

Agroforestry farmers' perspective on the impact of agroforestry systems on food security in Esan Central Local Government Area of Edo State, Nigeria



¹*Osadolor, N. and ²Isese, M. O. O.

¹Department of Forest Resources and Wildlife Management, University of Benin, Nigeria

²Forest Research Institute of Nigeria, Ibadan, Nigeria

*Corresponding Author Email: nosayaba.ehondor@uniben.edu

Other Author(s) Email: saintmykel2002@yahoo.com.au

ABSTRACT

This study assessed agroforestry's contribution to Esan Central Local Government Area, Edo State, food security. One hundred (100) agroforestry farmers, or 5% of the 110 villages that comprise the Esan Central LGA, were chosen at random from among the six communities or villages. At the 5% level of significance, the gathered data were examined using descriptive and inferential statistics utilizing analysis of variance (ANOVA). To separate the means of variables that were significant at 5 percent, a Duncan multiple range test was employed. The findings showed that 32% of these farmers experienced food insecurity and 68% of these farmers experienced food security. Agroforestry methods have several advantages for household food security. Firstly, they give 100% of the nutrients needed at home; secondly, they lower the cost of eating a balanced meal (95%); thirdly, they cover 90% of the rent (90%); and finally, they cut school tuition (90%). The maximum annual mean income from suckers, grains, fruits, and tubers sales was ₦101,000, while the lowest amount was ₦24,200. The system that was used the most was agrisilviculture, whereas apsilviculture was used the least. According to the respondents, *Irvingia wombulu* was the most prevalent species of tree on their fields and offered numerous advantages. However, a lack of funding and farmers' limited access to credit made agroforestry methods difficult. Relevant stakeholders are urged to assist rural agroforestry by giving farmers simple access to loans for agroforestry development as well as programmes that raise awareness and empower them.

Keywords: Agroforestry, food security, communities, arable crops, tree species

INTRODUCTION

Over 1.2 billion people worldwide use agroforestry, a land use strategy that combines the growing of agricultural crops and the raising of animals with the utilisation of forest trees (Tomar *et al.*, 2021). Farming on this old terrain has been done for about 1300 years (Brookfield and Padoch, 1994; Jamnadass *et al.*, 2013). In rural communities in the developing world, agroforestry is still the only resource management strategy that offers genuine and palpable potential to break the cycles of energy scarcity, food insecurity, poverty, and undernutrition. This is according to Lulandala (2004). Home gardens, taungya

farming, shifting cultivation, alley cropping, shelterbelts, apsilviculture, and aquasilviculture are among the agroforestry systems used in Nigeria (Adekoya, 1997).

"All people, at all times, have physical and economic access to sufficient, safe, and nutritious food that meets their dietary needs" is defined as "food security" by FAO (2008). This definition falls into five interconnected categories: availability, accessibility, usage, sovereignty, and stability. It entails getting enough calories, protein, and fat from macronutrients as well as vitamins and minerals from micronutrients. Agroforestry can

boost food availability indirectly by increasing the output of associated crops and/or animal component(s) and directly by producing food from the perennial component(s) (Jamnadass *et al.*, 2013; Sarvade *et al.*, 2014). By directly supplying a range of foods, including cereals, legumes, fruits, nuts, root and stem tubers, and leafy vegetables from the system's trees and crops, it can increase the availability of food (Hagan, 2017). Additionally, by supplying rare items that are typically limited by market availability, agroforestry has the potential to lessen issues associated with food accessibility. Therefore, the main objective of this research is to assess how arable crop cultivation—in the context of agroforestry practices—contributes to the food security of rural households in Esan Central, Edo State, Nigeria.

MATERIALS AND METHODS

Study area

The research was carried out in the Nigerian state of Edo, in the Esan Central Local Government Area (LGA) (Figure 1). Its administrative center is located in Irrua. Between latitudes 6.636°N and 6.909°N and longitudes 6.182° E and 6.364° E of the Greenwich meridian, the region is located. The state receives between 1250 and 1500 mm of precipitation each season. There is a reduced peak in July and August and a clearly bimodal distribution of rainfall. In the wet season, the average temperature is 25 °C, whereas in the dry season, it is 28 °C. The principal agricultural products farmed in the region include oil palm, rubber, cassava, pineapple, kola nuts, rice, yams, and tomatoes.

Sampling procedure

In order to obtain information about the overall number of communities within the Esan Central Local Government Area (LGA) and the number of agroforestry farmers in the region, a preliminary visit was made to the LGA secretariat. Out of 110 localities in the LGA, six villages or communities were chosen at random using a 5% sample intensity. The communities that were chosen were Afuda, Ugbegun, Ewossa, Ebelle, Egbesan, and Irrua.

(Table 1). These study communities were selected based on the intensity of agroforestry practice in the study area. Forty percent sampling intensity was employed to select respondents from the practicing agroforestry farmers in each of the selected communities (Table 1). This was to obtain an adequate representation of the agroforestry farmers of each of the selected communities. A total of 100 respondents were interviewed for the study.

Data Collection

The agroforestry farmers were given questionnaires to complete in order to gather data. The purpose of the questionnaire was to gather data from the farmers regarding the crops grown on agroforestry farms, the presence of woody species, the income generated by the activities, and the effects of the practices on food security. During the study, field assistants were dispatched and utilized the local dialects of Esan to facilitate communication.

Statistical analysis

Data collected were analyzed using inferential statistics with the use of analysis of variance (ANOVA) at the 5% level of significance as well as descriptive statistics of frequency and percentages reported in tables and charts. The means of the variables that were significant at the 5% level were separated using the Duncan multiple range test.

RESULTS

Socioeconomic characteristics of farmers

Table 2 displays the respondents' socioeconomic characteristics. The findings indicated that 18% of respondents were between the ages of 28 and 37, and the majority of respondents (58%) were between the ages of 38 and 47. This study bears similarities with those of Sale and Shaibu (2019), who found that Kogi State's agroforestry farmers had an average age of 43. Of the responders, 64.9 percent were female and 35.1% were male. To provide food for the home, women were more likely to use agroforestry techniques.

Table 2: Socioeconomic characteristics of Esan Central farmers

Variables	Frequency	Percentage
Age (years)		
28-37	18	18.0%
38-47	58	58.0%
48-57	22	22.0%
58-67	2	2.0%
Sex		
Male	35	35.1%
Female	65	64.9%
Marital status		
Single	33	33.0%
Married	38	38.0%
Widow	25	25.0%
Separated	4	4.0%
Level of education		
Primary	24	24.5%
Secondary	14	14.3%
Tertiary	40	40.8%
No formal education	20	20.4%
Household size		
1-5	37	36.7%
6-10	53	54.1%
11-15	8	8.2%
21-25	1	1.0%

Source: Field Survey, 2022

Food security status of agroforestry farmers in the study area

According to the findings, 32% of the agroforestry farmers believed that food security was precarious, while 68% of them expressed concern over it (Figure 3). As a result, the majority of agroforestry farmers are able to provide for each family member's nutritional needs so they can live active, healthy lives. According to Mulugeta (2014), 89% of farmers in Southwest Ethiopia have access to food because they practice agroforestry. Similar findings were documented by Sale and Shaibu (2019), who found that agroforestry methods increased food security in their study region and that 67.9% of rural households in Kogi State were food secured.

Benefit of adopting agroforestry practices on food security status of farmers

Adopting agroforestry practices has several advantages for farmers' food security status, including: supplying 100% of their household's home nutrition, which is the highest percentage; and relieving them of the worry

that their food will run out (88%), which is the lowest percentage (Table 3). This suggests that the status of household food security has improved as a result of the study area's adoption of agroforestry techniques. Similarly, Nwozuzu *et al.* (2022) proposed that rural women farmers in Imo State were found to show good status and secured in thirteen (13) of the nineteen (19) food security status index understudied. Consequently, agroforestry ensures farmers' household food security (Ojo *et al.*, 2009).

Most common arable crops cultivated and agroforestry practices by agroforestry farmers in the study area

The most popular arable crops grown nearby by agroforestry producers are shown in Figure 4. The most often grown arable crop in the research area was cassava (30%). The least cultivated arable crop was banana (3%), which was closely followed by maize (25%).

Also, Table 4 displays the outcomes of the agroforestry techniques used in the research

region. These systems have means of 14.3, 6.5, 4.5, and 2.8 for agrisilviculture, agrisilvopastoral, and apisilviculture, respectively. A substantial difference ($P < 0.05$) was seen between the several agroforestry practices that the respondents had employed;

agrisilviculture was the most prevalent approach. Agrosilviculture was practiced by most farmers in Kogi State, with a small percentage (1.3%) engaging in agrosilvopasture (Sale and Shaibu, 2019).

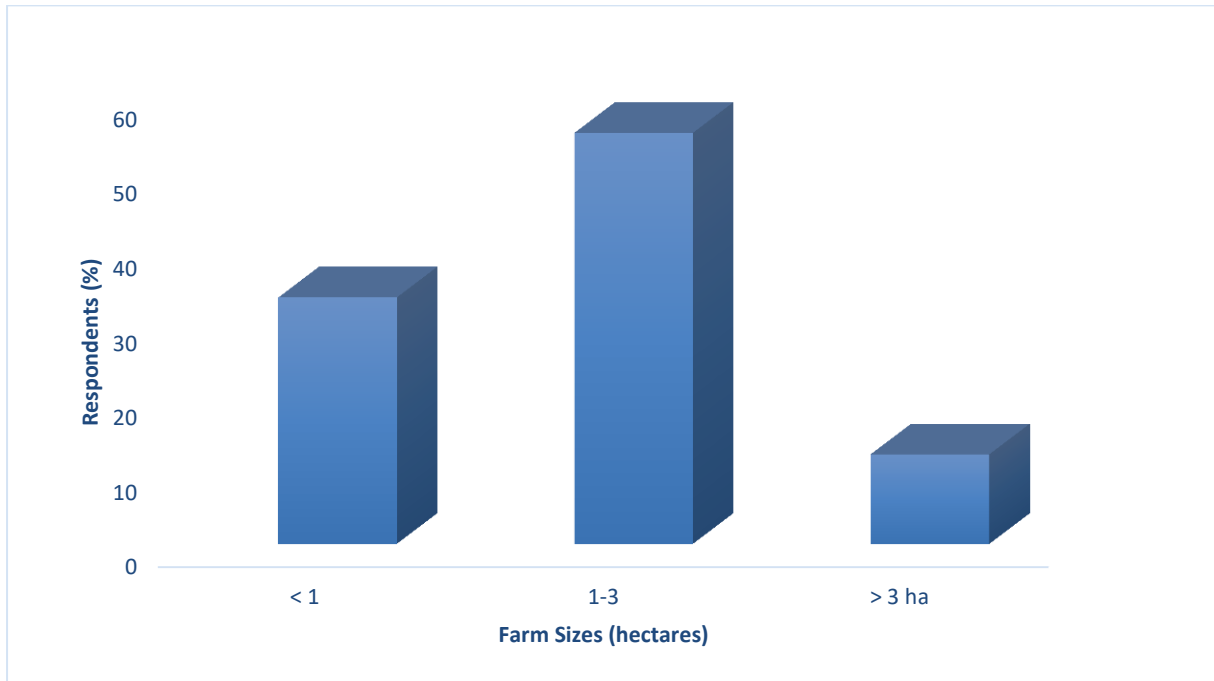


Figure 2: Respondents’ agroforestry farm size

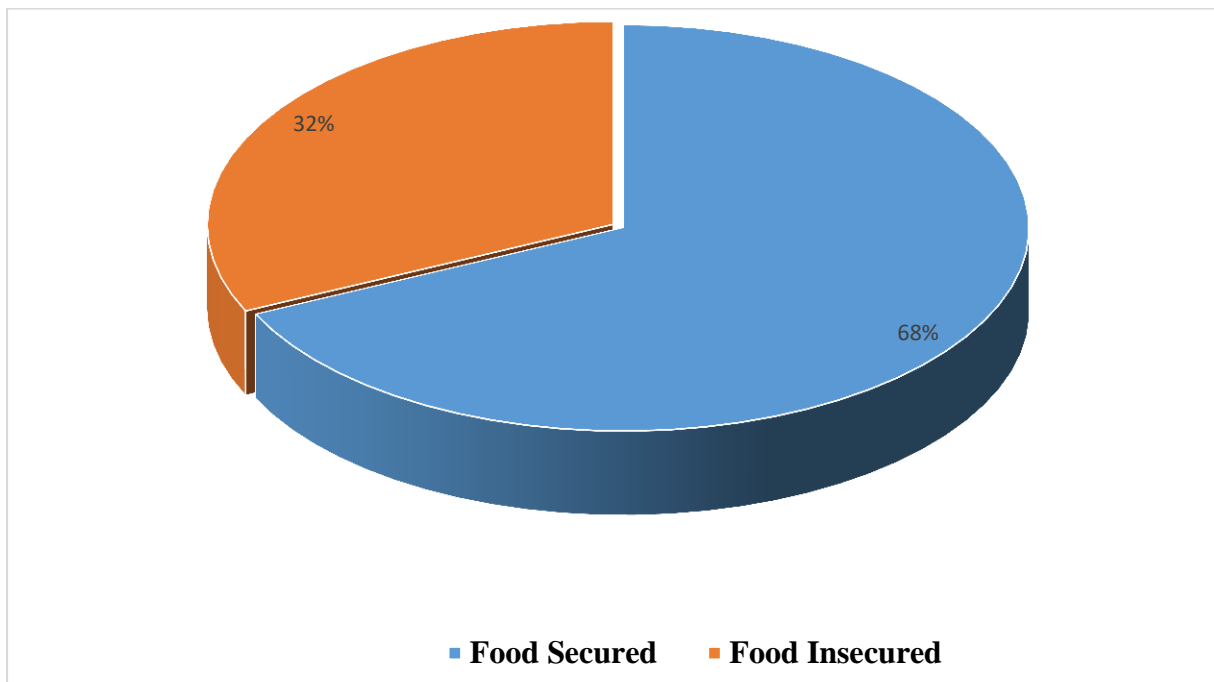
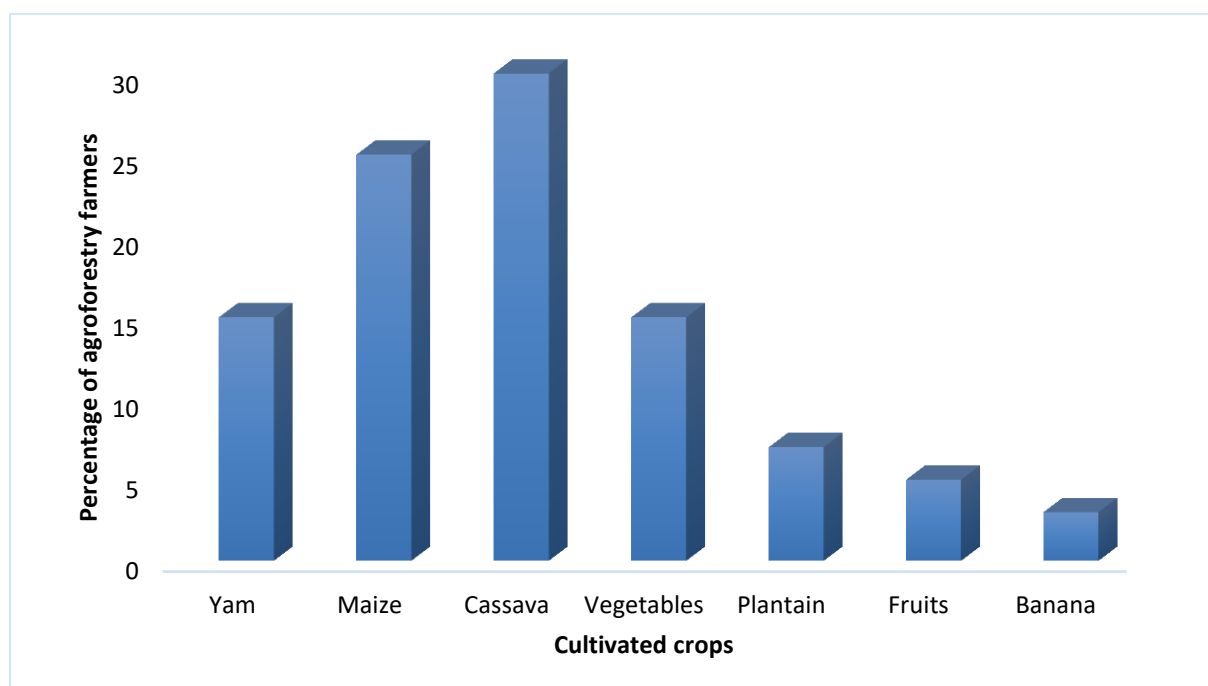


Figure 3: Respondents’ opinion on food security status in the study area

Table 3: Benefit of adopting agroforestry practices on food security status of farmers in Esan Central LGA

Benefits	Frequency	%
Source of home nutrition	100	100
Can afford to eat balanced meals with income from agroforestry practices	95	95
Can afford three square meal a day	94	94
Have been able to afford my house rent	90	90
Have been able to afford my children's school fees	90	90
Has never cut size of family meal	90	90
Not worried that household food will run out	88	88

Source: Field Survey, 2022

**Figure 4:** Some common arable crops cultivated**Table 4:** Agroforestry systems adopted by farmers

Locations	Agrisilviculture	Agrisilvipastoral	Silvopastoral	Apisilviculture
Irrua	16	8	5	3
Ewosa	10	4	2	1
Ebelle	18	10	7	4
Egbesan	9	3	2	2
Ugbegun	22	9	8	5
Afuda	11	5	3	2
Mean	14.3^a	6.5^b	4.5^{bc}	2.8^c

*Mean with same letters are not significant; Source: Field Survey, 2022

Income annually generated from arable crops by agroforestry farmers

A total of ₦101,000, ₦82,200, ₦65,500, ₦53,700, ₦48,800, ₦33,200, and ₦24,200 are made each year from the sales of cassava, yam, maize, vegetables, plantains, fruits, and bananas, respectively (Table 5). The income gained from different arable crops varied

significantly ($P < 0.05$), with cassava being the most prominent crop. In addition, there was a significant difference ($P < 0.05$) in the income obtained from the sales of this farm produce among the communities that were taken into consideration for this study. This suggests that in addition to providing food for domestic consumption, agroforestry helps these farmers

make money through selling the produce they grow, which they utilize to meet a variety of requirements. Therefore, farmers in Esan rely on agroforestry as a source of income. Center Farmers' ability to acquire food and make money has thereby increased as a result of the commercialization of agroforestry produce (Schreckenberget al., 2006).

Common tree species in agroforestry plots in the study area

The predominant tree species utilized in the agroforestry plots by the farmers is *Irvingia wimbulu*, sometimes referred to as bush mango (20%) in the local dialect (Figure 5). Next in order are otien *Chrysophyllum albida* (10%), horse tamarind (*Leucaena leucocephala*) (10%), *Gliricidia sepium* (13%), and mango (*Mangifera indica*) (12%). Cashew (*Anacardium occidentale*) and soursop (*Annona muricata*) had the lowest percentages, at 3% apiece. The most common species farmed by agroforestry farmers in the area is the bush mango tree (*Irvingia wimbulu*). This might be because the fruit's nuts, which are valued highly by the Esan people and most of Edo State, are used to make the traditional or well-known dish known as ogbono soup.

Additionally, during the planting season of arable crops, the agroforestry farmers' financial demands can be met with the money raised from the sales of the system's fruits. According to Sale and Shaibu (2019), oil palm (*Elaeis guineensis*) and cashew (*Anacardium occidentale*) are the two main plants planted by agroforestry farmers in Kogi State. These trees were planted for their ability to provide money.

Constraints encountered by agroforestry farmers in the study area

Inadequate capital (26.3%), poor credit availability (21.1%), labour shortages (15.8%), land tenure (10.5%), poor quality of roads (10.5%), theft (8.4%), pest and disease incidence (5.3%), and limited access to extension services (2.1%) were the challenges faced by farmers in the region (Table 6). This suggests that the main things impeding farmers are a lack of cash and the inability to obtain financing to support the expansion and advancement of agroforestry in the area. However, insufficient planting seeds, high labour costs, a lack of technical know-how, and insecurity were some of the obstacles to agroforestry in Chikun LGA, Kaduna State (Olagunju *et al.*, 2022).

Table 5: Income annually generated from arable crops and fruit trees (#'000)

Locations	Yam	Maize	Cassava	Vegetable	Plantain	Fruits	Banana	Mean
Irrua	86	60	110	52	46	30	24	58.3 ^c
Ewosa	64	56	78	44	40	24	17	46.1 ^d
Ebelle	95	82	126	65	59	45	32	72.0 ^b
Egbesan	57	45	62	40	35	20	12	38.7 ^e
Ugbegun	115	92	140	74	70	53	40	83.4 ^a
Afuda	76	58	90	47	43	27	20	51.6 ^d
Mean	82.2^b	65.5^c	101.0^a	53.7^d	48.8^d	33.2^e	24.2^e	

*Mean with same letters are not significant; Source: Field Survey, 2022

Table 6: Constraints encountered by farmers

Constraints	Frequency	Percentage
Incidence of pests and diseases	5	5.3
Theft	8	8.4
Inadequate Capital	25	26.3
Land tenure	10	10.5
Poor access to extension services	2	2.1
Poor access to credit	20	21.1
Labour scarcity	15	15.8
Lack of good roads	10	10.5
Total	95	100

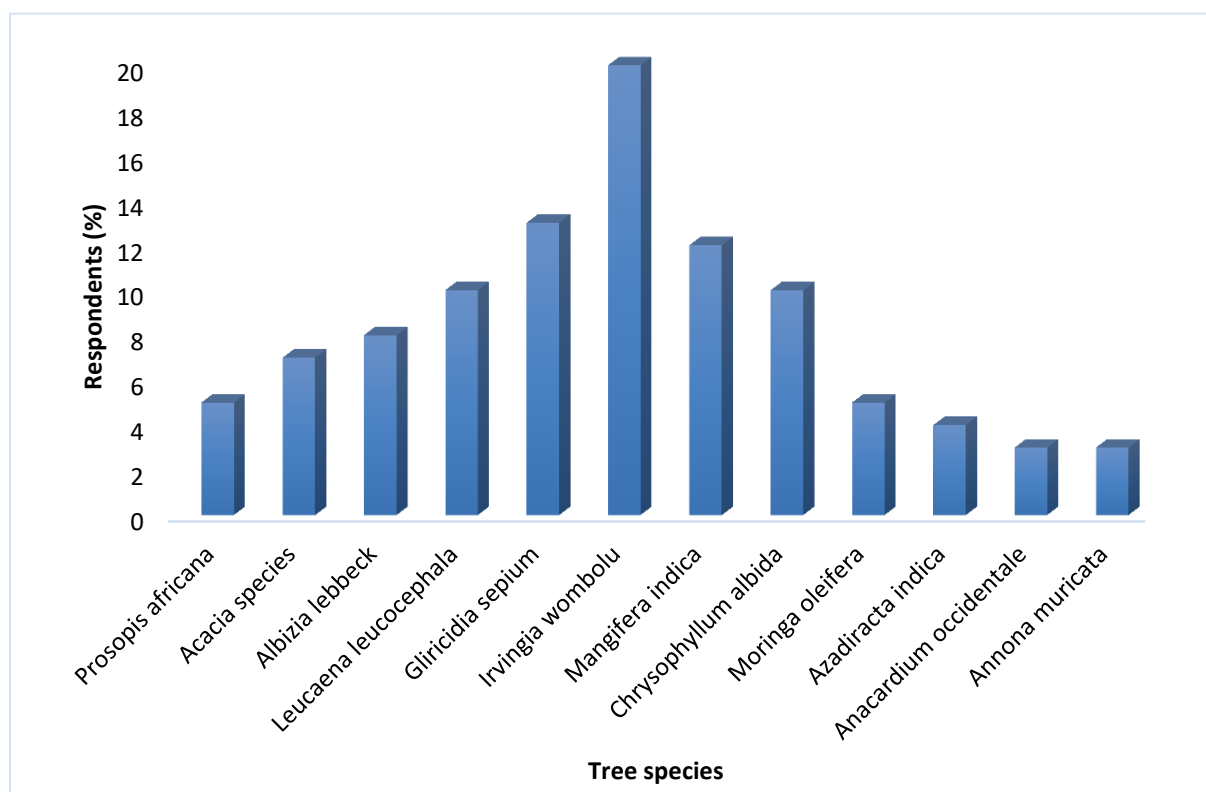


Figure 5: Most common tree species in agroforestry plots in the study area

CONCLUSIONS

The study area's agroforestry farmers can afford to cover their households' daily food demands as well as other necessities like shelter and education, so they are secure in their food supply. These farmers mostly engaged in agrosilviculture and silvopasture, which has greatly enhanced their standard of living and increased their level of food security. The majority of fruit tree species contributed significantly to the production of arable crops. Farmers profit from agroforestry, but their options for financing are limited due to low capital and difficult bank access. To increase production capacity and encourage agroforestry participation, the government ought to make financial institution credit facilities easily accessible.

REFERENCES

- Abdulhamid, B., Abubakar, E. M. and Dawaki, S. A. 2017. An assessment of potential contributions of agroforestry to food security in Katsina, Sudan Savannah Area, Nigeria. *Current Life Sciences*, 3(3), 39-46.
- Adekoya, A. E. 1997. An analysis of farmers' participation in agroforestry in Oyo state, Nigeria. Ph.D. thesis, Department of Agricultural Extension, University of Ibadan, Nigeria.
- Brookfield, H. and Padoch, C. 1994. Appreciating agrodiversity: A look at the dynamism and diversity of indigenous farming practices. *Environment Science and Policy for Sustainable Development*, 36(5), 6-45. DOI: 10.1080/00139157.1994.9929164
- FAO. 2008. An introduction to the basic concepts of food security. FAO Food security Programme, Rome, Italy.
- Hagan, R. O. 2017. So...Does Agroforestry Contribute to Food Security? Available at <https://www.plantagbiosciences.org/people/rob-o-hagan/2017/08/29/so-does-agroforestry-contribute-to-food-security/>.
- Jamnadass, R., Place, F., Torquebiau, E., Malézieux, E., Iiyama, M., Sileshi, G. W., Kehlenbeck, K., Masters, E., McMullin, S., Weber, J. C. and Dawson, I. K. 2013. Agroforestry, food and nutritional security. ICRAF Working Paper No. 170. Nairobi, World Agroforestry Centre. DOI: 10.5716/WP13054.PDF

- Lulandala, L. L. L. 2004. Agroforestry Concepts, Systems, Practices, Potentials, Constraints, Research and Training needs, MSc. MNRSA Lecture Notes, SUA Morogoro, 19 Pg.
- Mulugeta, G. 2014. Evergreen agriculture: agroforestry for food security and climate change resilience. *Journal of Natural Sciences Research*, 4(11), 80-90.
- Nwozuzu, S. O., Ukpongson, M. T., Ejiogu, O. N., Chijioke, C. A. and Onyejiuwa, J. N. 2022. Effects of agroforestry on household food security as perceived by rural women farmers in Imo State, Nigeria. *International Journal of Agriculture and Rural Development*, 25(1), 6191-6196.
- Ojo, A. R., Duru, H. I., Onilearo, K. S., Badejo, B. Y., Akinnate, E. A. 2009. Non-Timber Forest Products (NTFP), food crisis and the rural youth. In: Olojede, A. O., Okoye, B. C., Ekwe, K. C., Chukwu, G. O. Nwachukwu, I. N. and Alawode, O. (Eds.) *Global food crisis and Nigerian agriculture. Proceedings of the 43rd Annual Conference of Agricultural Society of Nigeria*, Abuja.
- Olagunju, O. E., Ariyo, O. C., Olagunju, O. S. and Alabi, O. F. 2022. Contribution of agroforestry practices to rural household food security status in Chikun Local Government Area of Kaduna State. In: Oluwadare, A. O., Akinyemi, O., Idumah, F. O., Akintunde-Alo, D. A. and Lawal, A. (Eds.) *Forestry and Challenges of insecurity, climate change and COVID-19 pandemic in Nigeria*, pp. 244-250. *Proceedings of the 8th Biennial Conference of the Forests & Forest Products Society*, held on the 14th-20th at the Forestry Research Institute of Nigeria, Ibadan, Nigeria.
- Sarvade, S., Singh, R., Vikas, G. and Kachawaya, D. S. 2014. Agroforestry: an approach for food security. *Indian J. Ecol.*, 41(1), 95-98.
- Sale, F. A. and Shaibu, U. M. 2019. Understanding the Nexus between Participation in Agroforestry and Food Security Status: Empirical Evidence from Rural Households in Kogi State, Nigeria. *Nigerian Journal of Forestry*, 49(2), 120 – 125.
- Schreckenber, K., Awono, A., Degrande, A., Mbosso, C., Ndoye, O. and Tchoundjeu, Z. 2006. Domesticating indigenous fruit trees as a contribution to poverty reduction. *Forests, Trees and Livelihoods*, 16(1), 35-51.
- Tomar, J. M. S., Ahmed, A., Bhat, J. A., Kaushal, R., Shukla, G. and Kumar, R. 2021. Potential and opportunities of agroforestry practices in combating land degradation. In: Shukla, G., Chakravarty, S., Panwar, P. and Bhat, J. A. (Eds.) *Agroforestry-small landholder's tool for climate change resiliency and mitigation*. IntechOpen, pp. 1-18. DOI: 10.5772/intechopen.9783.