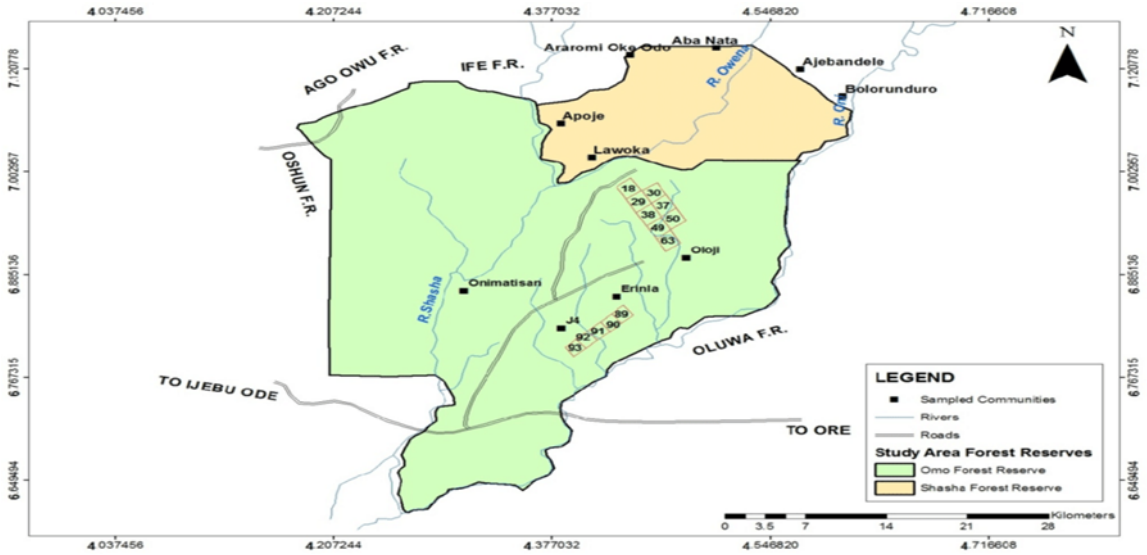
Study Area

The study was carried out in the Shasha Forest Reserve of the tropical lowland rainforest zone in southwestern Nigeria. It is located between latitudes 7°00'–7°30'N and longitudes 4°00'–5°E in Osun State, southwestern Nigeria. The reserve was first mentioned in 1925 as part of the Old Shasha Forest Reserve under an agreement with the Ijebu Native Authority. It shares boundaries with Omo Forest Reserve on the west. The total area of the reserve is currently 23,064 ha. Out of this, about 1,523 ha are under plantation of various species. The remaining 21,541ha are presently dominated by pockets of degraded natural forests characterized by the broken canopy. The rainy season usually commences from March/April and lasts till November. Total annual rainfall ranges from 887 mm to 2,180 mm. The mean annual temperature is about 26.5°C, with an annual range between 19.5°C and 32.5°. The reserve is subdivided into two major areas, viz areas 4 and 5. There are about forty communities within and around the Shasha Forest Reserve. The population of these communities ranges from 200 to 2,000 inhabitants.

Sampling Procedure and Sample Size

The sampling technique used for selecting the sample size for the study was the purposive sampling procedure. Four (4) adjoining communities within the axis of the Shasha Forest Reserve were chosen purposively for the analysis. The selected communities were Araromi Oke-Odo, Aba Nata, Ajebandele, and Bolorunduro. The communities comprise 32, 38, 36, and 40 households, respectively, from which a sample was selected for the study with the aid of simple random sampling. In Araromi Oke-Odo, 19 were selected, in Aba Nata – 26, Ajebandele – 22, and Bolorunduro – 32. A total of 99 respondents were included as a sample for the study.

Map of the study area



Note: Map showing Shasha Forest Reserve of Osun State, Nigeria
Source: Field survey, 2021.

These respondents were smallholder farmers residing in the axis of the Shasha Forest Reserve who practiced agroforestry on tenancy holding by the authorization of the reserve. A well-structured questionnaire was used for data collection in the study area. Both descriptive and inferential statistics were employed to run the data analysis. Descriptive statistics such as frequencies and percentages were used for the analysis of data from the survey.

RESULTS AND DISCUSSION

Table 1 reveals the factors influencing agroforestry practices among smallholder farmers in the Shasha Forest Reserve of Osun State.

The results in Table 1 reveal the factors influencing the agroforestry practices. They show that early reward from multipurpose tree species (65.7%) affects the adoption of agroforestry practices. This implies that early reward such as extra income from multipurpose tree species drives the adoption of agroforestry among smallholder farmers. This finding is in line with Wanjira et al. (2020), who opined that smallholder farmers in farm forestry tend to produce more through multipurpose tree species. Also, the results show that most respondents (63.6%) opined that low income/financial challenges are a major influencing factor in agroforestry practices. This implies that respondents adopt agroforestry to boost their production and generate more income. This finding corroborates with FAO (2018) that most agroforestry systems aim to increase on-farm output and household income through opportunities available to small-scale forest-based enterprises. Also, about 61.6% of respondents signified that the land tenure system/landowner challenge is a major factor influencing the adoption of agroforestry practices. This implies that land tenure/landowner challenges led many farmers to agroforestry practices due to disagreement on the lease contract. This concurs with Ibrahim (2019), who indicated that the land tenure system posed a serious challenge to farmers in our society due to landowners' reluctance to lease their land. About 60.6% of respondents also agreed that crop resilience during the drought period significantly influences the agroforestry practice in the study area. This suggests that agroforestry enhances crop resilience during harsh weather conditions like drought. This finding concurs with Isaac et al. (2020), who submitted that agroforestry helps crop resilience during prolonged drought due to extreme weather conditions. About 60.6% of respondents pointed out that

Table 1. Factors influencing agroforestry practices (n = 99)

Variable	Major F, %	Minor F, %
Early reward from multipurpose tree species	65 (65.7)	34 (34.3)
Low income from farm activities/financial challenges	63 (63.6)	36 (36.4)
Land tenure system/challenges from land owners	61 (61.6)	38 (38.4)
Sufficient availability of fodders for livestock	61 (61.6)	38 (38.4)
Crop resilience during a drought period	60 (60.6)	39 (39.4)
Household size	60 (60.6)	39 (39.4)
Limited fertile land for cultivation	54 (54.5)	45 (45.5)
Suitable agro-ecological terrain for production	54 (54.5)	45 (45.5)
Crop yield improvement from proper tree management system	54 (54.5)	45 (45.5)
Farmers' experience	51 (51.5)	48 (48.5)
Improved fallow practice	50 (50.5)	49 (49.5)
Cultural belief	49 (49.5)	50 (50.5)
Ease of weed management	48 (48.5)	51 (51.5)
Opportunities in agro forestry practices	45 (45.5)	54 (54.5)
Undependable climatic variability	43 (43.4)	56 (56.6)
Farmers association /cooperative society	41 (41.4)	58 (58.6)
Proximity to village	30 (30.3)	69 (69.7)

Note: F = Frequencies, % = Percentages in parentheses.
Source: Field survey, 2021.

household size is a major influencing factor in adopting agroforestry practice. Furthermore, about 54.5% of respondents agreed that limited fertile land for cultivation is a major factor influencing agroforestry practices. This implies that most smallholder farmers adopt agroforestry as a result of little fertile land for cultivation. This finding corroborates with Oladele et al. (2020), who ascertained that farmers are encouraged to adopt agroforestry practices to ensure sustainable land use because of limited land. Table 1 likewise shows that about 50.5% of respondents said the improved fallow method contributes to agroforestry practice. This indicates that agroforestry contributes immensely to improved fallow practice among farmers.

This finding aligns with Brown et al. (2018), who opined that agroforestry could improve agricultural productivity. This study shows that early reward from multipurpose tree species, followed by low income/financial challenges, land tenure system/landowner challenge, crop resilience during drought, and household size, were the major factors promoting agroforestry practices in the study area.

Table 2 reveals the results of the benefits derived from practicing agroforestry among smallholder farmers in the Shasha Forest Reserve. The frequencies and the percentage in parentheses show the importance of agroforestry practices to the production of smallholder farmers in the study area.

The results in Table 2 demonstrate that most respondents in the study area derived benefits from practicing agroforestry. About 98.0% of them agreed that agroforestry improves soil fertility. This implies agroforestry practices are an important source of increasing soil fertility. This is corroborated by Nair et al. (2007) that agroforestry technologies have a higher potential to improve soils than arable cropland because of the increased rates of organic matter addition and retention due to improved aggregation and change in litter quality. Also,

Table 2. Benefits derived from practicing agroforestry among respondents (n = 99)

Variables	Yes F, %	No F, %
Improved soil fertility	98 (98.0)	1 (1.0)
Erosion control	95 (95.9)	4 (4.0)
Increase land productivity and production	92 (92.9)	7 (7.1)
Fuel wood source	91 (91.9)	8 (8.1)
Improved vegetative cover	91 (91.9)	8 (8.1)
Food and medicine for people	85 (85.9)	14 (14.1)
Decrease in pest and diseases	81 (81.8)	18 (18.2)
Micro climate	59 (59.6)	40 (40.4)
Improve flora and fauna	15 (15.2)	84 (84.8)

Note: F = Frequencies, % = Percentages in parentheses
Source: Field survey, 2021.

the addition of mulch from woody tree species leads to significant increases in organic matter, which is mainly associated with the active soil organic matter pool (Phiri et al., 2004). The result further shows that the majority of respondents (95.9%) believed that soil erosion control is another benefit derived from practicing agroforestry. This indicates that agroforestry practices could improve landscape which would invariably reduce soil erosion. This finding is in line with FAO (2017) that agroforestry provides three important ecosystem services: improvement of productivity, enhancement of erosion control, an increased rate of soil water retention. The findings show that about 92.9% of respondents reported that agroforestry practices increase land productivity and production. This indicates that agroforestry practices are potential land management practices that help promote farmers' productivity and food security. About 91.1% of respondents also stated that fuelwood for households and industrial use was a valuable benefit generated from agroforestry practices. This finding is supported by Jensen (1995) that agroforestry technologies incorporating multipurpose species have considerable potential to reduce the fuelwood deficit. The results further indicate that about 86.0% of respondents found that food and medicine are important values derivable from practicing agroforestry. This demonstrates that agroforestry practices could provide a means of generating herbs and shrubs to fuel and enhance alternative medicine among the farmers. This is in line with the submission of the US Department of Agriculture (2019) that forestry farming operations produce herbal crops under a forest canopy that is managed to provide other products. The findings reveal that about 82.0% of respondents indicated a decrease in pests and diseases as one of the benefits of agroforestry. This implies that agroforestry practices reduce pests and diseases of arable crops on the field. This finding corroborates with Pumariño et al. (2015), who submitted that agroforestry affects pests and diseases that are crop dependent by lowering their abundance, thereby decreasing plant damage.

Table 3 reveals the results of the hindrances to agroforestry practices among smallholder farmers of the Shasha Forest Reserve. The frequencies and the percentage

Table 3. Hindrances to agroforestry in Shasha Forest Reserve (n = 99)

Variables	Major F, %	Minor F, %
High management cost in practicing agroforestry	77 (77.8)	22 (22.8)
Lack of information on trees/crop cultivation integration	59 (59.5)	40 (40.5)
Lack of interest in agroforestry	49 (49.5)	50 (50.5)
Poor knowledge of sustainable forest management practices	49 (49.5)	50 (50.5)
Poor tree management practices	45 (45.5)	54 (54.5)
Poor awareness of agroforestry practices	38 (38.4)	61 (61.6)

Note: F = Frequencies, % = Percentages in parentheses
Source: Field survey, 2021.

in parentheses show the challenges faced by the smallholder farmers engaging in agroforestry practices in the study area.

Table 3 shows that most respondents (77.8%) cited high management cost as a major problem to adopting agroforestry practices in the study area. This indicates that smallholder farmers' adoption of agroforestry practices may suffer from the high management costs, including hiring farm machinery, fumigation against pests and diseases, and labor. Furthermore, the results show that about 59.5% of respondents opined that lack of information on tree and crop cultivation integration is another major challenge to adopting agroforestry practices. This implies that a lack of information on trees and crop cultivation integration could obstruct farmers' interest in adopting agroforestry practices.

CONCLUSIONS

The factors promoting agroforestry in the study are driven by certain profound components, including limited fertile land, crop resilience during drought due to extreme weather conditions, improved fallow practice, low income/financial challenges in their production, land tenure/landowner disagreement on the lease contract, early reward such as extra income from multipurpose trees and so on. Furthermore, the benefits from agroforestry practices are pronounced in the study area. In the study, agroforestry is an essential source of increasing soil fertility, enhancing erosion reduction, generating herbs for treatment in alternative medicine, generating fuelwood for household and industrial use, and contributing to reducing pests and diseases. Also, the adoption of agroforestry practices could suffer due to the high management costs. Finally, the dearth of information on tree/crop cultivation integration could discourage the farmers' interest to adopt agroforestry practices in Shasha Forest Reserve of Osun State, Nigeria.

RECOMMENDATIONS

1. Agencies of the Nigerian Ministry of Environment, both state and federal, should be assigned to train farmers on the benefits of agroforestry, especially in sustainable forest management.
2. Forestry extension agents should provide necessary information on agroforestry technologies and create motivating/simulative awareness to arouse farmers' interest.
3. There should be an infusion of financial capital, seeds, seedlings, and incentives from the government into developing agroforestry technologies to enhance multiple streams of income for the farmers and the nation as a whole.

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CZYNNIKI PROMUJĄCE PRAKTYKI AGROLEŚNICZE WŚRÓD ROLNIKÓW MAŁOROLNYCH W REZERWACIE LEŚNYM SHASHA W STANIE OSUN, NIGERIA

Abstrakt. W pracy oceniano czynniki promujące praktyki agroleśnicze wśród rolników małorolnych w rezerwacie leśnym Shasha w stanie Osun. Zastosowano procedurę celowego doboru próby, aby wybrać cztery sąsiadujące społeczności w obrębie Shasha. Próby były zbliżonej wartości. Do zebrania danych od 99 respondentów wykorzystano starannie skonstruowany kwestionariusz. Badanie dotyczyło czynników wpływających na praktyki agroleśnicze wśród rolników małorolnych na badanym obszarze oraz na ich korzyściach i ograniczeniach. Do analizy danych wykorzystano statystykę zarówno opisową, jak i inferencyjną. Badanie wykazało, że około 50,5% respondentów uznało ulepszony odłóg za czynnik wpływający na przyjęcie agroleśnictwa, 54,5% respondentów odpowiedziało, że do tych czynników warunkujących praktyki agroleśnicze należą ograniczona ilość żyznej ziemi, odporność upraw (60,6%), prawo własności ziemi/brak zgody właścicieli gruntów na umowę dzierżawy (61,6%), niskie dochody/wyzwania finansowe (63,6%) i wynagrodzenie

z leśnego zbioru wielofunkcyjnych gatunków drzew (65,7%). Wśród korzyści płynących z praktyk agroleśniczych można wymienić zwiększenie żyzności gleby (98,0%), redukcję jej erozji (95,9%), uzyskiwanie ziół do leczenia w medycynie alternatywnej (86,0%), produkcję drewna opałowego do użytku domowego i przemysłowego (91,0%), a także redukcję szkodników i chorób (82,0%). Zastosowanie praktyk agroleśniczych były ograniczone wysokimi kosztami zarządzania (77,9%) i brakiem informacji na temat integracji drzew i upraw (59,5%). W badaniach zaleca się, aby w celu zwiększenia wykorzystania praktyk rolno-leśnych przeprowadzać szkolenia dla rolników małorolnych i budować świadomość na temat najnowszych praktyk rolno-leśnych, aby zainteresowano się nimi na terenie rezerwatu Shasha.

Słowa kluczowe: agroleśnictwo, rolnicy małorolni, rezerwat Shasha, korzyści