ID: 442

Assessing the Contribution of *Musa Species* to Sustainable Livelihoods of Agroforestry Farmers in Egbeda Municipality, Oyo State, Nigeria

***Adebayo Samson Adeoye[1], Adebayo David Samuel[2]**

[1]Federal College of Forestry (Forestry Research Institute of Nigeria), P.M.B. 5087, Jericho Hills, Ibadan, 200272, Nigeria
*Email: adeoye.adebayo@fcfibadan.edu.ng; saadeoye06@gmail.com
Phone No.: +2347036335225
[2]University of Suffolk, United Kingdom, University of Agriculture, Makurdi, Nigeria samuel.adebayo2022@aol.com

ABSTRACT

The livelihoods of agroforestry farmers are compromised by suboptimal management practices, inputs supply constraints, and post-harvest losses. The study assesses the role of *Musa species* in enhancing the livelihoods of agroforestry farmers in Egbeda municipality, Oyo State. A Multistage sampling design was adopted to select a sample size of 95 respondents from four wards. Questionnaire survey was conducted to gather data on socio-economic characteristics, *Musa species* acquisition, availability, management, and livelihood contributions. Data were analysed with descriptive and inferential statistics. Findings revealed that most respondents were males (69.5%), aged 40-50 (30.5%), and married (54.7%). Suckers were primarily sourced from fellow farmers (64.2%). Significant proportion of respondents (77.9%). Chi square analysis revealed significant associations between farmers' age, livelihood activities, and *Musa species*' contribution to livelihood improvement. The study concludes that *Musa species* production enhances agroforestry farmers' livelihoods and recommends training in value-chain production techniques to optimize returns on investments.

Keywords: *Contribution, Musa species, Management, Livelihood enhancement, Optimal yield*

INTRODUCTION

Musa species (Bananas and plantain) occupy a critical position for boosting Nigeria's food production capacity (Akinyemi *et al*., 2010). *Musa species* ranks third among starchy staples with Nigeria's production doubling over the past 20 years. Production is predominantly carried out in Southern Nigeria where smallholder farmers traditionally integrated it into diverse cropping systems. Musa species production sector in Nigeria is characterized by a gender-based division of labour, with men dominating production, and women handling marketing. However, the sector faces challenges, including farmers' limited knowledge of best practices, inadequate extension services, and research specialization biases, which collectively contribution to the country's low yields. Notwithstanding, in recent years, plantain and banana have become increasingly important contributors to revenues of Nigeria's major producing communities. The African continent is the largest producer of *Musa species*, contributing more than 50% to worldwide production (Adeniji and Tenkouano, 2008). Nigeria is one of the largest plantain and banana producing countries in the world (FAO, 2004). West and Central Africa are the dominant producers of Musa species, accounting for 61% and 21% of global production respectively (FAO, 2006). In these regions, approximately 70 million people rely on plantains and bananas for over 25% of their carbohydrate intake, making them a primary source of food energy in the African zone (Ayanwale, 2016). Notably, Nigeria ranks among the world top plantain and banana producers (FAO, 2004). Nigeria's Southern States with forest soils, including Akwa-Ibom, Cross-River, Imo, Enugu, Rivers, Edo, Delta, Lagos, Ogun, Osun, and Oyo states, are the primary regions for Musa species' production (Akinyemi *et al*., 2010). Musa species is produced in these states, and moved through marketing channels to different parts of Nigeria. Its demand is very high with supply competing with its demand, and this has created serious competition on the crop serving the status of earning foreign exchange for Nigeria. Plantain and banana are vital crops in Nigeria serving as a staple food, raw material for various product and a significant source of revenue for many individuals and industries. As a strategic crop in food production, it provides carbohydrates for over 50 million people. Its short gestation period and perennial nature make it an ideal crop. In particular, the unripe, the ripe, and the overripe are utilized in various forms, including being peeled, dried, and processed into flour, it can also be boiled or roasted as food or made into chips while overripe are used industrially serves as a base ingredient in the manufacture of baby food products, biscuits and others products (Akinyemi *et al*., 2010). Consequently, it helps alleviate hunger and food insecurity, and also enhance smallholder farmers to earn more cash and to possess cash at hand during the sales of bananas (Tenkouano *et al*., 2019). However, the main limitation affecting the supply of Musa species is post-harvest losses among others. Bautista and Esguerra (2007) reposed that poor handling and sorting have resulted in postharvest disease and losses. Additionally, certain factors like temperature, relative humidity, atmospheric composition contribute deterioration and destruction of the shelf-life of plantains and bananas. Udosen (2016) ascertained that limited processing capacity are responsible for product wastage over time. Hence, this paper assessed contribution of *Musa species*' production to livelihood enhancement of agroforestry farmers. The objectives for the study were examining the

socio-economic profiles, identifying sources of *Musa species*, identifying *Musa species* availability for production, examining management practices, and assessing the contribution of *Musa species* production to sustainable livelihoods of respondents. Hypotheses testing include relationship between socioeconomic profiles and contribution to sustainable livelihoods of farmers, and relationship between *Musa species*' production and contribution to sustainable livelihoods of farmers.

METHODOLOGY

Study Area

The study was carried out in Egbeda Municipality. The site of study is geographically located on longitude 30˚56'54.753"E, 40˚8'58.585"E, and latitude 70˚27'23.532"N, 70˚18'34.578"N with shared boundaries of Ona Ara Municipality, Lagelu Municipality, North East Municipality respectively in Oyo State, and Irewolede Municipality in Osun State (Tomori, 2012). The municipality is occupying a land mass of 420.75 km². The study area is rainforest vegetation with a certain part being a derived savannah. The local government area comprises 11 wards which are Erunmu, Ebgeda, Owobale, Olodo 1, Olodo 2, Monatan, Olode, Alugbo, Olubadan Estate, Kasumu, and Ayede (Tomori, 2012). The population of the area consists of commercial and smallholder farmers.

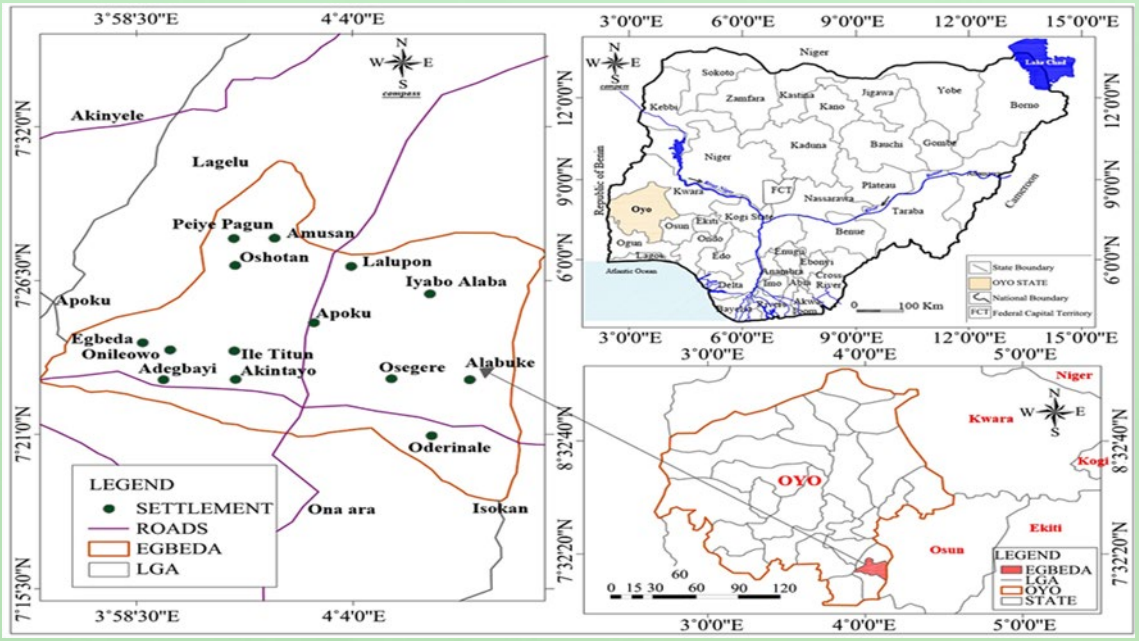

Figure 1. Maps of the Study area (Egbeda Municipality) extrapolated from the map of Nigeria

Sampling Method and Data Collection

The study adopted multistage sampling design. In 1st stage, Egbeda Municipality was purposively selected due to the large number of population of farmers practicing agroforestry. Also, in 2nd stage, 30% of 11 wards from the municipality was selected randomly. Hence, three wards were selected for the study and they were Erunmu, Egbeda, and Ayede. The sample size was selected from these three wards and communities with a random selection of 95 agroforestry farmers. Furthermore, a questionnaire was used to collect data from 95 respondents. The data collected were analyzed using frequencies, simple percentages, and inferential statistical analytical tools like chi-square and PPMC to examine the relationship that exists between the research variables.

RESULTS AND DISCUSSION

Results in Table 1 show that most respondents (69.5%) were males. This indicates male respondents engage more in the cultivation of *Musa species*. This finding corroborates submission of Ayanwale *et al*. (2018) that plantain and banana production was mainly dominated by men who were monogamously married. Majority of respondents (30.5%) that engaged in banana propagation were within age range of 41 to 50 years. This indicates that farmers who engage in production of bananas and plantains were middle-aged men. This result aligns with submission of Ayanwale *et al*. (2018) that the mean age of farmers that engaged in bananas and plantains production were in their midlife. Most respondents (54.7%) were married. This is an indication that marriage infers commitment and responsibility which influence banana production. The result negates the findings of Faturoti *et al*. (2009) who reports singles predominantly engaged in production of *Musa species*. Majority of respondents (82.1%) were having a household size of 5 persons. This indicates that family size could contributes to the robustness of bananas

and plantains production. Also, most respondents (44.2%) engaged in crop farming as one of the other livelihood activities in the study. This indicates that crop farming was another livelihood activity of the agroforestry farmers that enhances production of Musa species. This result corroborates Dimelu (2015) that most household farmers involved in mixed cropping were producers of plantain and banana in Nigeria. In addition, about 50.0% of the respondents had banana and plantain farms ranging from 1 to 2 acres. This implies that the predominant and robust production of *Musa species*. This result agrees with submission of Ayanwale *et al*. (2018) that most household farmers' farm size was less than 1 hectare. Also, 37.8% of respondents had an annual yield of 50 -60 tons of *Musa species*. This indicates that *Musa species* production is a lucrative business. This finding aligns with Nelson *et al*. (2006) who submitted that yield can be as high as 44,092 – 66.139 tons of banana and plantain annually in commercial agroforestry farms orchards. Furthermore, about 44.0% of the respondents had an annual income ranging from ₦501,010 to ₦1,500,000. This is an indication that Musa species production among agroforestry farmers contributed to their annual income. This finding aligns with the submission of Ajibade *et al*. (2022) that the net annual income from sales of *Musa species* was ₦1,907,000.

Table 1: Socio-Economic Characteristics of Respondents

Variable	Frequencies	Percentages
Gender		
Male	66	69.5
Female	29	30.5
Age		
21-30	19	20.0
31-40	25	26.3
41-50	29	30.5
>50	22	23.2
Marital status		
Single	16	16.8
Married	52	54.7
Divorced	13	13.7
Widow (er)	14	14.8
Household size		
1-5	78	82.1
6-10	13	13.7
>10	4	4.2
Other livelihood activities		
Crop farming	42	44.2
Livestock farming	23	24.2
Marketing	30	31.6
Farm size (acres)		
≤ 2	47	49.5
3-4	44	46.3
>5	4	4.2
Yield per annum (tons)		
≤50	30	31.6
50- 60	36	37.8
70-80	22	23.2
> 80	7	7.4
Income per annum (₦,000,000)		
<500,000	30	31.6
501,010-1,500,000	42	44.2
1,510,000-3,000,000	18	18.9
>3,000,000	5	5.3

Table 2: Sources of *Musa species* (Banana and Plantain)

Variable	Frequency	Percentage
Fellow farmers	61	64.2
Research Institutes	27	28.4
Ministry of Agriculture	4	4.2
Private horticultural farms	3	3.2

Results in Table 2 reveal that majority of the respondents (64.2%) were able to source for the suckers of *Musa species* from their fellow farmers. This result indicates that most agroforestry farmers got their planting material from their fellow farmers very close to them. This result corroborates Adeoye *et al*. (2013) who submits that about 92% of farmers sourced their planting suckers directly from their fellow farmers.

Results in Table 3 show that most respondents (60.0%) stated that *Musa accuminata* was available and 67.4% of respondents also stated *Musa balbisiana* too was available. This finding indicates that *Musa accuminata and Musa balbisiana* were predominantly available for production among farmers. This finding concurs with Adewole (2017) that *Musa species* of different varieties were predominantly available in southwest Nigeria as one of the staple foods.

Results in Table 4 show that most respondents (71.6%) agreed that seasons do not affect the production of bananas and plantain. This indicates that cultivation of *Musa species* thrives during rainy and dry seasons due to its perennial nature. This result concurs with Sense (2016) that *Musa species* need both hot and humid environments with an average temperature of 30°C and rainfall well distributed throughout the year. Furthermore, majority of the respondents (81.1%) propagated bananas with suckers sourced from their fellow farmers. This implies that banana and plantain suckers were sourced from fellow farmers which ease the stress of sourcing planting materials for robust production of banana and plantain. This result corroborates Agbongiarhuoyi *et al*. (2016) that majority of farmers sourced their planting materials from their fellow farmers. About 57.0% of respondents applied inorganic fertilizers on their farms. This indicates that applying fertilizer is important to value addition for a robust production of banana and plantain. This finding aligns with the submission by Norgrove and Hauser (2014) that majority of smallholder farmers involved in the cultivation of plantain applied fertilizer as a cultural practice. Also, most respondents (76.8%) stated that the length of maturity of bananas ranges from 9 months to more months. This indicates that the duration of banana and plantain production takes up to 9 months or more. This result conforms to the opinion of Agu (2018) that farmers need 8-9 months to harvest fully mature fruits of plantain and banana.

Results in Table 5 show that about 63.0% of respondents signified more sources of income from the production of bananas and plantain, and about 78.0% of respondents established that there was increase in their income from banana and plantain sales after harvest. Furthermore, the majority of the respondents (92.6%) had improved living standards. This indicated that banana and plantain production was a lucrative business among the agroforestry farmers which was evident in its contribution to their livelihood enhancement in the study area. This result corroborates Akinyemi *et al*. (2010) that the production of *Musa species* production has tremendously raised the income of rural livelihoods.

Table **3: *Musa species* Available for Production among Agroforestry Farmers**

Variable	Yes	No
	Frequency (%)	Frequency (%)
Musa accuminata (Wild Banana)	57 (60.0)	38 (40.0)
Musa balbisiana (Plantain)	64 (67.4)	31 (32.6)
Musa baradisiaca (Hybrid Banana)	28 (29.5)	67(70.5)

Percentages in parentheses

Table 4: Production Practices in Cultivation of *Musa Species* by Agroforestry Farmers

Variable	Yes	No
	Frequency (%)	Frequency (%)
Seasons do not affect the production of *Musa species*	68(71.6)	27(28.4)
Use of suckers from tissue culture for propagation	22(23.2)	73(76.8)
Use of suckers from fellow farmers for planting	77(81.1)	18(18.9)
Spacing of suckers during planting is essential	65(68.4)	30(31.6)
The application of inorganic fertilizer is very important	54(56.8)	41(43.2)
Use of agrochemicals important for production	17(17.9)	78(82.1)
Length of maturity between 9 months and 11 months	73(76.8)	22(23.2)
Some species mature in 12 months or more	28(29.5)	67(70.5)

Percentages in parentheses

Table 5: Contribution of *Musa Species* Production to Sustainable Livelihoods of Agroforestry Farmers

Variable	Yes	No
	Frequency (%)	Frequency (%)
Increase in sources of income	60(63.2)	35(36.8)
Improvement of income after sales	74(77.9)	21(22.1)
Improvement in standard of living	88(92.6)	7(7.4)
Contribution to food security	49(51.6)	46(48.4)

Percentage in parentheses

Table 6: Relationship between respondents' socio-economic characteristics and contribution of *Musa species* production to sustainable livelihoods of agroforestry farmers

Variable	χ^2	p-value	Decision
Sex	2.85	0.09	Not significant
Age	8.78	0.03	Significant
Marital status	6.48	0.09	Not significant
Household size	2.17	0.34	Not significant
Other livelihood activities	13.30	$1x10^{-3}$	Significant

Note: χ^2 = Chi-square coefficient, p = level of significant @ $\alpha_{0.05}$

Table 7: Relationship between the production of banana species and contribution of *Musa species* production to sustainable livelihoods of agroforestry farmers

Variable	r-value	p-value	Decision
Musa production and Sustainable livelihoods	-0.026	0.04	Significant

Note: r = correlation coefficient, p = level of significance @ $\alpha_{0.05}$

The results in Table 6 reveal that age (χ^2= 8.78, p<0.05), and livelihood activities (χ^2= 13.30, p<0.05) of the respondents are significantly related to the contribution of *Musa species* production to sustainable livelihoods of agroforestry farmers. This result implies that the age of farmers and their other livelihood activities have a high level of dependency on the contribution of *Musa species* production to the farmers' livelihood enhancement. This indicated that the farmers' age and other livelihood activities were germane factors of years of experience and practice *Musa species* production that contributed to the livelihood enhancement of the agroforestry farmers. This result corroborates Kainga *et al*. (2014) that the average age of *Musa species* farmers was approximately 45 years and their other livelihoods mean to contribute to livelihood improvement.

The result in Table 7 showcased a weak correlation but significant relationship between the production of banana species and contribution of *Musa species* production to sustainable livelihoods of agroforestry farmers (r =- 0.026, p = 0.04). This result implies that respondents' production of practices had an influence on the livelihood enhancement of the farmers indicating production practices are favorable and impactful on the livelihood enhancement of the agroforestry farmers. This finding concurs with submission of Sengar *et al*. (2019) that the management practices involved in the production *of Musa species* raise the yield of banana and plantain thereby enhancing income and sustaining the livelihoods of farmers.

CONCLUSION

The study assessed contribution of *Musa species* to sustainable livelihoods of agroforestry farmers in Egbeda municipality, Oyo State, Nigeria. The findings showed majority of the farmers engaging in *Musa species* production being middle-aged men. These were married people practicing crop farming as an additional livelihood on acres of land for production of *Musa species*. Furthermore, the findings showed that most agroforestry farmers got their planting material from their fellow farmers. The findings also revealed that *Musa accuminata and Musa balbisiana* were predominantly available for production by agroforestry farmers. Several management practices were used to ensure optimum yield for most respondents with an annual yield of 50 - 60 tons of Musa species accruing from their production with an annual income of ranging from ₦501,010 to ₦1,500,000, showcasing a lucrative business with improved income and enhanced living standards. The study recommends an introduction of effective extension services to rural agroforestry farmers by subject matter specialists to meet their information and input needs. In addition, subject matter specialists should train the agroforestry farmers on new techniques of cultivation, and also introduce them to sources of credits and loans that would create a value-chain production and high rate of return on investment.

Acknowledgments
We acknowledge the contribution of the respondents for providing us with data.

REFERENCES

Adeniji,T.A. and Tenkouano, A. (2008). Effect of processing on whole flour's proximate, mineral, and pasting properties from some new plantain and banana hybrid pulp and peel mixture. *Journal of Tropical Agriculture, Food, Environment, and Extension*. 7 (2); 99-105. http://www.agrosciencejournal.com/

Adeoye, I.B., Oni, O.A., Yusuf, S.A. and Adenegan, K.O. (2013). Plantain Value Chain Mapping in Southwestern Nigeria. *Journal of Economics and Sustainable Development* 4 (16); www.iiste.org

Ajibade, Y.E., Ameh, O.E., Onoja, N.M., Jeremiah, D.J. (2022). Banana fruits enterprises profitability analysis in Odigbo Local Government Area, Ondo State, Nigeria. *International Journal of Innovative Science and Research Technology* 7 (3): 1530-1540 https://www.ijisrt.com

Akinyemi, S.O.S., Aiyelaagbe, I.O.O. and Akyeampong, E. (2010). Plantain (*Musa species*) Cultivation in Nigeria: A Review of Its Production, Marketing, and Research in the Last Two Decades. *Acta Hortic*; 879, 211-218 https://www.actahort.org

Akinyemi, S.O.S., Adejoro, M.A., Layade, A.A., and Adegbite, O.O. (2017). Market Structure and Performance for Plantain and Banana. *International Journal of Fruit Science* 17 (4). https://www.tandfonline.com

Ayanwale, A., Fatunbi, O. and Ojo, M. (2018). Baseline Analysis of Plantain (Musa species) Value Chain in Southwest Nigeria. 3 (1); www.researchgate.net Agbongiarhuoyi, A.E.,

Ayegboyin, K.O., Ogunlade, M.O., and Orisajo, S.B. (2016). Farmers' Use of Banana Instead of Plantain as Shade Crop in Cocoa Establishment: A Case of Cross River State, Nigeria. *World Rural Observations*; Vol.8 (1). www.sciencepub.net/rural

Agu, Z. (2018). Detailed Guide to How to Grow Plantains. https://legit.ng>1150513

Bautista, O.K. and Esguerra, E.B. (eds.) (2007). Post-harvest Technology for Southeast Asian Perishable Crops. Second Edition. University of the Philippines Los Banos and DA-Bureau of Agricultural Research. 447. https://www.bar.gov.ph

Dimelu, M.U. (2015). Involvement of Farm Households in Banana and Plantain Production. *Journal of Agricultural Extension;* 19 (1): 105-116 https://www.ajol.info

Faturoti, B.O., Ajayi, A.R., Baiyeri, P. and Madukwe, M.C. (2009). Impact of International Institute of Tropical Agriculture Banana (*Musa species*) Production Technologies on Smallholder Farmers in Southern Nigeria. *Journal of Applied Sciences*; 9: 2592-2598 https://scialert.net

Food and Agriculture Organization (2006). The State of Food and Agriculture in 2006. Available at www.fao.org/dorcep/...../ao800e

Food and Agriculture Organization, AGROSTAT Database (2004). Food and Agriculture Organization of the United Nations. Production Yearbook. FAO, Rome.

Kainga, P.E., Okorji, C.E., and Nweze, N.J. (2014). Socio-economic determinants and productivity of Banana and Plantain Production. Global Journal of Biology, Agriculture and Health Sciences. 3 (1); 26-31. www.gifre.org

Nelson, S.C., Ploetz, R.C, Kepler, A.K. (2006). Musa species (banana and plantain). Species profiles for pacific Island agroforestry. www.traditionaltree.org

Norgrove, L. and Hauser, S. (2014). Improving Plantain (*Musa* spp. AAB) Yields on Smallholder Farms in West and Central Africa. *Journal of Food Security* 6: 501-514 https://link.springer.com

Sengar, S., Manoj, K., and Chaudhary, R. (2019). Banana Farming for Enhancing Income and Sustaining Livelihoods

Sense Agric. (2016). Plantain (Musa spp.) Production Manual. www.agriculturenigeria.com

Tenkouano, A., Lamien, N., Agogbua, J., Amah, D., Swennen, R., Traore, S., Thiemele, D., Aby, N., Kobenan, K., Gnonhouri, G., Yao, N., Astin, G., Sawadogo-Kabore, S., Tarpaga, V., Issa, W., Lokossou, B., Adjanohoun, A., Amadji, G.L., and Adangnitode, S. (2019). Promising High-Yielding Tetraploid Plantain-Bred Hybrids in West Africa. International Journal of Agronomy. https://www.hindawi.com>ija

Tomori, S.A. (2012). Memorandum on Local Government Administration 2nd Edition. Pp 120-176

Udosen, J.S. (2016). Economic Analysis of Plantain (*Musa paradisiaca*) Marketing in Federal Capital Territory (FCT) Abuja, Nigeria. Online Master's Thesis. www.kubanni.abu.edu.ng