

## ECONOMICS OF UNDERUTILIZED CROP PRODUCTION IN AKOKNORTH WEST LOCAL GOVERNMENTAREA, ONDO STATE, NIGERIA: A CASE STUDY OF PIGEON PEA (*Cajanus cajan*)

**Olutope Stephen OJO**

Adekunle Ajasin University, Agricultural Economics Department, Akungba-Akoko, Ondo State, Nigeria, Phone: +234 9030001700, E-mail: olutope.ojo@aaua.edu.ng; topeojo7777@gmail.com

**Corresponding author:** topeojo7777@gmail.com

### **Abstract**

*The study deals with Economics of underutilized crop production in Akoko North West Local Government Area of Ondo State, using pigeon pea as a case study. Specifically, the study describes the socio-economic characteristics of pigeon pea farmers, estimate the profitability of Pigeon pea production, identify factors that affect the profitability of Pigeon pea production and identify the constraints facing Pigeon pea production in the study area. To achieve these, 120 pigeon pea farmers were selected and interviewed with the use of a well – structured questionnaire. Multistage sampling technique was used for the study. This involved purposive selection of ten communities (Arigidi, Okeagbe, Oyin, Ogbagi, Afin, Ese, Irun, Ajowa, Ikaramu and Erusu) out of 18 communities in the study area. The second stage involved snowball sampling of which 12 respondents were selected from each village to make a total of 120 respondents in the study area. Descriptive statistics were used to analyze the socio-economic characteristics of respondents and constraints facing Pigeon pea production, Budgetary analysis was used to analyze the profitability of Pigeon pea production and Regression analysis was used to analyze the factors that affect the profitability of Pigeon pea production. The results of the estimate of Cost and return revealed that the average pigeon pea production for the last season was 105.4kg and the average price was ₦551.7. The BCR (Benefit Cost Ratio) was estimated to be ₦ 1.6 and this implies that for every one naira invested in pigeon pea farming, the farmer. Will realize ₦1 and 6 kobo. The result of the multiple regression of the factors affecting the output of pigeon Pea indicated that 96.1% of the total variation in the level of pigeon pea output is accounted for by all the explanatory variables in the regression model. The estimated coefficient of labour was negative and significant at 1 percent alpha level and the estimated coefficient of agrochemical, and quantity produce were positive and significant at 1 percent alpha level, indicating that increase in this variable will increase output and profit of pigeon pea of the constraints affecting pigeon pea farming poor road network was ranked the 1st and land problem was ranked 12th. It was recommended that government should provide funds for the Research institutes for the innovations of improved pigeon pea production and hence boost the production of pigeon pea in Nigeria. Also, more studies should be carried out to consider the future outlook of the crop. Inputs like fertilizer, improved seed varieties and farm machineries should readily be available to farmers at affordable rate and on time.*

**Key words:** economics, underutilized, crop production, Pigeon pea, *Cajanus cajan*

### **INTRODUCTION**

The agricultural sector in Nigeria has undergone significant challenges over the past two decades, transitioning from a period of thriving export trade in agricultural commodities to becoming heavily reliant on imports [26]. The imperative of protein intake for maintaining good health among the populace cannot be overstated, with the Food and Agricultural Organization [16, 18]. recommending a daily consumption of 71 grams of protein per person. However, animal-based protein sources such as fish,

beef, and mutton are often prohibitively expensive for many Nigerian households [38]. This underscores the importance of exploring affordable protein alternatives, with plant-based sources like cowpea, pigeon pea, and soybean emerging as viable options [38]. Pigeon pea (*Cajanus cajan*), in particular, stands out as a promising protein source. Originating from Barbados, this legume is cultivated worldwide under various names such as tropical green pea and red gram [15]. Despite its potential benefits, pigeon pea is categorized as an underutilized crop due to neglect from various stakeholders, including

researchers, farmers, and consumers [9, 29, 14].

Globally, pigeon pea ranks sixth among pulse crops, with significant cultivation across 82 countries, predominantly in India, where it accounts for a substantial portion of production [17]. In Africa, it plays a crucial role in countries like Malawi, Kenya, and Uganda, often grown alongside other staple crops [11]. In Nigeria, pigeon pea thrives in the guinea savannah zones of both the northern and southern regions, contributing significantly to agricultural activities, particularly in states like Oyo [10].

The economic potential of pigeon pea is substantial, serving as a key protein source for both humans and livestock, a raw material in pharmaceuticals, and a versatile food product [24, 20]. Its appeal to smallholder farmers in rural areas lies in its multifaceted benefits, including income generation, livestock feed, and food security during lean periods [4, 20]. However, despite its economic significance, research on pigeon pea in Nigeria remains inadequate, with limited data and policy frameworks to support its production and utilization [15].

Pigeon pea represents a promising avenue for addressing protein deficiencies and enhancing economic development in Nigeria's agricultural sector, particularly among smallholder farmers. Thus, making it to be highly relevant economically [36]. However, concerted efforts are needed to unlock its full potential through increased research, investment, and policy support.

#### *Problem statement*

Pigeon pea holds significant importance as a staple crop in many Asian countries, yet in Nigeria, its utilization remains notably low. One of the main hurdles is the lack of competitiveness compared to commonly cultivated legumes like cowpea and soybean. However, overcoming this underutilization challenge is feasible if the economic significance of pigeon pea is recognized and demand increases, particularly given its potential as evidenced by international demand [29, 28]. Nigeria has recently secured a substantial \$100 billion offer from India to export legumes, including pigeon pea, as

reported by the National Agricultural Quarantine Service [28]. This initiative is poised to generate significant revenue, particularly benefiting women who are heavily involved in pigeon pea cultivation due to its potential to enhance both income and nutritional security for households [3]. The agricultural sector's underperformance in Nigeria can be attributed to inefficiencies and the limited availability of resources such as land, labor, and capital along the production chain. Additionally, high transactional costs and the weak performance of enterprises are prevalent, stemming from challenges such as elevated transportation costs, inadequate storage facilities and equipment, and insufficient market infrastructure [2]. Capital is limited, and investment in agricultural production is minimal, while traditional and outdated techniques are still prevalent. Research indicates that the challenges facing small-scale agriculture in Nigeria encompass a scarcity of high-yielding seed varieties and cultivars, insufficient information regarding new production technologies, a lack of basic farm inputs, and reliance on traditional, low-productivity methods [7]. There exist farmers in the Akoko North West Local Government Area of Ondo State engaged in pigeon pea production. Therefore, it is imperative to assess the profitability of these crops and to raise awareness among farmers about the global opportunities that pigeon pea farming can offer them.

This study will explore the stated research question as well as any additional inquiries that may arise during the investigation:

- (i) what are the socio-economic characteristics of respondents in the study area?
- (ii) how profitable is Pigeon pea in the study area?
- (iii) what are the factors that affect profitability of Pigeon pea production in the study area?
- (iv) what are the problems associated with Pigeon pea production in the study area?

#### *Objectives of the Study*

The main objective of this research was to assess the profitability of pigeon pea production in the Akoko North West area of

Ondo State. The specific objectives of the study were to:

- (i) describe the socio-economic characteristics of respondents in the study area;
- (ii) estimate the profitability of Pigeon pea production
- (iii) identify factors that affect the profitability of Pigeon pea production in the study area
- (iv) identify the problems facing Pigeon pea farmers in the study area.

### Justification

Numerous research endeavors have explored the nutritional significance of pigeon pea [33, 34, 19, 25]. Additionally, other studies have examined the correlation between pigeon pea yields and economic aspects [21]. Additional research has focused on the utilization and challenges associated with pigeon pea production [22, 27, 3].

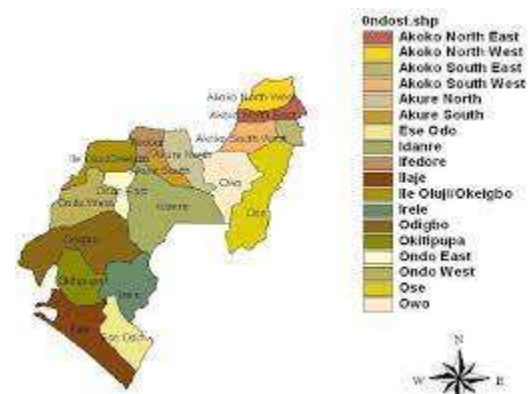
While research on the preference and consumption of pigeon pea is available [23], there remains a dearth of studies focusing on the profitability of pigeon pea production, its production prospects, and the constraints inhibiting its cultivation in Nigeria. Additionally, the majority of studies on pigeon pea have not been specifically conducted within Nigeria, resulting in a lack of current information regarding pigeon pea production activities. This study aims at providing information on the Economics of Pigeon pea Production in Akoko North West Local Government Area of Ondo State, Nigeria.

## MATERIALS AND METHODS

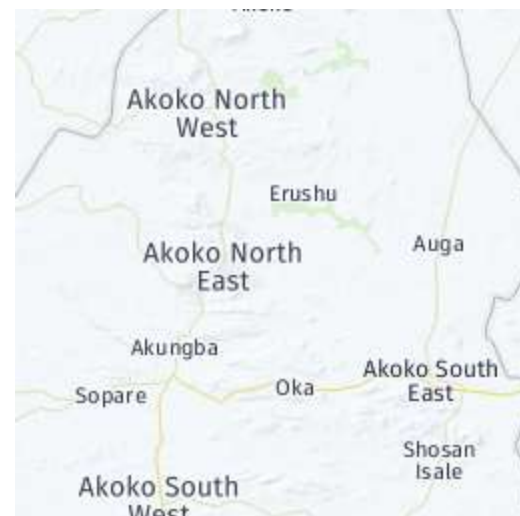
### The Study Area

This research was carried out in carried out in Akoko North-West Local Government of Ondo State. The choice of Akoko North-West area for this study was deemed to be appropriate given its antecedent in agriculture and farming activities. Generally, Akoko is a large Yoruba cultural sub-group in the North Eastern part of Yoruba land and it extends from Ondo State to Edo state. It has a population of about 815,360 people (Federal Government of Nigeria, 2007) with a land area of 1,283,443 km<sup>2</sup> and with the

coordinates of 7°23'51.58" N 5°41'40.67" E. It takes 4 out of the 18 local government areas in the state. The local government areas include Akoko North East, Akoko South West, Akoko North West, and Akoko South East. The major occupation there is farming and most of the people in the district are engaged in small- and large-scale farming with major arable crops cultivated. Some of the crops grown include groundnut, tomatoes, maize, cocoa, cassava, yam, plantain etc.



Map 1. Nigeria  
 Source: Wikipedia.org [40].



Map 2. Map of Akoko Districts, Ondo State  
 Source: Wikipedia.org [37].

### Sampling Technique

Akoko North-west LGA was chosen because of the heavy concentration of pigeon pea (*Cajanus cajan*) crop in the area. Multi-stage sampling was used to select samples for the study. The first stage involved the purposive selection of one local government from the eighteen local government areas that make up the entire Ondo state while the second stage

involved a simple random selection of ten (10) out of thirteen (18) communities in the local government area. The last stage involved a snowball sampling technique selection of twelve (12) rural farmers from each selected community, which totalled one hundred and twenty (120) rural farmers in all the selected communities.

*Data Analysis*

Data for analysis were generated primarily using interview scheduled and structured questionnaires administered to one hundred and twenty (120) respondents selected for the study.

*Analytical Technique*

Data for the study were analyzed using both descriptive and inferential statistics. Objectives(i) and (iv) were analyzed using descriptive statistics such as mean, percentages and frequency distribution. Objective (ii) was analyzed using Budgetary Analysis Technique. Objective (iii) was analyzed using Regression Analysis.

*Model Specification*

*Budgetary Analysis Technique*

Farm budgetary model was constructed to determine the profitability of Pigeon pea production. Net income was computed as the difference between the Gross Revenue and Total Cost of Production. Total Cost of production is the total expenses incurred during the production period. It includes Variable and Fixed costs. Return on Investment (ROI), Benefit cost Ratio (BCR) are indicators that determine the worthiness of an investment.

$$NI = TR - TC \dots\dots\dots(1)$$

$$\text{Recall that, } TR = P \cdot Q \dots\dots\dots(2)$$

$$TC = TFC + TVC \dots\dots\dots(3)$$

$$\text{Therefore, } NI = P \cdot Q - (TFC + TVC) \dots\dots\dots(4)$$

where:

NI = net income accrued to the  $i^{\text{th}}$  farmer from Pigeon pea production (₦)

TR = Total revenue realized from the sale of Pigeon pea by the  $i^{\text{th}}$  farmer (₦)

TVC = Total variable cost incurred on production of Pigeon pea by the  $i^{\text{th}}$  farmer (₦)

Q = Total quantity of produced by the  $i^{\text{th}}$  farmer (₦)

P = Current price per unit of output (₦)

TFC = Total fixed cost incurred by the  $i^{\text{th}}$  farmer (₦)

Benefit Cost Ratio: The Benefit-cost ratio analysis will be measured

Using:

$$BCR = TR/TC \dots\dots\dots(ii)$$

where:

BCR = Benefit-Cost Ratio

BCR must be greater than 1 for an investment in pigeon pea farming to be worthwhile. According to Olaoye et al. (2016), an agricultural venture is profitable provided that:

$$TR > TC;$$

$$BCR > 1;$$

ROI > 0.00; Net Farm Income and Gross margin are positive.

P = Unit price of output (₦/kg)

Q = Total quantity of output, that is pigeon pea (kg)

*Regression Analysis*

Regression analysis was used to determine factors that affect profitability of Pigeon pea production. In estimating the parameters of socio-economic characteristics, the explicit production function relating income realized from the sales of grains (Y) to some explanatory variables (Xi) was expressed as:

$Y_1$  = Gross Income realized in Pigeon pea grains production by  $i^{\text{th}}$  farmer (Naira)

X1 = Sex

X2 = Age of respondents(years)

X3=Household size

X4 = Year of Experience (years)

X5=Year of education

X6=Farm size

X7=Quantity of seed

X8=Labour

X9=Agrochemical (liters)

X10=Quantity produces(kg)

E = Error term

Four functional form namely linear, exponential, double logarithm and semi logarithm functions were fitted to determine the form that best fit for the data.

Explicitly, the models were represented as follows:

The linear regression was expressed explicitly below:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \mu;$$

Semi log

$$Y = \beta_0 + \beta_1 \text{Log}X_1 + \beta_2 \text{Log}X_2 + \beta_3 \text{Log}X_3 + \beta_4 \text{Log}X_4 + \beta_5 \text{Log}X_5 + \beta_6 \text{Log}X_6 + \beta_7 \text{Log}X_7 + \beta_8 \text{Log}X_8 + \beta_9 \text{Log}X_9 + \beta_{10} \text{Log}X_{10} + \mu;$$

Exponential

$$\text{Log } Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \mu;$$

Double log

$$\text{Log } Y = \beta_0 + \beta_1 \text{Log}X_1 + \beta_2 \text{Log}X_2 + \beta_3 \text{Log}X_3 + \beta_4 \text{Log}X_4 + \beta_5 \text{Log}X_5 + \beta_6 \text{Log}X_6 + \beta_7 \text{Log}X_7 + \beta_8 \text{Log}X_8 + \beta_9 \text{Log}X_9 + \beta_{10} \text{Log}X_{10} + \mu;$$

*Likert scale*

Likert scale was used to analyze objective (iv). Likert scale is a 5-point scale that uses an ordinal level of measurement. Likert scaling is a summative and bi-polar scaling method that measures either positive or negative response to statement. The responses to the various constraints were scored so that the response indicating the most serious constraint was assigned the highest point (i.e., 5).

As a 5-point scale, the responses were grouped into five:

- (1) Very serious = 5
- (2) Serious = 4
- (3) Moderately serious = 3
- (4) Least serious = 2
- (5) Not serious = 1

For a given constraint, the mean was computed by summing the score on each constraint and dividing by the total number of responses. This method of determining the constraints is important, because it tells exactly which constraints are serious. Should the mean be less than 3, it means the 37 constraint is not very serious, and if the mean is equal to or greater than 3, that will indicate very serious constraints.

## RESULTS AND DISCUSSIONS

### Socio-economic characteristics

The survey analyzed a range of socio-economic factors among respondents, encompassing age, gender distribution, marital status, level of education, household size, access to credit, capital acquisition channels, experience in pigeon pea cultivation, participation in cooperative associations, utilization of extension services, cropping systems employed, preferred planting varieties, adoption of improved pigeon pea strains, and resistance to diseases.

The findings reveal a varied distribution of respondents across different age brackets. Specifically, 11.7% fell within the age range of 30-39 years, while the majority, comprising 65%, were aged between 40 and 49. Furthermore, 10% were within the 50-59 age bracket, with 5.8% and 7.5% falling within the 60-69 and 70-79 age categories, respectively. The estimated mean age of respondents was 48 years. These findings underscore that a significant portion of pigeon pea farmers sampled are still in their prime working years, indicative of a demographic actively involved in agricultural activities. The presence of younger farmers, known for their agility, willingness to embrace risk, and eagerness to adopt new technologies and practices, is particularly notable. This outcome is in line with the observations made by [7], who also noted that the majority of farmers, with an average age of 44 years, are well-positioned to contribute positively to agricultural production.

The analysis of respondent gender distribution indicated that the majority (69.2%) were male, with the remaining (30.8%) being female. This suggests a notable gender disparity in participation within pigeon pea production, with women accounting for a smaller proportion. The prevalence of male dominance in this context may be attributed to the physically demanding nature of pigeon pea cultivation, particularly when intercropped with other crops. This finding resonates with the observations made by [12], who similarly reported a predominance of male pigeon pea farmers, comprising approximately 66.6% of the surveyed population.

The findings indicate that 5% of respondents were single, 20% were widowed, and the majority (75%) were married. The prevalence of married respondents suggests a potential abundance of labour for pigeon pea production. It's worth noting that marital status is often linked to household size, with single individuals potentially relying on hired labour for farm activities. The overwhelming presence of married individuals underscores the dominance of farming activities among this demographic in the study area. As noted by [1], the capacity of households to provide necessary labour for farming largely hinges on their marital status.

The distribution of educational levels among the respondents is as follows: 5.8% had no formal education, 43.3% had completed primary education, 38.3% had attained secondary education, and 12.5% had tertiary education. This indicates that a majority of the respondents had attained relatively higher levels of education. Consequently, there is a higher likelihood that these educated respondents may be more receptive to adopting new innovations, technologies, and acquiring technical knowledge pertaining to pigeon pea farming. This observation resonates with the findings of [30], who underscored the significant influence of education in motivating small-scale farmers to embrace new innovations and research findings relevant to their agricultural activities.

The analysis of household sizes among the respondents revealed that 49.2% had households comprising 4 to 6 members, 25.0% had households with 7 to 9 members, 15.8% had households ranging from 10 to 12 members, 0.8% had households with 13 to 15 members, and 2.5% had households exceeding 15 members. With a mean household size of 4.6, it suggests a fairly large household size, potentially providing ample family labour if farmers engage their family members in agricultural activities. This could consequently lead to increased pigeon pea production in the study area. These findings align with those of [13], who similarly reported a mean household size of 4.7 among

pigeon pea farmers in Riyom Local Government Area, Plateau State.

The distribution of access to credit facilities among the respondents revealed that 87.5% did not have access to such facilities, while 12.5% did. The lack of access to credit facilities has discouraged many respondents from participating in agricultural productive activities that could potentially enhance production within the study area, as suggested by [32].

The distribution of capital sources among pigeon pea farmers showed that the majority (76.7%) sourced their capital for pigeon pea farming from personal savings. This reliance on personal funds is partly due to the insufficient access to credit from formal financial institutions. This discovery mirrors the findings of [5], whose research revealed that a significant proportion of farmers in Osun State, Nigeria, initiated their agricultural ventures using personal savings.

The distribution of respondents by years of experience revealed that 37.5% had 11-20 years of farming experience, while 27.5% had 21-30 years of experience specifically in pigeon pea farming. The average farming experience among farmers in the study area was calculated to be 23.4 years. This finding is consistent with the results of [8], who noted that 50% of pigeon pea farmers had between 15 to 25 years of farming experience. This suggests that the farmers engaged in pigeon pea production in the study area have been involved in farming for a substantial period. Accumulated experience equips farmers with the necessary knowledge and management practices essential for successful pigeon pea production.

The breakdown of respondents by membership of cooperatives revealed that 83.3% were not members of any cooperative, while the remaining 16.7% were cooperative members. This suggests that the majority of respondents were not engaged in cooperative membership, potentially impacting pigeon pea production in the study area. Cooperative membership typically enhances efficiency by providing easier access to productive inputs and facilitating extension services, compared to non-members. The fundamental purpose of

cooperative associations is to empower individuals to address their challenges through collective action.

Table 1. Socio-economic Characteristics of the Respondents (n =120)

Characteristics	Frequency	Percentage
<b>Age (Years)</b>		
Below 30	16	13.3
31-40	29	24.2
41-50	73	60.8
Above 50	2	1.7
<b>Marital Status</b>		
Single	3	2.5
Married	114	95
Widowed	2	2.5
<b>Educational level</b>		
No formal education	4	3.3
Primary education	26	21.6
Secondary education	50	41.7
Tertiary education	38	31.7
Other	2	1.7
<b>Gender</b>		
Male	84	70
Female	36	30
<b>Household size</b>		
Below 5	38	31
6-10	75	62.5
11-15	6	5.0
Above 15	1	0.8
<b>Access to credit</b>		
Yes	56	46.7
No	64	53.3
<b>Cooperative membership</b>		
Yes	75	62.5
No	45	37.5
<b>Extension services</b>		
None	65	54.2
Monthly	8	6.7
Quarterly	27	22.5
Yearly	20	16.6
<b>Income per annum</b>		
Below ₦100,000	58.68	48.9
₦100,000- ₦500,000	46.68	38.9
₦500,001- ₦1,000,000	9.36	7.8
Above ₦1,000,000	5.28	4.4
<b>Frequency of meals per day</b>		
Once per day	3	2.5
Twice per day	20	16.7
Three times per day	93	77.5
Four times per day	4	3.3
<b>Amount spent on food per month</b>		
Below ₦2,000	35	29.2
₦2001-₦5,000	81	67.5
Above ₦5,000	4	3.3

Source: Field survey, 2024.

This finding resonates with that of [31], who found that a significant portion of farmers declined to participate in cooperatives, often due to cultural and religious beliefs.

The distribution of respondents by extension visits revealed that 82.5% did not receive any extension services, while only 17.5% received such services annually. This indicates a lack of adequate extension services reaching the respondents. Consequently, it suggests that many pigeon pea farmers may not be sufficiently informed about recent innovations and best practices in pigeon pea farming. Research suggests that respondents who do not receive visits from extension agents have fewer opportunities to enhance their income compared to those who do [6].

The distribution of respondents based on their cropping systems revealed that the majority of farmers (74.2%) practiced mixed cropping, followed by sole cropping (15.0%), and intercropping (10.8%). This analysis suggests that pigeon pea farming often involves mixed cultivation or planting alongside other crops, optimizing the utilization of land, labour, and fertilizers.

These findings are consistent with those of [35], who noted that mixed cropping is the predominant system in pigeon pea farming.

The distribution of respondents' access to new varieties showed that the majority (82.5%) do not have access to new varieties, while 17.5% do. This indicates that farmers generally lack access to new varieties, potentially contributing to the underutilization of the crop in the study area.

### Cost and Return Estimate of pigeon pea production

The incurred cost items in pigeon pea farms were grouped into variable and fixed costs. The variable cost considered include expense on labour which comprises of (land preparation, weeding, and harvesting), while the fixed cost which are at depreciated cost are cutlass, bucket, hoe, jute bag, and basket. The average cost is presented in Table 2.

The table showed that labour cost (land preparation 41.0%, weeding 17.0, and harvesting 20.0%) accounted for 78.0% of the total cost, Agrochemical accounted for 10.0%, and transportation accounted for 3.0%.

The fixed depreciation fixed cost on cutlass, basket, hoe, jute bag and basket accounted for 2.0%, 1.0%, 3.0%, 1.0%, 2.0% respectively. The total fixed cost accounted for only 9.0% of total cost.

Table 2. Distribution of Cost structure and Net farm Income of the Respondents

Items	Value in (₦)	
Variable Cost	Average	Percentage
Labour	28,496	78
Agrochemicals	3,500	10
Transportation	1,200	3
<b>TVC</b>	<b>33,196</b>	<b>91</b>
<b>Fixed Cost (Depreciation Cost)</b>		
Cutlass	819	2
Bucket	508	1
Hoe	971	3
Jute bag	392	1
Basket	637	2
<b>TFC</b>	<b>3,327</b>	<b>9</b>
<b>Total Cost=TFC + TVC</b>	<b>36,523</b>	<b>100</b>
Quantity (Q) sold =	105.40	
Price (P) per kg	551.70	
Quantity	105.4	
Total Revenue (TR) = Price *Quantity	58,141	
Gross Margin= TR -TVC	24,945	
NFI =TR -TC	21,618	
Benefit Cost Ratio (BCR)=TR/TC	1.60	

Source: Field Survey, 2023.

A partial reason for this low share of fixed cost is that all fixed costs are depreciated values. The results interpret that labour is highly essential for production so as to increase the output yield of pigeon pea in the study area. The average pigeon pea production for the last season was accounted for 105.4kg and the average price was accounted for ₦551.7.

The average revenue for pigeon pea farmers was accounted for ₦58, 141 and gross margin for pigeon pea farming was estimated to be ₦24, 945. This result was in line with [12]. who estimated revenue and gross margin for pigeon pea farmers to be ₦ 50, 185 and ₦27, 564 respectively. The net farm income was calculated by subtracting the total cost of

production from the total revenue in the last production season. The BCR (Benefit Cost Ratio) is estimated to be ₦ 1.6 46 47 and this implies that for every one naira invested in pigeon pea farming, the farmer will realize ₦1 and 6 kobo. BCR must be greater than 1 for an investment in pigeon pea farming to be worthwhile. Pigeon pea farming is a profitable venture in the study area. Farmers in the study area should be encouraged to go into pigeon pea farming because of its profitability and economic benefit.

### Factors affecting the Profitability of Pigeon pea

Four different functional form were fitted to the data and these are linear, double log, Exponential and semi-log. On the basis of criteria of choice of the lead equation, the linear model was chosen as lead equation because it has the highest R<sup>2</sup> The linear model has R<sup>2</sup> of 0.961% and this implies that 96.1% of total variation in the level of pigeon output is accounted for by all the explanatory variables in the regression model as well as expected positive signs. The estimated coefficient labour, agrochemical, and quantity produce were positive and significant at 1 percent alpha level indicating that these variables were the factors affecting the profitability of pigeon pea in the study area. The estimated coefficient of labour was negative and significant at 1 percent alpha level, indicating that increase in this variable will decrease profit of pigeon pea by 55.4%. Possible reasons for this negative coefficient could include inefficient use of labour, high wage rates, or inadequate training of labourers. For instance, if the labour input is not used efficiently or if the labour force is not skilled enough to perform the necessary tasks, then the additional labour input may not lead to an increase in output proportional to the increase in cost. Agrochemical was positively coefficient at 1 percent alpha level. The implication of this results is that increase in the use of agrochemical will increase the profit of farmers by 0.2%. The high cost of agrochemical may reduce the quantity of litres used by the farmers and these decisions may reduce the output of pigeon pea production and hence increase the profit of pigeon pea



farmers. The quantity sold was positively significant at 1 percent alpha level. This result implies that increase in the quantity of pigeon pea sold will increase pigeon pea profit by 12%. This result was in line with [7] whose

findings indicated that Fertilizer and farm size were the variables significant in determining the profit efficiency of pigeon pea production in Federal capital Territory Abuja.

Table 3. Distribution for OLS Regression Estimates of Production of Pigeon Pea Production

Independent Variables	Variable letter	Linear	Double log	Exponential	Semi-log
Constant	Coefficient	-30313.76	-6.857	8.134	-452446
	T-value	(-4.750)	(-2.725)	(-10.267)	(-7.717)
	P-value	0.000	0.008	0.000	0.000
Sex	X <sub>1</sub>	125.923	0.063	0.021	-1811.71
		(-0.087)	(-0.300)	(-0.115)	(-.367)
		0.931	0.765	0.909	0.714
Age	X <sub>2</sub>	19.825	-0.138	2.71835	10502.19
		(-0.236)	(-0.312)	(-0.003)	(-1.044)
		0.814	0.756	0.998	0.299
Household size	X <sub>3</sub>	-159.286	0.029	0.031	-616.477
		(-0.231)	(-0.16)	(-0.003)	(-0.147)
		0.818	0.873	0.998	0.883
Years of experience	X <sub>4</sub>	18.708	-0.007	0.001	-4562.58
		(-0.216)	(-0.043)	(-0.06)	(-1.209)
		0.829	0.996	0.952	0.229
Years of education	X <sub>5</sub>	-1742.662	0.176	-0.397	-6835.51
		(-.596)	(-0.554)	(-1.095)	(-.688)
		0.552	0.581	0.276	0.493
Farm size	X <sub>6</sub>	-996.874	-0.138	.651*	-1832.78
		(-.326)	(-1.203)	(-1.703)	(-.688)
		0.745	0.232	0.092	0.493
Quantity of seeds	X <sub>7</sub>	3967.787	.421**	.794*	3913.439
		(-1.098)	2.436	(-1.758)	0.976
		0.275	0.017	0.082	0.331
Labour	X <sub>8</sub>	.554***	-0.145	-1.55435	.3956.101*
		(-5.554)	-1.62	(-1.245)	-1.898
		0.000	0.108	0.216	0.06
Agrochemicals	X <sub>9</sub>	42.67***	1.795***	.002***	40587.551***
		13.772	6.463	4.299	6.29
		0.000	0.000	0.000	0.000
Quantity sold (kg)	X <sub>10</sub>	477.764***	1.692***	.012***	54364.856***
		44.514	13.075	8.773	18.463
		0.000	0.000	0.000	0.000
R <sup>2</sup>		0.961	0.679	0.566	0.78
Adjusted R <sup>2</sup>		0.957	0.649	0.521	0.759
F-Ratio		242	22.4	12.6	38.2

Source: Field Survey, 2024.

Figure in first line= estimated coefficient variables; Figures in parenthesis = t value; Figure in third line= p value  
 \*\*\*< 0.01=1%; \*\* 0.01-0.05= 5%; \*0.051-0.099=10%

### Constraints faced by pigeon pea farmers

The results of the analysis of the constraints faced by pigeon pea farmers in the study area were recorded. Multiple responses were allowed for farmers to choose which of the constraints affects them most. The analysis revealed that about (88.3%) of the sampled pigeon pea farmers were faced with the condition of poor road network that linked their farms and the markets and was ranked

1<sup>st</sup>. Generally bad roads are very terrible in Nigeria especially when conveying agricultural produce from the farm to the market or to the residence of the farmers. The results also showed the second ranking of the constraints encountered by the respondents was poor demand of pigeon pea. This may be as a results of underutilizing pigeon pea production. The crop serves a lot of purposes such as; feed for poultry birds, and for soil

improvement. Lack of improved varieties ranked 3rd by farmers in the study area. Pricing problem ranked 4<sup>th</sup>, this was as a result of low demand for pigeon pea. In economics when the demand is low for a particular produce, such produce tends to be purchased in low price because of low demand. Capital and labour scarcity were ranked 5<sup>th</sup>. Marketing problem and agrochemicals was ranked 6<sup>th</sup> as the constraints faced by pigeon pea farming in the study area. When managed as a green manure crop, pigeon pea generally has few insect

pests. However, if allowed to form pods, pigeon pea may attract pod borers and agromyzid fruit flies. The underutilization of pigeon pea crop will affect the marketing of pigeon pea production. Other constraints which were the least constraints were identified by pigeon pea farmers in the study area include theft, storage, natural disaster and land problem and were ranked as 9<sup>th</sup>, 10<sup>th</sup>, 11<sup>th</sup> respectively. Pigeon pea is less affected by wind that is the reason why there is low tendency for the crop to be carried by wind which may cause fire explosion.

Table 4. Distribution of Constraints faced by Respondents

S/N	Problem of Pigeon Pea Production	Frequency	Percentage	Rank	Mean
1	Poor road network	106	88.3	1 <sup>st</sup>	3.9
2	Poor demand	105	87.5	2 <sup>nd</sup>	3.7
3	Lack of improved varieties	102	85.0	3 <sup>rd</sup>	3.53
4	Pricing problem	89	74.2	4 <sup>th</sup>	3.58
5	Inadequate capital	89	74.2	4 <sup>th</sup>	3.58
5	Labour scarcity	83	69.1	5 <sup>th</sup>	3.1
7	Marketing problem	82	68.3	6 <sup>th</sup>	3.04
8	Agrochemicals	82	68.3	6 <sup>th</sup>	3.04
9	Theft	81	67.7	7 <sup>th</sup>	3.02
10	Storage(process facilities)	71	60.0	8 <sup>th</sup>	2.88
11	Natural disaster	46	38.3	9 <sup>th</sup>	2.44
12	Land problem	44	36.6	10 <sup>th</sup>	2.37

Source: Field survey, 2024.

## CONCLUSIONS

The study concluded that pigeon pea farmers were predominantly male and are married in Akoko North West Local government Area of Ondo State. The study further concluded that the average pigeon pea farmers' age was 48years. The majority of the pigeon pea farmers had large household size and are literate. The study also revealed that Pigeon pea is a profitable enterprise in the study area with (Benefit Cost Ratio) which was estimated to be ₦ 1.6 and this implies that for every one naira invested in pigeon pea farming, the farmer will realize ₦1 and 6 kobo. They did not have access to credit facilities and extension services. They sourced for capital from personal savings, cooperative society and banks.

The study therefore recommends that, government should provide funds for the Research institutes for the innovations of

improved pigeon pea production and hence boost the production of pigeon pea in Nigeria. Also, more studies should be carried out to consider the future outlook of the crop. Inputs like fertilizer, improved seed varieties and farm machineries should readily be available to farmers at affordable rate and on time. Farmers should be encouraged to maximize their return from pigeon pea farming enterprise by increasing their farm sizes in the study area. Policies should be aimed at ensuring that institutional credit sources reduce the current high interest rates on loans and the procedural difficulties in securing credit facilities, to encourage farmers' access to such credit facilities for increased pigeon pea production and hence, boost their profit.

## REFERENCES

- [1]Agbugba, I. U., Onyenweaku, C. E., Okoye, B. C., 2014, Influence of marital status on labour supply among arable crop farmers in Nsukka agricultural zone

- of Enugu State, Nigeria. *International Journal of Agricultural Economics and Rural Development*, 7(2), 173-182.
- [2]Alabi, O.O., Oladele, A.O., Maharazu, I., 2020, Profitability analysis and marketing efficiency of soybean (*Glycine max*) value chain among actors in Abuja, Nigeria. *Sarhad Journal of Agriculture*, 36(4), 1010-1019.
- [3]Ayenan, M.A.T., Danquah, A., Ahoton, L.E., Ofori, K., 2017, Utilization and farmers' knowledge on pigeonpea diversity in Benin, West Africa. *Journal of Ethnobiology and Ethnomedicine*, 13(1), 1-11.
- [4]Ayenan, M.A.T., Ofori, K., Ahoton, L.E., Danquah, A., 2017, Pigeon pea [*Cajanus cajan* (L.) Millsp.] production system, farmers' preferred traits and implications for variety development and introduction in Benin. *Agriculture & Food Security*, 6(1), 1-11.
- [5]Ayodeji, O.T., 2022, Analysis of Agricultural Credit Facilities and Their Impact on the Performance of Smallholder Farmers in Osun State, Nigeria. *Journal of Agricultural Economics and Rural Development*, 5(1), 1-14.
- [6]Bamire, A. S., Tijani, A. A., Aromolaran, A. B., 2012, Determinants of smallholder farmers' access to agricultural information in southwestern Nigeria. *Journal of Agricultural Extension*, 16(2), 62-73. <https://doi.org/10.4314/jae.v16i2.8>
- [7]Christiana A., U., Luka A., O., Omotayo A., O., Daniel O., Dolapo B., A., Victor O., 2022, Profit Efficiency of Soybean Production in Federal Capital Territory, Nigeria. *European Journal of Agriculture and Food Sciences*, [www.ejfood.org](http://www.ejfood.org). 55
- [8]Christopher, O. A., Lateef, A. O., Morufu, O. A., 2014, Farming experience and farmers' willingness to pay for agricultural extension services in Kwara State, Nigeria. *Asian Journal of Agricultural Extension, Economics & Sociology*, 3(10), 1285-1291.
- [9]Dansi, A. R., Vodouhè, P., Azokpota, H., Yedomonhan, P., Assogba, A., Adjatin, A., Akpagana, K., 2012, Diversity of the Neglected and Underutilized Crop Species of Importance in Benin. *Scientific World Journal*, 2012, 932947. <https://doi.org/10.1100/2012/932947>
- [10]Egbe, O.M., 2005, Evaluation of Some Agronomic Potentials of Pigeon pea Genotypes for Intercropping with Maize and Sorghum in Southern Guinea Savanna (Doctoral Dissertation, Ph. D. Thesis, University of Agriculture, Makurdi, Nigeria).
- [11]Egbe, O.M., Kalu, B.A., 2006, Farming systems study: participatory rural appraisal of pigeon pea cropping systems in southern Guinea savanna of Nigeria. *Abia State University Environment Review (ASUER)*, 5(1), 37-47.
- [12]Emefiene, M.E., Joshua, V.I., Nwadike, A.Y., Yaroson, N.D.E., 2014, Profitability analysis of pigeon pea (*Cajanus cajan*) production in Riyom LGA of Plateau State. *Int. Lett. Nat. Sci.*, 13.
- [13]Emefiene, L., Onu, J., Odoemenem, I., Emodi, S., 2014, Gender participation in pigeon pea production in Anambra State, Nigeria. *International Journal of Agriculture and Biology*, 16(5), 1021-1026.
- [14]Esan, V.I., Ojemola, O.I., 2018, Evaluation of production systems, traditional knowledge of pigeon pea (*Cajanus cajan*) and risks of extinction of pigeon pea, jack bean (*Canavalia ensiformis*) and Lubia Bean (*Lablab purpureus*) in some parts of south west Nigeria. *J. Exp. Agric. Int.*, 1-11.
- [15]Esther, A.O., Olayiwola, I.O., Omonona, B.T., 2021, Economic Analysis of Pigeon pea Production in Oyo State, Nigeria. *Journal of Agriculture and Rural Development in the Tropics and Subtropics (JARTS)*, 122(1), 27-38.
- [16]FAO Statistics, 2017, Pigeon Producing Countries. Production and Area Harvested, Food and Agriculture Organization of the United Nations, Rome, Food and Agricultural Organization,
- [17]FAO, 2009, Production year book. Food and Agricultural Organization, United Nations, Rome.
- [18]Fasoyiro, S.B., Farinde, E.O., Adiat, W.T., Zaka, K.O., Ajani, A.O., 2013, Proximate composition and organoleptic properties of cassava snacks fortified with pigeon pea flour. *Sci. Focus*, 18, 1 9.
- [19]Fasoyiro, S.B., Farinde, E.O., Chete, O.B., Ajani, A.O., 2019, A review on the nutritional value and economic importance of yam (*Dioscorea* spp.) in Nigeria. *Journal of Applied Life Sciences International*, 21(2), 1-12.
- [20]Kamara, A., Tofa, A.I., Kyei-Boahen, S., Solomon, R., Ajeigbe, H.A., Kamai, N., 2016, Effects of plant density on the performance of cowpea in Nigerian Savannas. *Experimental Agriculture*, 1-13.
- [21]Kumar, R., Surjit V., Khan, P. E., 2018, Complexity in technology choices and market access for pigeon pea growers in semi-arid tropics of India. *Agric. Res.*, 7(3), 360-372.
- [22]Majili, Z. S., Nyaruhucha, C., Kulwa, K., Mutabazi, K., Rybak, C., Sieber, S., 2020, Preferences and consumption of pigeon peas among rural households as determinants for developing diversified products for sustainable health. *Sustainability*, 12(15), 6130.
- [23]Manzo, J. A. M., Vitor II, R. J. S., 2017, Antihyperglycemic effects of *Cajanus cajan* L. (pigeon pea ethanolic extract on the blood glucose levels of ICR mice (*Mus musculus* l.)).
- [24]Megan, M., Mark, B., 2014, Pigeon Pea Nutritional Benefits. United State Department of Agriculture, NRCS Plant Guide; "Vitamin and Mineral Deficiency" by Micronutrient Initiative. [www.ucdavis.edu](http://www.ucdavis.edu). Accessed on June 6, 2024.
- [25]Moses, J. D., 2017, Technical Efficiency of Soya Beans Production in Mubi North Local Government Area of Adamawa State, Nigeria. *International Journal of Environmental & Agriculture Research*, 1-3(6), 36-42.
- [26]Mussa, E.C, Simtowe, F., Obare, G., 2012, Factor productivity in smallholder pigeon pea production systems: empirical evidence from Northern Tanzania. *J. Agric. Economy. Dev.*, 6(1), 138-144.
- [27]NAQS, 2017, Nigerian agricultural quarantine service strategic plan 2017-2021. Abuja, Nigeria: NAQS.

- [28]Odeny, D., A., 2007, The potential of pigeon pea (*Cajanus cajan* (L.) Millsp.) in Africa, in: Natural Resources Forum, vol. 31, Blackwell Publishing Ltd, Oxford, UK, ,November, pp. 297–305. No. 4. 57
- [29]Okorie, A., Okorie, U. E., Iheke, O. R., 2016, The effect of education on agricultural productivity: Evidence from rice farmers in Nigeria. *Journal of Agricultural Extension*, 20(2), 83-91.
- [30]Omolehin, R. A., Oyinbo, O., Adeoye, B. W., 2007, Factors affecting the level of farmers' participation in cooperative societies in Osun state, Nigeria. *Journal of Agricultural Extension*, 10(2), 85-91. <https://doi.org/10.4314/jae.v10i2.38799>
- [31]Oyinbo, O., Tobi Olaleye, K., 2016, Farm Households Livelihood Diversification and Poverty Alleviation in Giwa Local Government Area of Kaduna State, Nigeria. *Consilience*, (15). <https://doi.org/10.7916/consilience.v0i15.3914>
- [32]Saxena, K.B., Kumar, R.V., Sultana, R., 2010, Quality nutrition through pigeon pea—a review. *Health Journal*, 2(11), 1335-1344.
- [33]Sharma, S. A., Nidhi, L., Preeti, V., 2011, Pigeon pea (*Cajanus cajan* L.): A hidden treasure of regime nutrition. *Journal of Functional and Environmental Botany*, 1(2), 91-101.
- [34]Tabo, R., Bationo, A., Christiansen, J. L., 1995, Soil fertility management research in West Africa: Historical, present and future perspectives. In J. I. Uitto & P. J. Loveland (Eds.), *Soil fertility management in West African land use systems* (pp. 1-30). Springer Science+Business Media Dordrecht. [https://doi.org/10.1007/978-94-015-8449-6\\_1](https://doi.org/10.1007/978-94-015-8449-6_1)
- [35]Tiwari, B.K., Brennan, C.S., Jaganmohan Rao, L., Surabi, A., Alagusundaram, K., 2011, Utilization of pigeon pea (*Cajanus cajan* L.) byproducts in biscuit manufacture. *LWT-Food Science and Technology*, 44(6), 1533-1537.
- [36]United States Department of Agriculture. (2006). Soybean backgrounder. *Electronic Outlook Report from the Economic Research Services*, 1-43. <https://www.ers.usda.gov/> Accessed on June 6,2024.
- [37]Wikipedia.org.
- [38]Yadav, B.S., Yadav, R.B., Kumar, M., 2011, Suitability of pigeon pea and rice starches and their blends for noodle making. *LWT-Food Science and Technology*, 44(6), 1415-1421.