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Socio-Economic Determinants of Input Use and Agronomic Practices among Yam Farmers in Cross River State, Nigeria

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ABSTRACT
The study examined the Socio-Economic Determinants of Input Use and Agronomic Practices among Yam Farmers in Cross River State, Nigeria. The methodology indicates a final sample of 150 yam farmers and descriptive statistics were used to characterize agronomic practices, while multiple linear regression was used to examine input-use relationships. Result showed that sex (0.419) and farming experience (0.425) were positive and significant for farm size at 5% level. The estimated coefficients for farming experience (0.22) and farm income (0.12) were positive and significant for use of seed yam at 10% and 5% levels respectively. Similarly, analysis showed that only farming experience (0.41) contributed positively and significantly to use of herbicide at 10% level. The estimated coefficient for sex (-0.91) was negative and significant for use of fertilizer at 5% level. Findings showed that only age (1.15) contributed positively and significantly to use of labour at 10% level. Education was positive and significant for farm size (0.0763), seed (0.024), herbicide (0.017) and fertilizer (0.015) respectively at various levels of significance. Similarly, farm income was significant and positive for all the variables measured. Result indicates that a unit increase in farm income increases the use of all the variables measured by their corresponding coefficients The following policy recommendations were made based on the findings of this study: increase in the education of yam farmers should be encouraged to increases the use of the identified positive variables in cultivation of yam in the area.

Keywords: Socio-Economic Characteristics, Input Use, Yam Production, Agronomic Practices

INTRODUCTION

Yam is a highly prized crop in Nigeria, nutritionally superior to other comparable crops and a major employer of labour in Nigeria (Nweze and Umebali, 2021). Nigeria is the leading yam producing country and although yam production in Nigeria has risen over time, there is decreasing yield and low annual growth rate of the crop in Nigeria (Food and Agricultural organization (FAO), 2022). Yams are one of the most expensive crops to produce, increased yam production is due to expansion of land area under cultivation and its production is expensive and labour-intensive in Nigeria, with labour constituting approximately 40% of the total cost of production, nevertheless, yam cultivation is profitable and has high demand.
(Shiwachi and Toyohara, 2005).

Although yams are grown throughout Africa, Nigeria is said to be the world's largest producer, accounting for roughly 67% to 70% of total global yam production (NBS, 2022). FAO (2022) reported that Nigeria' annual production ranges between 45 million and 67.2 million metric tons, depending on the season and reporting metrics, with around 2.8 to 2.9 million hectares are dedicated to growing yams across the country. Despite this massive output, national demand of 120 million metric tons leaves a more than 50 million metric ton deficit. Izetor and Olumese (2010) revealed that yam production without high labour leads to low yield per hectare when compared to crops such as cassava or sweet potato. The authors noted that relatively large amount of planting materials and agronomic practices are required and its long growing season was observed to be a limiting factor to it profitability. By far the most critical of these factors is labour requirement, which exceeds that of other comparable crops. For these reasons and problems of storing harvested yam, the cost of production is high and yam is slowly losing ground to cassava. The resources that are usually needed by yam farmers range from land to seed yams, labour, chemicals and fertilizers, which are often barely affordable (Komolafe *et al.* 2022). In Nigeria, beyond its food and nutritious values, the ownership and cultivation of yam have many cultural, religious, and social meanings, which may vary between specific ethnic groups and regional areas. International Institute of Tropical Agriculture (IITA, 2023) averred that yam production is a major source of livelihood and food security to the producers in Nigeria.

Yam production in Cross River State, Nigeria, is largely driven by smallholder farmers who face significant constraints (Agbachom *et al.* 2024). Yield and profitability depend heavily on the farmer's age, education level, and household size, which influence decisions regarding labor use, the use of organic versus inorganic inputs, and traditional agronomic practices. Nweze and Umebali (2021) noted that major socio-economic profile of yam farmers includes but not limited to the following: demographics: majority of yam producers in the state are middle-aged to older males, land constraints: land tenure systems practised (communal tenure system) often restrict farm sizes, with most farmers cultivating small plots ranging from 1 to 2 plots or less than 1 hectare. According to Ettah *et al.* (2026) other attributes include: education & experience: many farmers possess basic to secondary-level education. A higher level of education positively correlates with a better understanding of improved technologies, soil management, and fertilizer application.

Also, labor dynamics as an attribute remains a major bottleneck and family labor is heavily utilized for routine operations (Shiwachi *et al.* 2008).

According to Amaefula (2021) agronomic practices and input use can be seen as techniques and strategies used to cultivate yam. The inputs include: planting materials: farmers typically rely on traditional seed yams and yam setts (retained tubers from previous harvests). The quantity and quality of yam setts used are significant determinants of the final output. Soil management: traditional methods of soil fertility maintenance, such as shifting cultivation, bush fallowing, and the burning of crop residues, are widely practiced (Olatinwo *et al.* 2022). The application of inorganic fertilizers: this is recognized but underutilized due to high costs and limited access. Cultural practices: agronomic tasks - including land clearing, mound making, staking, weeding, and harvesting—remain predominantly manual. Mechanization and irrigation are rarely utilized. Pesticide/herbicide use: the use of agrochemicals to manage pests and weeds is growing but often depends on the farmer's financial capital and cooperative memberships (National Bureau of Statistics (NBS), 2022).

The crops' cultivation and yield patterns are of economic importance to the livelihood of an average farmer, as they have links with food security in rural areas. Yam has a large potential to enhance agribusiness development, generate income and employment opportunities that will lead to significant impact in the rural sector. Socio-economic characteristics of yam farmers have been known to affect yam production in Nigeria (Komolafe *et al*. 2022). The critical lack of site-specific input use and integrated agronomic frameworks tailored to modern, climate-resilient yam production practices and the paucity of information regarding this subject matter in the study area are the research gaps this study is designed to fill. Hence, this study aims to assess the influence of farmers' socio-economic characteristics on agricultural input use and to examine the agronomic practices employed in yam production in Cross River State, Nigeria. Therefore, this study would provide agronomic and input-use information in the cultivation of yam to farmers and farm organizations, who want to venture into yam production. To policy makers, the study will help formulate policies that will have a direct bearing on yam farm which will enhance productivity, leading to greater output

MATERIALS AND METHODS

Study Area

Cross River State, Nigeria is the study area. The State is bounded by the States of Benue `in the North, Ebonyi on the West, Akwa Ibom on the South West. It is bordered on the East by the Cameroon Republic and fronts the Atlantic Ocean on the South (National Population Commission, (NPC), 2006). The State lies between latitude 4° 15' North and $7^{\circ}00'$ North and longitude $7^{\circ}15'$ East and $9^{o}30^{1}$ East and has a land area of about 7,782 square miles or 20,156 square kilometers and the population as at 2006 Census Baseline recorded a total of 2,892,988 residents. Following an annual growth rate of about 2.8% to 3.0%, projections scale higher toward 4. 6 million to 5.2 million people in 2026 (NPC, 2006). The state has a climate characterized by two distinct seasons-the dry and wet seasons. The dry season spans from November to late March, while rainy season spans from April to October with a short spell in August called "August break". The mean annual rainfall is between 1,300mm to 3,000mm, which varies from place to place across the state (Cross River State Ministry of Agriculture and Tourism Guide, 2022). According to the tourism guide, highest temperature is recorded between February and March and does not exceed 37^{o}C and the lowest between May and October and does not go below 15^{o}C and also varies from place to place.

The vegetation of the state parades four distinct features: Mangrove Swamp (wetland), rainforest, derived savannah and parkland (Cross River Tourism Bulletin (CRTB), 2023). The type of soil found in the area is deep laterite fertile and dark clayey basalt. Hence, agriculture is the major activity of Cross Riverians. Studies by CRTB (2023) noted that over 75% of the people of the state are engaged in agriculture. This figure is distributed in agricultural production, processing and distribution. For convenience of administration, the eighteen local government areas the state is divided into were further subdivided into three agricultural zones by the Cross River State Agricultural Development Project (CRADP) (2022). The Southern zone comprises the following local government areas. Akpabuyo, New Bakassi, Calabar municipality, Calabar South, Biase, Akpamkpa, and Odukpani, with headquarters in Calabar municipality. The central zone has Yakurr, Abi, Obubra, Ikom, Etung and Boki, with headquarters in Ikom while the northern zone has, Ogoja, Bekwarra, Yala, Obanliku and Obudu, with headquarters in Ogoja.

Sampling Technique

The population for the study comprised yam farmers from Cross River State. Multi-stage sampling technique was used to select respondents for the study. In the first stage, Yakurr, Ikom and Ogoja, Local Government Areas were purposively selected because they are the major producers of yam in the State. In the second stage, a simple random selection of five villages was made from each Local Government Area earlier selected, bringing the total number villages to fifteen. Thirdly, a simple random selection of five council wards was made from each the villages earlier selected, giving a total of seventy-five wards in the sample. Lastly a simple random selection of two farmers was done from each of the wards making a total of 150 respondents for the study.

Data Collection

Data for this study was collected from primary sources using a structured questionnaire. The questionnaires were used to collect information on; socio-economic characteristics of yam farmers and agronomic practices used in yam production in the study area. The questionnaires were administered by extension agents and trained enumerators and supported by interviews to elicit information for those who cannot read and write.

Data Analysis

The data collected for this study were analysed using both descriptive and inferential statistics (linear regression)

Model Specification

Ordinary Least Square Regression

The statistical software and version used was the statistical package for the social sciences **(**SPSS) Stata 19 version

The linear regression was used to achieve the objective. It is expressed as:

Linear: $Yi = \beta_O + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + e$ (1)

Where Y = each input used (farm size, seed yam, herbicide, fertilizer or labour)

and the X's represent the farmers' socio-economic characteristics

β_n = coefficient to be estimated

X_1 = Age (years)

X_2 = Sex (dummy 0= male, 1= female)

X_3 = education (years in school)
X_4 = farming experience (years)
X_5 = farm income (naira)
e = Error term.

RESULTS AND DISCUSSION

Ordinary Least Square Estimates of Parameters Showing the Influence of Socio-Economic Characteristics on Input Use

Findings in Table 1 showed the influence of socio-economic characteristics on input use. The result shows that sex (0.419) and farming experience (0.425) were positive and significant for farm size at 10% level of significance. The significance of sex implies that the coded sex categories ownership of land enhances farm size. The estimate of regression coefficient of sex showed that, for the estimated difference between the coded sex categories, holding other variables constant, farm size increases by 0.6ha. On farming experience, increased knowledge in farming practices could lead to increased cultivation of yam which could likely increase production. The estimated coefficients for farming experience (0.022) and farm income (0.012) were positive and significant for use of seed at 10% and 5% level respectively. This implies that, for every additional one year of farming experience the quantity of seed use increases by 0.64kg and for every one naira gained from yam the quantity of seed used is 0.3kg. Increased income from yam will motivate expansion of farm size and hence increased use of seed and more efficiently owing to experience. Similarly, analysis showed that only farming experience contributes positively and significantly to use of herbicide, yam seeds and fertilizer at 10%, 5% and 10% level of significance repectively. Increase in farming experience tends to increase quantity of use of these variables by yam farmers. Their effective use is strongly based on experience over past years without which expected bumper harvest can be marred.

The estimated coefficient for sex (-0.091) was negative and significant for use of fertilizer at 10% level. This implies that the cultivation of yam by the coded sex categories tends to decrease quantity of fertilizer used by 0.91kg. This could be that this category sticks to their old believe that yam does not require fertilizer. It could also be that they feel their soil is rich in nutrient and as such doesn't need to be fertilized. Furthermore, findings in Table 1 showed that, only age (1.15) contributes positively and significantly to use of labour at 1% level. The positive relationship implies that, for every increase in age of farmers by a year, increases use of labour by 1.15 man-days. It is expected that the more one grows in age, the more the household size which will be employed into cultivation of yam for higher productivity and hence income to meet various needs. Education was positive and significant for farm size (0.076), seed (0.024), herbicide (0.017) and fertilizer (0.015) respectively at various levels of significance. This means that increase in education of yam farmers increases the use of these variables in cultivation of yam in the area. Similarly, farm income was significant and positive for all the variables measured. This result is in line with *apriori* expectation that more farm income facilitates the use of farm inputs and the findings of Shiwachi *et al.* (2008). Result indicates that a unit increase in farm income increases the use of all the variables measured by their corresponding coefficients.

Table 1: Regression Analysis of Input Use and Socio-Economic Relationship

Independent Variable	Farm size	Yam seed	Herbicide	Fertilizer	Labour
Constant	-0.35	-0.19	0.63	-1.35	2.03
	(-0.511)	(-0.21)	(0.86)	(-0.70)	(3.36) *
Age	-0.116	0.28	0.06	0.31	1.15
	(-0.707)	(1.35)	(0.36)	(0.86)	(0.079) *
Sex	0.419	0.13	0.04	-0.91	-0.15
	(0.0605) *	(0.63)	(0.21)	(-0.0219) **	(-1.07)
Education	0.048	0.019	0.08	0.28	-0.06
	(0.0763)	(0.024)	(0.017)	(0.015)	(-1.11)
Experience	0.425	0.22	0.41	0.37	0.01
	(0.058) *	(0.064) *	(0.0502) *	(0.0703)*	(1.46)
farm income	0.023	0.12	0.01	0.05	0.03
	(0.074) *	(0.030) **	(0.032) **	(0.060) *	(0.010) **
R^2	0.21	0.13	0.15	0.07	0.33
R^2 adjusted	0.18	0.10	0.11	0.03	0.30
F	6.93	3.78	4.34	1.81	12.35
Prob > F	0.00	0.00	0.00	0.07	0.00

p < .01; p < .05
Source: Field Survey 2026

Predominant Agronomic Practices for Yam Production in The Study Area

Agronomic practices for production of yam are shown in Table 2. Land preparation starts between January and February in the area with clearing and burning after about three weeks and subsequently parking. This finding is similar to that of Ettah *et al.* (2025) who found a similar period of land preparation for yam cultivation in the South-South region of Nigeria, which could be attributed to the early onset of the rainy season in this area. Tilling of the soil into heaps of about one-meter-high follows in March, within this period the rains start dropping. A study by revealed that tilling can also be done in February or in April depending on the nature of the land - wetland or dryland respectively. Generally, the rains start early because the area is in the mangrove Swamp and rain forest zones of the country (Olatinwo *et al.* 2022). Planting of yam setts/seeds is done in April, at this period the farmland is moderately wet, since the rains are not intense. However, noted that yam setts/seeds can be planted in march in wetlands in spite of the sparse rains and then mulched. Between June and July, 1st weeding and staking activities takes place to avoid competition for food, space, etc. of the newly established yam with weeds and ensure upward growth of the yam respectively, a practice necessary for the proper

growth and development of the tubers. Idumah and Owombo (2019) averred that this weeding depends on the rate of growth and establishment of the weeds.

Farmers in the area rarely use herbicides, probably because of cost and ignorance (Agbachom *et al.* 2024; Iriegbu 2019). Fertilizer and pesticide applications are also hardly done by the farmers due to the claim that their soils were fertile enough and no incidences of pest attacks respectively. First harvesting begins when the crop is fully matured by August and September. This first harvest is used for the celebration of the new yam festival of the people of the area. According to Oniah and Edem (2024) this first harvest is not done by most of the people of the area except those who may want to use them for festivities because they consider the yams not matured enough for consumption. In October, the yam farm is weeded again to eliminate the newly grown weeds and between November and December the second and final harvest is done. Edem *et al.* (2024) noted that this harvest can be delayed to January depending on the maturity rate and financial position of the farmer. These agronomic practices are similar to those recommended by National Agricultural Extension and Research Liaison Services, Ahmadu Bello University Zaria, Nigeria and IITA. Tieing in barns ends the agronomic practices, which takes place after the second harvest in December and acts as storage for the yam. Ettah *et al.* (2026) in their study advised that yam should be marketed as soon as they are harvested because of the high incidence of theft and disease infestation.

Table 2: Predominant Agronomic Practices for Yam Production in the Study Area

Farm operations	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
Land preparation	****	****										
Tilling			****									
Planting				****								
1st weeding/staking							****	****				
1st harvesting									****			
2nd weeding											****	
2nd harvesting												****
Tying in barns												****

CONCLUSION

The study was carried out to determine the socio-economic determinants of input use and agronomic practices among yam farmers in Cross River State, Nigeria. Respondents were selected through a three-stage sampling technique. Both descriptive and inferential statistics (linear regression) were the tools employed to capture the objectives of the study. Result showed that sex and farming experience were positive and significant for farm size at 5% level. The estimated coefficients for farming experience (0.22) and farm income (0.12) were positive and significant for use of seed at 10% and 5% levels respectively. Similarly, only farming experience contributes positively and significantly to use of herbicide at 10% level. The estimated coefficient for sex (-0.91) was negative and significant for use of fertilizer at 5% level. Findings also showed that only age (1.15) contributed positively and significantly to use of labour at 10% level. Agronomic practices and their timing in the area for yam production are consistent to best practices. The following is recommendations are proffered: increase in the education of yam farmers should be encouraged to increases the use of the identified positive variables in cultivation of yam in the area.

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