EFFECT OF INDIGENOUS AGRICULTURAL PRACTICES ON RURAL SMALL-SCALE YAM FARMING IN ONDO STATE, NIGERIA

IBIDAPO, I.

Department of Agricultural Science, Adeyemi Federal University of Education, Ondo State, Nigeria
Correspondence: ibidapo68@gmail.com; +2348032282432
https://orcid.org/0009-0006-6725-4234

ABSTRACT

The decline in yam production has been worrisome among small-scale yam farmers; however, the effect of the adoption of indigenous agricultural practices in yam production is yet to be adequately investigated. This study, therefore, investigated the effect of indigenous agricultural practices on rural small-scale yam farming in Ondo State. The multistage sampling procedure was employed in the selection of 150 yam farmers. Data were collected using a structured questionnaire. Data collected were analysed with descriptive statistics (frequency distribution counts, mean and standard deviation) and probit regression analysis. The results revealed that 69.3% of small-scale yam farmers were male, with an average age of 47.01±9.03 years, and the mean household size was 7.0±2.0 people, and 52.6% had no formal education. Common indigenous agricultural practices employed included mixed cropping, bush fallowing, use of organic fertilisers/manure, mulching, making of heaps and mounds, and communal labour arrangements. Findings showed that many farmers indicated that the application of indigenous agricultural practices in yam cultivation increases yam productivity. The probit regression analysis revealed that age of farmers, education, household size, non-farm income, access to inputs and cultivated farm size significantly influence adoption of indigenous agricultural practices at 5% level of significance. Indigenous agricultural practices were reported to improve soil fertility, structure, health and drainage, leading to an increase in yields. The study recommends that increased awareness about indigenous practices and improved access to finance and inputs be provided to support small-scale yam farmers.

Keywords: ***Indigenous practices, small-scale, food security, probit regression, yam cultivation***

INTRODUCTION

Globally, 2 billion people are food insecure, and about 1 billion people are hungry, and of these, 254 million people are found in sub-Saharan Africa(FAO, 2012; 2017; IFPRI, 2016). Food security has been a major concern of the global development agenda as reflected in Millennium Development Goals (MDGs) and Sustainable Development Goals (SDGs) (UN, 2014). The importance of yam in addressing food insecurity and hunger cannot be underplayed, and it has the potential to reduce poverty and food insecurity in households (Ihenacho *et al*., 2019; Ufondu*et al*., 2021). Nigeria is the largest world producer of yam with an annual production of about 36.72 million metric tonnes (Aniedu, 2016).

Yam production has been an age-long farming activity of rural communities to supply food for the family and indigenous practices have formed the foundation of this practice among smallholder farmers (Udemezue *et al*., 2017). Yam is a major stable food crop that is widely grown and consumed by average households of Nigeria and the sustainability of yam production has become a subject of increasing interest to society and researchers (Aniedu, 2016). The traditional system of production has been of much benefit to the farmers in terms of productivity, soil health and environmental

effects, hence, the practices are passed down through generations. Indigenous agricultural practices such crop rotation, shifting cultivation, intercropping, and organic manure production using local resources, are deeply rooted in cultural and environmental sustainability (Sharma *et al*., 2021; Islam *et al*., 2017). In the rural communities in developing countries, yam is not only a staple food crop but also holds significant cultural and economic value for the households. Yam as an important source of income and food could help to alleviate poverty, hunger and malnutrition among the farming households. Despite the application of modern agricultural innovations such as fertilizers, pesticides, among others, to boost yam production, there has been consistent decrease in yam production. Moreover, the adverse effects of these modern innovations on yam, soil, environment and biodiversity cannot be undermined. Hence, the adoption of indigenous methods of yam production could be viewed as a panacea to low or poor yield, loss of fertility and biodiversity. Over the last two decades, there has been increase interest in the roles the adoption of indigenous agricultural practices can play in participatory approaches to food security and sustainable development (Kom *et al*., 2024; Malapane *et al*., 2024; Akinola *et al*., 2020).

Indigenous agricultural practices adopted by rural farmers largely depend on traditional knowledge, common in the agricultural system to preserve the ecosystem, biodiversity, and useful in maintaining sustainable food and human health (Ishwar *et al*., 2020; Rwangire and Muriisa, 2019). Farmers possess a vast pool of indigenous knowledge in crop production which reduces external input dependency by utilizing various agricultural practices (Ishwar *et al*., 2020; Rwangire and Muriisa, 2019). Indigenous agricultural practices can offer resilience and sustainability in yam production in the face of climate variability and limited access to modern inputs. However, decline in yam production among small-scale yam farmers has been a serious problem on households' food security (Ufondu*et al*., 2021). Several studies on yam production focused on the application of fertilizer, organo-minerals fertilizers, to boost production however, there are limited empirical evidence on the effect of indigenous agricultural practices on yam productivity (Sharma *et al*., 2021; Ufondu*et al*., 2021). Indigenous agricultural practices have been reported to have positive significant effects on agricultural production, improved soil fertility and yields, thus enhance food production (Sharma and Kanta, 2020). Literature on the integration of indigenous practices enhances households food security (Rwangire and Muriisa, 2019), maintenance of biodiversity (Sharma *et al*., 2021), address climate change and mitigation among others (Ihenacho *et al*., 2019).

In the rural areas of the developing countries, many of the modern agricultural yam production practices have not yielded to the growing food demands, leading to food insecurity among rural population. Moreover, modern agricultural innovations are observed to be cost-ineffective and cannot bolster rural farmers' ability to maximise yam yield and profit. The effects of indigenous agricultural practices most importantly in yam production have not been adequately investigated particularly in the study area; hence, there is limited empirical evidence on the adoption of indigenous agricultural practices and effects on yam production. Hence, there is a need for a holistic evaluation of the influence of indigenous practices on yam production and food security. Findings of this study will provide information on indigenous

agricultural practices in yam production, thus helping to sensitise yam farmers on the benefits of the practices in agricultural production. Hence, this study investigated the effect of indigenous agricultural practices on rural small-scale yam farming in Ondo State. Specifically, this study seeks to;

1. examine the socio-economic characteristics of small-scale yam farmers in the study area,
2. identify the various indigenous agricultural practices used by small-scale yam farmers in the study area,
3. examine the effects of indigenous agricultural practices on small-scale yam farming households in the study area, and
4. determine factors influencing small-scale yam farming households' engagement in indigenous agricultural practices in the study area.

METHODOLOGY

The study was conducted in Ondo State, which is an agrarian state, and the area favours the cultivation of both arable and cash crops. The average rainfall lies between 1000mm and 2400mm, with a mean temperature of 240 °C. The study area has an estimated population of 7,930,787 people (National Population Commission of Nigeria, NPC, 2021). The population for the study comprised the small-scale yam farmers who cultivate between 0 and 5 hectares of farmland in the study area. Primary data for this study were collected using A validated structured interview schedule was used in the collection of primary data for this study. One hundred and fifty small-scale farmers were selected for the study through the multistage sampling procedure. The first stage entailed the random selection of 3 local government areas (Owo, Ondo-East and Okitipupa) in the state. The second stage consisted of the random selection of five (5) agrarian communities in each of the selected LGAs for the study. The final stage comprised random selection of small-scale yam farmers in the selected communities based on the probability proportionate to the size of farmers in the communities. A total of one hundred and fifty (150) small-scale yam farmers were used for the study. Data collected included socio-economic characteristics of small-scale yam farmers, indigenous agricultural practices, and effects of indigenous agricultural practices on yam cultivation, among others. Data collected were analysed with descriptive statistics (frequency distribution, mean and standard deviation) and probit regression analysis. The probit regression was used in the determination of factors influencing the adoption of indigenous agricultural practices among small-scale yam farmers in the study area. The probit model specification is implicitly stated below;

Model specification: The probit model is specified as in Gujarati (2003);

$P_{1(Y=`1)} = (FZ_1)$.....1

Where $Z_1 = \beta_0 + \beta_1 X_1$

$Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + ...+ \beta_n X_n + ... \varepsilon$.....2

Y is unobserved but $Y_1=0$ if $Y_1^* < 0$, $Y_1 =1$ if $Y_1^* \geq 0$

$P(Y_1=1) = P(y_1^* \geq 0)$

$P(\varepsilon \geq - \beta_1 - \beta_2 X_{2i} ..... \beta_n X_{ni})$.....……3

Where Y_i = 1 if farmers' adopt indigenous agricultural practices 0 = otherwise), X_1 = Age of the farmer (yr), X_2 = Gender (male =1, 0 = otherwise), X_3 = Marital status (married =1, 0 = otherwise), X_4 = Household size , X_5 = Level of education (yrs), X_6 = Non-farm income (₦),X_7 = Cultivated farm size (ha), X_8 = Total livestock unit (TLU), X_9 = Access to information (1=yes, 0= no),

X_{10} = access to credit (1= yes, 0= no km), X_{11} = Distance to farm (km), X_{12} = Road access (1=yes, 0= no), β_0 = Constant , β_1- β_6 = parameters to be estimated, ε = error term.

RESULTS AND DISCUSSION

The results in Table 1 revealed that the mean age of the farmers was 47.01±9.03 years. This attests to findings that in the rural areas of the developing countries, the majority of the farmers are within the economically active age (Khumalo *et al*., 2025). The result on gender shows that 69.3% of the yam farmers were male-headed households. This finding agrees with Khumalo *et al*. (2025), who reported more male engagement in indigenous agricultural practices in South Africa. This is contrary to findings by Ufondu*et al*. (2021), who reported more female involvement in the adoption of indigenous agricultural practices in yam cultivation. The result implies that gender plays a paramount role in farmers' participation in indigenous agricultural practices. On marital status, the study revealed that 16.8% were single, while 68.6% of the yam farmers were married, suggesting the significance that being married will enhance more labour for the production of yams for members of the family. This finding was at variance with Khumalo *et al*. (2025), who reported that single participants participate more in the adoption of cultural practices.

The educational attainment of the yam farmers indicates that 52.6% had no formal education, while 25.6% obtained the primary education certificate. The low level of education may contribute to the low level of adoption of innovation in agriculture; however, this may be why others failed to use or engage in indigenous agricultural practices. This finding corroborates Nkegbe*et al*. (2022), who reported the challenges of education among small-scale farmers in Ghana. The results also revealed that 84.0% of the yam farmers adopted indigenous agricultural practices in yam production. This finding is in line with Ufondu*et al*. (2021) that indigenous agricultural practices have been on with farmers for decades; however, farmers' adoption of the practices is gradually declining, most especially in yam production.

On household size, the analysis revealed that the household size of small-scale yam farmers was 7.0±3.0 members on average. This is, however, more than the average national household of 5 members per household in Nigeria. This implies that more labour would be made available by the family for farm activities, particularly yam production. This supports finding by Amsalu *et al*. (2013) that more members in the households guaranteed more labour supply for farm work in yam production, and this can serve as an impetus to the adoption of indigenous agricultural practices. The years of experience revealed an average of 10.5 ±3.6 years, which implies that yam farmers have more years of experience in yam cultivation, which could influence better performance in yam production. This is in agreement with Ochonma*et al*. (2018) that more years of experience of workers on a job can have a significant influence on the mastery of the work, which can metamorphose into better performance.

On cultivated land size, the result shows that the mean cultivated land size was 1.42±1.03 hectares of land. This finding is in harmony with the Federal Office of Statistics (FOS, 1999) report that the average land size of smallholder farmers is less than 5 hectares. This finding corroborates Babatunde and Quaim (2016) that small-scale farmers are constrained by a shortage of land for farm production. The widespread adoption of indigenous agricultural practices could be

attributable to the small farm holding at the disposal of the farmers. However, indigenous agricultural practice was reported to enhance soil productivity and resilience to variability in climate change in yam production. The adoption of indigenous agricultural practice was observed to be beneficial to the yam farmers as reflected in the average income of ₦143645± ₦57406. This indicates that the engagement of indigenous agricultural practice was able to boost productivity, hence an increase in farmers' income.

Table 1: Socio-economic characteristics of small-scale yam farmers n = 156

Variables	Frequency	Percentage (%)	Mean
Age			
<30	17	10.9	
30 – 45	49	31.4	
46 – 60	74	47.4	47.01±9.03
>60	16	10.3	
Sex			
Female	48	30.7	
Male	108	69.3	
Marital Status			
Single	25	16.0	
Married	107	68.6	
Widowed	10	6.4	
Divorced/Separated	14	9.0	
Education			
No formal education	82	52.6	
Primary education	40	25.6	
Secondary education	29	18.6	
Tertiary education	5	3.2	
Do you engage indigenous practice in yam cultivation?			
No	25	16.0	
Yes	131	84.0	
Household Size (number)			
<5	10	6.4	
5 – 8	85	54.5	
9 – 12	53	34.0	7.0±3.0
>12	8	5.1	
Yrs of Experience (years)			
<6	6	3.8	
6 – 9	76	50.0	10.5±3.6
10 – 13	63	40.4	
>13	9	5.8	
Cultivated Land Size (hectare)			
<0.50	32	20.6	
0.5 – 1.50	106	67.9	1.42±1.03
>1.50	18	11.5	
Income from Yam Cultivation (₦)			
<65000	12	7.6	
65,000 – 104,000	26	16.7	
105,000 – 144,000	103	66.0	143645±57406
145, 000 – 184,000	11	7.1	
>184, 000	4	2.6	

Source: Field Survey, 2025

Analysis of results in Table 2 revealed the various indigenous agricultural practices and the effects of these practices on yam farmers in the study area. It was revealed that the indigenous agricultural practices engaged by yam farmers in the study area included: mixed cropping, shifting cultivation, cultural pest and disease control, ash broadcast, crop rotation, among others. This finding supports Sharma *et al*. (2021) and Ihenacho *et al*. (2019), who reported crop rotation, crop diversification and mixed farming, multiple cropping, and changing the time of planting as some of the indigenous agricultural practices adopted for yam production in southeast Nigeria. Moreover, the finding concurs with Rwangire and Muriisa (2018) in Uganda, who reported that the engagement of indigenous knowledge in agricultural practices is important is very effective in meeting the food requirements, effective in soil enrichment, weeding and mound/ridge making. Rwangire and Muriisa (2018) state further that mixed farming, mixed cropping, crop rotation and shifting cultivation helptremendouslyin enhancing bumper harvest on the farm.

Table 2: Distribution by Indigenous Agricultural Practices Adopted by Farmers n = 156

Indigenous Agricultural Practices	Frequency**	Percentage (%)
Shifting cultivation	128	82.0
Mixed cropping	119	73.3
Cultural Pest/Diseases Control (hand picking, neem and urine, spray mixture of ash)	134	85.9
Mulching	129	82.7
Organic manuring (compost, green manure, FYM)	137	87.8
Use a regenerated tree base as a stake	98	62.8
Ash broadcasting	111	71.2
Crop rotation/fallow land	142	91.0
Mixture of ash/urine/manure	123	78.8

Source: Field Survey, 2025 *****multiple responses***

On the effects of indigenous agricultural practices on yam production, the finding shows that 61.5% of the yam farmers indicated it increases soil fertility and aeration, 12.8% and 10.9% indicated that indigenous agricultural practices conserve biodiversity, and reduce erosion and leaching, among others. This finding is in line with Kom *et al*. (2024) that various indigenous practices helped to improve soil structure, aeration, mitigate climate change, increase soil nutrients and enhance the growth of plants, leading to good yield. Kom *et al*. (2024) stressed that indigenous agricultural practice such as mixed cropping helps to preserve soil fertility, while minimal tillage keeps top soil strong enough to prevent washing away by erosion. It therefore implies that indigenous agricultural practices such as mixed cropping systems, bush fallowing, and mulching allow for soil management strategies, thus helping to ensure the sustainability of farmland (Rwangire and Muriisa, 2018).

Table 3: Distribution by Effects of Indigenous Agricultural Practices n = 156

Effects of Indigenous Practices	Frequency**	Percentage (%)
Improves soil health	118	75.6
Increases soil fertility and aeration	136	87.2

Effects of Indigenous Practices	Frequency**	Percentage (%)
Increases yield	141	90.4
Reduces soil erosion and leaching	132	84.6
Conservation of Biodiversity	128	82.1

Source: Field Survey, 2025 ***** multiple responses***

Results in Table 3 show factors influencing small-scale yam farmers' adoption of indigenous agricultural practices in yam production in the study area. The results of the probit regression revealed that the log likelihood was -128.549 and significant at 1%. This indicates that the hypothesised variables are joint predictors of yam farmers' engagement in indigenous agricultural practices in the study area. The LR Chi^2 was 169.8, the Prob>Chi^2 was 0.000, while the Pseudo R^2 was 0.4985. The results showed that age, household size, education, non-farm income, cultivated land size, access to information and credit were the significant variables influencing yam farmers' adoption of indigenous agricultural practices. Age is found to influence individuals' decision making and was significant at 1%, but with a negative coefficient and marginal impact on yam farmers adoption of indigenous practices, suggesting that an increase in age reduced yam farmers engagement in indigenous agricultural practices by 8.5%. This is in line with Chinwuba (2015), who find negative association between age and participation in farm activity.

Household size showed a positive coefficient and was significant at 1% level of significance. This indicated that as household size increases the probability of yam farmers' participation in indigenous practices increased by 16.2%. This implies that increase in numbers of family members will increase the adoption of indigenous agricultural practices by 8.5%. This finding is contrary to Makhathini (2013) submission that household with more young children or less than 18 years reduces labour participation in adoption of innovation practices on the farm. Education of small-scale yam farmers was negatively significant at 1% level relative to engagement in indigenous agricultural practices. This implies that a one-year increase in years of completed education decreased engagement in indigenous agricultural practice by 6.3% in the study area. This conforms to the *a priori* expectation that more years of completed education reducefarmers' participation in indigenous practices, but for more lucrative jobs outside the farm. This supports finding of Otto (2019) that education positively influences participation in non-farm activities and negatively affects participation in farm activities.

Cultivated land size had a positive coefficient and was significant at 5% level of significance. This implies that a hectare increase in cultivated land size increases the probability of small-scale farmers' involvement in indigenous agricultural practices in yam cultivation by 3.6%. This is not unconnected with the fact that land is a major asset of the smallholder farmers; hence,the availability of land will lead to an increase in the scale of production on the farm. This aligns with findings by Grega *et al*. (2015) that a lack of land or access to land lowers productivity and could lead to poverty among farmers. Access to information and credit were found to have positive significant coefficients at 5% respectively relative to engagement in indigenous agricultural practices in yam production. This implies that farmers' access to information will help to equip them on the indigenous knowledge and practices of yam cultivation. Moreover, access to credit will

enhance yam farmers to procure farm inputs and other farm tools and materials that could boost the adoption of indigenous technology in yam production on the farm.

Table 4: Factors Influencing the Adoption of Indigenous Agricultural Practices among Yam Farmers

Variables	Coefficient	P>/z/	Marginal Effect
Age (yrs)	-0.598(0.275)	0.000***	-0.085
Gender (1= male; 0 = otherwise)	-0.288(0.303)	0.301	-0.041
Marital status (1 = married; 0 = otherwise)	0.400(0.427)	0.347	0.057
Household size (number)	1.033(0.246)	0.000***	0.162
Education (years of schooling)	-1.145(0.247)	0.000***	-0.063
Non-farm income (₦)	3.790(0.837)	0.000***	0.127
Cultivated land size (hectares)	0.514(0.245)	0.036**	0.073
Total livestock unit (TLU)	0.155(0.256)	0.546	0.022
Access to information (1= yes; 0 = no)	1.006(0.348)	0.022**	0.142
Access to credit (1 = yes; 0 = no)	1.450(0.439)	0.041**	0.205
Distance to farm centre (km)	-0.461(0.229)	0.344	-0.065
Road Access (1= yes; 0 = no)	-0.142(0.269)	0.597	-0.020
Constant	-15.339(5.397)	0.000***	

Source: Author's Computation, 2025; *Observation = 131; Log Likelihood = -128.549; LR Chi^2 = 169.83; Prob>Chi^2 = 0.000; Pseudo R^2 = 0.4985; *** and ** significant @ 1% and 5%.*

CONCLUSION AND RECOMMENDATIONS

The indigenous agricultural practices adopted in the study area included mixed cropping, ash broadcasting, crop rotation/fallow, among others, and these were observed to have positive effects on conservation of biodiversity, soil fertility and yield of yams. The study found that adoption of indigenous agricultural practices in yam production could be influenced by the age of yam farmers, household size, education, cultivated land size, access to information and credit, among others. Hence, it is recommended that yam farmers should be given adequate education and training on indigenous practices, and youth should also be encouraged in the adoption of indigenous agricultural practices in yam production. Access to information and finance should be encouraged among farmers, as these will help in the adoption of agricultural innovations on the farm.

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