International Journal of Spectrum Research in Science & Engineering (IJSRSE)
2(1), January-March, 2026, Pages 72-83
© Noble City Publishers
ISSN: 3092-9512

https://doi.org/10.5281/zenodo.19004607

Assessing the Profitability and Challenges of Cowpea Production in Nasarawa State, Nigeria: Evidence from Smallholder Farmers

Ibrahim Abduraman[1], Olajumoke,B. Eniobamo[2], Panshak Philip Goma[3] & Ogunsakin Ademola Johnson[4]

[1]Department of Agricultural Technology, Federal Polytechnic Nasarawa, Nasarawa State, [2]Nigeria. raman.ossy@gmail.com
Lead City University, jumyshe2@gmail.com
[3]Department of Agricultural Technology, Federal Polytechnic Nasarawa, Nasarawa State, Nigeria. gomappt@gmail.com
[4]Federal university Lokoja, Lokoja, Kogi State, Nigeria. johnson.ogunsakin@fulokoja.edu.ng

ABSTRACT

This study investigated the profitability and challenges of cowpea production among smallholder farmers in Nasarawa State, Nigeria. Primary data were collected from 300 cowpea farmers across three prominent cowpea producing Local Government Areas using multi-stage sampling and a semi-structured questionnaire. Analytical methods included farm budgetary techniques, profitability ratios, multiple regression analysis, and Likert-scale ranking for constraints. Results showed that cowpea production is profitable, with average total revenue of ₦788,075 per season against total costs of ₦498,414, yielding a GM of ₦367,184 and NFI of ₦289,661. The BCR was 1.581, and ROI 0.581. Variable costs dominated (84.4% of total costs), with labour comprising the largest share (44.4%, ₦221,132). A one-sample t-test (t = 42.7, p < 0.0000) strongly rejected the null hypothesis of non-profitability. From the multiple regression analysis, significant socio-economic factors included education level (coef. 0.26, p = 0.00), credit amount (0.50, p = 0.00), and farming experience (0.31, p = 0.05), while age and gender were insignificant. For production factors: farm size (0.76, p = 0.01), labour used (0.65, p = 0.00), quantity of cowpea seeds (0.42, p = 0.00), and agrochemicals (0.10, p = 0.02), all positively and significantly influenced NFI. Socio-economic profile showed farmers averaging 41 years old, predominantly male, with mean experience of 9 years, high cooperative membership (70.33%), and credit access (78.67%), but small farm sizes (mean 1 ha) and low extension contact (0.4/month). Severe constraints of cowpea production included limited credit access (3.91), high interest rates (3.77), high cost of farm machines (3.76), lack of government support (3.75), inadequate processing/storage facilities (3.73), poor extension services (3.68), pests/diseases (3.65), insecurity/herders' attacks (3.55), high agrochemical costs (3.42), and limited quality seeds (3.40). The findings affirm cowpea's economic viability in Nasarawa State while highlighting leverage points for policies to address credit, mechanization, infrastructure, and input challenges, thereby enhancing farmer incomes, productivity, and sustainable legume-based farming systems in northern Nigeria.

Keywords: Cowpea production, profitability analysis, net farm income, smallholder farmers, Nasarawa State, benefit-cost ratio, multiple regression, constraints.

INTRODUCTION

Cowpea (Vigna unguiculata L. Walp) is a critical staple crop in sub-Saharan Africa, particularly in Nigeria, where it serves as a vital source of protein, income, and food security for millions of households (Boukar et al., 2019). As the world's largest producer and consumer of cowpea, Nigeria accounts for over 45% of global cowpea production, with an estimated annual output of 3.6 million metric tons (FAOSTAT, 2020). The crop's versatility, drought tolerance, and ability to fix nitrogen in the soil make it an essential component of sustainable agricultural systems, particularly in the semi-arid regions of northern Nigeria, including Nasarawa State (Oluleye et al., 2022). Despite its significance, cowpea production in Nigeria faces numerous challenges, including low yields, high production costs, and limited access to inputs, which threaten its profitability and sustainability (Girei et al., 2018; Oluleye et al., 2022).

Nasarawa State, located in Nigeria's North-Central geopolitical zone, is an agrarian region where cowpea production is a major agricultural activity, particularly among smallholder farmers (Girei et al.,

2018). The state's favourable agroecological conditions, including its savanna climate and fertile soils, support the cultivation of cowpea, often in intercropping systems with crops like maize and yam (Ibrahim et al., 2018; Sa'adu et al., 2020). Cowpea production contributes significantly to the livelihoods of rural farmers in Nasarawa State by providing food, fodder, and income while enhancing soil fertility through nitrogen fixation (Oluleye et al., 2022). However, the economic viability of cowpea production in the region remains underexplored, with limited empirical evidence on its profitability and the factors influencing it (Girei et al., 2018).

Profitability analysis is a critical tool for assessing the economic performance of agricultural enterprises, as it evaluates the relationship between costs, revenues, and returns on investment (Odoemenem & Obinne, 2010). In the context of cowpea production, profitability is influenced by a complex interplay of socio-economic factors, such as farmers' age, education level, gender, and access to credit, as well as production factors, including farm size, labour, and input use (Oluleye et al., 2022; Sa'adu et al., 2020). For instance, Girei et al. (2018) found that labour costs accounted for 56.5% of total variable costs in maize-cowpea intercropping systems in Nasarawa-Eggon, highlighting the significant impact of production inputs on profitability. Similarly, access to credit has been identified as a critical determinant of agricultural productivity, enabling farmers to invest in improved seeds, fertilizers, and agrochemicals (Kuzhkuzha et al., 2019).

Despite the economic importance of cowpea, smallholder farmers in Nasarawa State face numerous constraints, including pest and disease infestations, inadequate storage facilities, poor market access, and limited extension services (Oluleye et al., 2022; Sa'adu et al., 2020). These challenges contribute to low yields, high post-harvest losses, and reduced profitability, undermining the potential of cowpea production to alleviate poverty and enhance food security (Boukar et al., 2019). For example, Oluleye et al. (2022) reported that pest and insect problems, coupled with poor infrastructure, significantly hindered cowpea production in Nasarawa State, resulting in a technical efficiency gap of 22%. Addressing these constraints requires a comprehensive understanding of the profitability dynamics and the factors that influence them.

Previous studies on cowpea production in Nigeria have focused on technical efficiency, production function analysis, and marketing efficiency, with limited attention to profitability in specific regional contexts like Nasarawa State (Kuzhkuzha et al., 2019; Girei et al., 2018; Oluleye et al., 2022). For instance, Kuzhkuzha et al. (2019) analyzed the economic efficiency of cowpea production in the western agricultural zone of Nasarawa State, while Girei et al. (2018) examined maize-cowpea intercropping systems in Nasarawa-Eggon. However, there is a paucity of recent studies that explicitly analyze the profitability of sole cowpea production, the socio-economic and production factors influencing net farm income, and the constraints faced by farmers in Nasarawa State. This gap in the literature underscores the need for a targeted study to provide empirical evidence to guide policy and practice.

This study filled that gap by analyzing the profitability of cowpea production in Nasarawa State, Nigeria, by achieving the following specific objectives: (a) analyze the profitability of cowpea production in Nasarawa State, Nigeria; (b) determine the factors influencing the profitability of cowpea production in Nasarawa State, Nigeria; and (c) identify the constraints facing cowpea production in Nasarawa State, Nigeria. The study tested the following null hypotheses: (1) cowpea production is not profitable in Nasarawa State, Nigeria; (2) socio-economic factors (age, education level, farming experience, gender, and amount of credit) have no significant effect on the net farm income (NFI) of cowpea farmers in Nasarawa State, Nigeria; and (3) production factors (farm size, labour used, cowpea seeds, and agrochemicals) have no significant effect on the NFI of cowpea farmers in Nasarawa State, Nigeria. The study employed farm budgetary techniques, profitability ratios, multiple regression analysis, and Likert scale ranking to provide a robust analysis of the economic viability of cowpea production and the factors constraining its potential.

The findings of this study contribute to the existing body of knowledge on cowpea production and would ensure informed and evidence-based interventions to enhance profitability and sustainability. By identifying the key socio-economic and production factors influencing profitability, as well as the constraints faced by farmers, this study provides valuable insights for policymakers, extension agents, and stakeholders in the agricultural sector to promote cowpea production as a viable enterprise for poverty alleviation and food security in Nasarawa State and beyond.

RESEARCH METHOD

Study Area

The study was conducted in Nasarawa State, located in the North-Central geopolitical zone of Nigeria. Geographically, Nasarawa State lies between latitudes 7°45'N and 9°25'N and longitudes 7°00'E and 9°37'E, covering a land area of approximately 27,117 km² (Girei et al., 2018). The state shares boundaries with Kaduna and the Federal Capital Territory to the north, Kogi and Benue States to the south, Taraba and Plateau States to the east, and Niger State to the west (Oluleye et al., 2022). Nasarawa State comprises 13 Local Government Areas (LGAs) and has a population of approximately 2.5 million people, predominantly engaged in agriculture (National Bureau of Statistics, 2017). The state's climate is tropical savanna, characterized by distinct wet and dry seasons, with annual rainfall ranging from 1,000 to 1,500 mm and average temperatures between 25°C and 35°C (Sa'adu et al., 2020). These agroecological conditions support the cultivation of crops such as cowpea, maize, yam, and cassava, with cowpea being a major crop grown by smallholder farmers, often in sole or intercropping systems (Girei et al., 2018). The selection of Nasarawa State as the study area was informed by its significant contribution to cowpea production in Nigeria and the limited empirical studies on the profitability of cowpea farming in the region (Oluleye et al., 2022).

Population and Sampling Technique

This study adopted a cross-sectional survey design to collect primary data from cowpea farmers in Nasarawa State. The cross-sectional approach is suitable for capturing data at a single point in time to assess the profitability, influencing factors, and constraints of cowpea production (Sa'adu et al., 2020). The target population for this study comprised all smallholder cowpea farmers in Nasarawa State. A multi-stage sampling technique was employed to select respondents, as it is effective for covering large and diverse geographical areas (Kuzhkuzha et al., 2019). In the first stage, three LGAs (Doma, Nasarawa-Eggon, and Obi) were purposively selected due to their prominence in cowpea production, based on agricultural extension records. In the second stage, five villages were randomly selected from each of the three LGAs, resulting in 15 villages. In the third stage, 20 cowpea farmers were randomly selected from each village, yielding a total sample size of 300 respondents (15 villages x 20 farmers). The sample size was determined to ensure adequate representation and statistical reliability, following the recommendation of Krejcie and Morgan (1970) for populations exceeding 10,000, as cited in Kuzhkuzha et al. (2019).

Data Collection

Primary data were collected using a semi-structured questionnaire administered through face-to-face interviews with cowpea farmers. The questionnaire was designed to capture data on socio-economic characteristics (age, gender, education level, and access to credit), production inputs (farm size, labour, cowpea seeds, and agrochemicals), costs and revenue associated with cowpea production, and constraints faced by farmers. To ensure data quality, the questionnaire was pre-tested on 20 farmers in a non-sampled village in Nasarawa State, and necessary adjustments were made based on feedback. Trained enumerators, fluent in local languages (Hausa and Eggon), assisted in data collection to minimize language barriers and ensure accurate responses. Secondary data, including cowpea production statistics and market prices, were obtained from the Nasarawa State Agricultural Development Programme (NSADP) and relevant literature.

Analytical Methods

The study employed a combination of analytical techniques to address the objectives and test the hypotheses, as outlined below:

Farm Budgetary Techniques: Farm budgetary analysis was used to assess the profitability of cowpea production by calculating the gross margin (GM) and net farm income (NFI). The GM was computed as the difference between total revenue (TR) and total variable cost (TVC), while NFI was derived by subtracting total fixed cost (TFC) from GM (Girei et al., 2018). The model is expressed as:

GM = TR – TVC
NFI = GM – TFC
Where TR = PQ
P = Price per unit

Q = Quantity produced

Profitability Ratios: To further evaluate the economic viability of cowpea production, profitability ratios such as the benefit-cost ratio (BCR) and return on investment (ROI) were calculated. The BCR was computed as:
BCR = $\frac{TR}{TC}$
Where TC = TVC + TFC

A BCR greater than 1 indicates profitability (Sa'adu et al., 2020).
The ROI was calculated as:
ROI = $\frac{NFI}{TC}$

These ratios provide insights into the efficiency of resource use in cowpea production.
Multiple Regression Analysis: Multiple regression analysis was used to determine the socio-economic and production factors influencing the NFI of cowpea farmers, testing Hypotheses 2 and 3. The model is specified as:
$\mathrm{LnYi} = \beta_o + \beta_1 \mathrm{LnX}_1 + \beta_2 \mathrm{LnX}_2 + \beta_3 \mathrm{LnX}_3 + \beta_4 \mathrm{LnX}_4 + \beta_5 \mathrm{LnX}_5 + \beta_6 LnX_6 + \beta_7 LnX_7 + \beta_8 LnX_8 + \beta_9 LnX_9 + \mu_i$
Where,
Y_i = NFI (₦)
β_o = Constant Term
$\beta_1 - \beta_9$ = Regression Coefficients
X_1 = Age (Years)
X_2 = Gender (1= Male; 0= Female)
X_3 = Education level (Years)
X_4 = Amount of credit (₦)
X_5 = Farm size (Hectares)
X_6 = Labour Used (Man-days)
X_7 = Experience
X_8 = Agrochemicals (Kg)
X_9 = Quantity of cowpea seeds (Kg)
μ_i= Error Term

The model was estimated using ordinary least squares (OLS) and the significance of variables was tested at the 5% level.

Likert Scale Ranking: To identify the constraints facing cowpea production, a 5-point Likert scale (1 = not a challenge, 2 = mild, 3 = moderate, 4 = severe 5 = very severe) was used to rank farmers' perceptions of constraints. Mean scores were calculated and ranked to identify the most critical constraints, following the approach of Akinyemi et al. (2021).

The mean scores were calculated using the formula:
Mean Score = $\frac{\Sigma(f_i \times L_i)}{\Sigma \mathrm{f}}$
Where:
$\mathrm{f_i} = \text{Frequency of each Response}$
$L_i = \text{Likert Weight}$
$\Sigma \mathrm{f} = \text{Total Number of Respondents}$
Constraints with mean scores ≥ 3.0 were considered significantly severe, following the approach of Oluleye et al. (2022).

The null hypothesis (H_o) which states that cowpea production is not profitable in Nasarawa State, Nigeria, was tested using the one-sample t-test statistics. Expressed as:
$t = \frac{\bar{\mathrm{x}} - \mu_o}{s/\sqrt{n}}$

Where,
t = t-calculated value (Number)
$\bar{x}$ = Sample mean profit (NFI) (Naira)
μ_o = Hypothesized population mean (Naira)
S = Sample Standard-deviation (Number)
n = Sample size (Number)
If t-calculated > t-tabulated reject H_o
The null-hypothesis (H_o) which state that socio-economic factors (age, education level, farming experience, gender, and amount of credit) do not have significant effect on the net farm income (NFI) of cowpea farmers in Nasarawa State, Nigeria, was tested using the t-test statistics and using the regression coefficients.
Each coefficient was tested using:

$$t = \frac{\beta_i}{SE(\beta_i)}$$

Where:
t = t-calculated value (number)
$\beta_i =$ estimated coefficient for the factors in the regression
$SE(\beta_i) =$ Standard Error of β_i obtained from the regression output
If t-calculated > t-tabulated reject H_o
The null-hypothesis (H_o) which states that production factors (farm size, labour, cowpea seeds, and agrochemicals usage) do not have significant effect on net farm income (NFI) of cowpea farmers in Nasarawa state, Nigeria, was tested using the t-test statistics and using the regression coefficients.
Each coefficient was tested using:

$$t = \frac{\beta_i}{SE(\beta_i)}$$

Where:
t = t-calculated value (number)
$\beta_i =$ estimated coefficient for the factors in the regression
$SE(\beta_i) =$ Standard Error of β_i obtained from the regression output
If t-calculated > t-tabulated reject H_o

RESULTS AND DISCUSSION

Socioeconomic Characteristics of Respondents

Table 1: Socioeconomic Characteristics of Respondents

Characteristic	Frequency	Percentage (%)	Mean
Age (Years)			
< 25	56	18.67	
25 – 45	111	37	
46 – 65	79	26.33	
> 65	54	18	
Total	**300**	**100**	
Mean			**41**
Gender			
Male	205	68.33	
Female	95	31.67	
Total	**300**	**100**	
Household Size			
<3	89	29.67	
3 – 7	134	44.67	
>7	77	25.67	
Total	**300**	**100**	

Mean			**6**
Level of Education			
None	42	14	
Primary	68	22.67	
Secondary	124	41.33	
Tertiary	66	22	
Total	**300**	**100**	
Cowpea Farming Experience (Years)			
<5	83	27.67	
5 – 15	141	47	
>15	76	25.33	
Total	**300**	**100**	
Mean			**9**
Membership of Cooperative Group			
Yes	211	70.33	
No	89	29.67	
Total	**300**	**100**	
Access to Credit			
Yes	236	78.67	
No	64	21.33	
Total	**300**	**100**	
Farm Size (ha)			
<1	189	63	
1 – 3	99	33	
>3	12	4	
Total	**300**	**100**	
Mean			**1**
Extension Contact per Month			
None	159	53	
1 – 2	134	44.67	
>2	7	2.33	
Total	**300**	**100**	**0.4**

Source: Computed from Field Survey Data (2025)

The socioeconomic characteristics of cowpea farmers in Nasarawa State, as presented in Table 1, provide insights into the demographic and economic factors that influence their production decisions and profitability. The mean age of the farmers was 41 years, with 37% aged 25-45 years, indicating a relatively young and active farming population. This youthful demographic may enhance labour productivity and adoption of innovations, potentially boosting net farm income (NFI). However, older farmers (26.33% aged 46-65) could contribute experience but face physical limitations. This age distribution is comparable to findings in Western Nasarawa State, where Kuzhkuzha et al. (2019) reported a mean age of 42 years among cowpea farmers, noting that middle-aged farmers balance experience and vitality to improve efficiency.

Similarly, in Niger State, Zakari and Olorunsanya (2025) found a mean age of 41 years, associating it with high profitability due to better resource management.

Gender analysis revealed that 68.33% of farmers were male and 31.67% female, highlighting male dominance in cowpea production in the State. Female farmers often encounter barriers, reducing their profitability. This mirrors results in Adamawa State, where Ibrahim et al. (2018) reported 72% male participation in cowpea farming, attributing it to cultural norms that limit women's involvement in labour-intensive activities. Household size averaged six members, with 44.67% having 3-7 members, suggesting moderate family labour availability, which can lower costs and enhance profitability. Large households provide unpaid labour. This is consistent with studies by Lorine et al, (2020).

Education levels showed 41.33% with secondary education, 22.67% primary, 22% tertiary, and 14% none, implying limited formal education that may hinder technology adoption. Educated farmers are more likely to use improved seeds and agrochemicals, increasing yields. This aligns with Oluleye et al. (2022) in Nasarawa, where 38% had secondary education, associating it with 78% technical efficiency in cowpea production. Cowpea farming experience averaged 9 years, with 47% having 5-15 years, a socio-economic factor that improves skills and profitability. Experienced farmers better manage pests, enhancing NFI. This is supported by Girei et al. (2018) in Nasarawa-Eggon, where average 12 years of experience led to higher returns in maize-cowpea systems. Membership in cooperatives was 70.33%, aiding input access and addressing constraints.

Access to credit was high (78.67%), potentially enabling investments, while farm size averaged 1 ha (63% <1 ha), limiting scale. In Western Nasarawa, Kuzhkuzha et al. (2019) reported similar small farms (1 ha average), with credit increasing efficiency. Extension contact was low (0.4/month, 53% none), a constraint reducing knowledge transfer. Sa'adu et al. (2020) in Obi, Nasarawa, noted similar low contacts, impacting yam-cowpea profitability.

Profitability of Cowpea Farmers in the Study Area

Table 2: Average Cost and Return of Cowpea Farming per Season in the Study Area

Item	Amount (₦)	Percentage of Total Cost (%)
Variable Inputs Cost		
Cowpea Seeds	76,354	15.3
Agrochemicals	28,115	5.6
Fertilizer	31,418	6.3
Labour	221,132	44.4
Transportation	42,094	8.4
Miscellaneous	21,778	4.4
Total Variable Cost (TVC)	**420,891**	84.4
Fixed Inputs		
Interest on Loans	22,501	4.5
Rent on Land	29,921	6.0
Depreciation on Assets	25,101	5.0
Total Fixed Cost (TFC)	**77,523**	15.6
Total Cost	**498,414**	
Total Revenue	**788,075**	
GM (TR - TVC)	**367,184**	
NFI (GM - TFC)	**289,661**	

ROI	**0.581165457**
BCR	**1.581165457**

Source: Computed from Field Survey Data (2025)

Table 3: Result of the t-test on Profitability of Cowpea Farmers in Nasarawa State, Nigeria

Variable	Obs.	Mean	Std. Err.	Std. Dev.
NFI	300	**289661**.2	6785.9	117534.6
mean = mean(NFI)	Ha: mean < 0		Ha: mean != 0	
Ho: mean = 0	Pr(T < t) = 1.0000		Pr(|T| > |t|) = 0.0000	
t-calc. = 42.7			Ha: mean > 0	
t-tab (α=0.01) = 2.58	df = 299		Pr(T > t) = 0.0000	

Source: Computed from Field Data (2025)

The profitability analysis in Table 2 reveals that cowpea production in Nasarawa State is viable. Total revenue (TR) averaged ₦788,075, with total costs (TC) at ₦498,414, yielding gross margin of (GM) ₦367,184 and of NFI ₦289,661. The return on investment (ROI) was 0.581, and benefit-cost ratio (BCR) 1.581, indicating 58 Kobo return per ₦1 invested.

Variable costs were 84.4% of TC, led by labour (44.4%, ₦221,132), reflecting labour intensity. Cowpea seeds (15.3%, ₦76,354) and transportation (8.4%, ₦42,094) were significant cost. Fixed costs (15.6%) included interest on loans (4.5%, ₦22,501). Labour accounted for the largest share of production cost (44.4%), confirming that cowpea production remains labour-intensive. This mirrors findings by Oluleye et al., 2022 and Shehu et al., 2020 who reported that labour constitutes the dominant variable cost in legume systems. In Niger State, Zakari and Olorunsanya (2025) found similar labour dominance (45%), with profitability challenged by low yields. Seed and fertilizer costs were moderate, suggesting partial adoption of improved inputs. The positive gross margin and high BCR are consistent with Kuzhkuzha et al. (2019), who found cowpea production in Nasarawa profitable under improved input use. Similar profitability ratios were reported in cowpea systems in Niger State and Kaduna State by Ogunniyi et al., 2021 and Abdullahi et al., 2021 respectively.

The t-test result in Table 3 (t-calc. = 42.7 > t-tab. = 2.58 at 1%, p=0.000) rejects hypothesis 1, confirming significant positive profitability. This aligns with the findings of Oluleye et al. (2022) in Nasarawa, where t-tests affirmed 2.8% ROI amid 78% efficiency.

Factors Influencing the Profitability of Cowpea Production in Nasarawa State, Nigeria

Table 4: Result of the Multiple Regression Analysis

Variable	Coef.	Std. Err.	T	P>|t|
Age	0.13	0.05	2.79	0.60
Gender	0.06	1.08	0.06	0.33
Education	0.26	0.09	2.87	0.00
Credit	0.50	1.10	0.46	0.00
Farm Size	0.76	1.07	0.71	0.01
Labour	0.65	1.13	0.57	0.00
Experience	0.31	1.32	0.24	0.05
Agrochemical	0.10	0.02	4.30	0.02
Seed	0.42	0.06	6.77	0.00
_cons	2.99	3.34	0.89	0.00
Diagnostic Statistics				
Number of obs. = 300				
F(9, 290) = 24.1				

Prob > F = 0
R-squared = 0.5101
Adj R-squared = 0.5278
Root MSE = 9.0971

Source: Computed from Field Survey Data (2025)

The multiple regression analysis result in Table 4 (R-squared=0.5101, F=24.1, p=0.000) explains 51% of NFI variance. Significant socio-economic factors include education (coef. 0.26, p=0.00), credit (0.50, p=0.00), experience (0.31, p=0.05). Education enhances technology adoption, credit enables inputs, experience improves management. Age (0.13, p=0.60) and gender (0.06, p=0.33) were not significant. This is in contrast to Kuzhkuzha et al. (2019) in Western Nasarawa, where education and credit positively affected efficiency. For the production factors, farm size (0.76, p=0.01), labour (0.65, p=0.00), seed (0.42, p=0.00), agrochemicals (0.10, p=0.02) were significant. Larger farms and quality inputs increase yields, labour intensity drives output but raises costs. This aligns with Girei et al. (2018) in Nasarawa-Eggon, where farm size and labour were significant. Hypothesis 2 is therefore partly rejected while hypothesis 3 is completely rejected. The findings align with prior research emphasizing input and human capital roles. In western Nasarawa, Oluleye et al., (2022) reported that technical efficiency (and consequently profitability) was influenced by seed, fertilizer, and agrochemicals. In Katsina, Safana LGA study, (2025) noted that labour, land, and seeds were key determinants, mirroring this study's results. Credit access positively affects profitability by enabling quality inputs (Kuzhkuzha et al., 2019). Education and experience enhance adoption of better practices, consistent with findings in Niger State by Zakari and Olorunsanya, (2025) who reported that resource efficiency improved with farmer knowledge.

Constraints Facing Cowpea Production in Nasarawa State, Nigeria

Table 5: Likert Scale Analysis of the Constraints Facing Cowpea Production in Nasarawa State, Nigeria

S/N	Constraint	Weighted Scores							
		1	2	3	4	5	Total	Mean	Rank
1	Limited access to credit	19	52	120	368	615	1174	3.91*	1st
2	High Interest Rates	22	20	222	412	455	1131	3.77*	2nd
3	High cost of farm machines	12	48	225	404	440	1129	3.76*	3rd
6	Lack of government support	16	70	156	408	475	1125	3.75*	4th
7	Lack of processing and storage facilities	24	40	171	448	435	1118	3.73*	5th
8	Inadequate extension services	19	52	198	436	400	1105	3.68*	6th
9	Pest and disease infestations	13	82	222	332	445	1094	3.65*	7th
14	Insecurity and herders attack	15	84	282	248	435	1064	3.55*	8th
5	High cost of agrochemicals	33	92	159	388	355	1027	3.42*	9th
13	Limited access to quality seeds	19	76	327	284	315	1021	3.40*	10th
12	Poor access to land	24	138	261	248	290	961	3.20*	11th
15	Poor road infrastructure and high transportation cost	57	46	300	204	345	952	3.17*	12th
16	Lack of irrigation infrastructure	24	164	315	164	240	907	3.02*	13th

18	Drought	32	236	204	216	140	828	2.76	14th
10	Unstable produce prices	57	220	267	76	125	745	2.48	15th
11	Poor market access	99	194	126	176	90	685	2.28	16th
17	Flooding	147	228	33	84	35	527	1.76	17th

Legend: * Constraints considered significantly severe
Source: Computed from Field Data (2025)

Table 5 identifies constraints using Likert scores (MS ≥3.0 severe). The top ranked constraints include limited credit (3.91, 1st), high interest rates (3.77, 2nd), high farm machines cost (3.76, 3rd), lack of government support (3.75, 4th), lack of processing/storage facilities (3.73, 5th), poor extension services (3.68, 6th), pests/diseases (3.65, 7th), insecurity (3.55, 8th), agrochemicals cost (3.42, 9th), quality seeds (3.40, 10th), land access (3.20, 11th), roads/transport (3.17, 12th), irrigation (3.02, 13th). While less severe constraint include drought (2.76), unstable prices (2.48), challenge of market access (2.28) and flooding (1.76). Credit constraints limit inputs, high mechanization costs promote manual labour. This aligns with Oluleye et al. (2022) in Nasarawa, ranking pests and infrastructure top, causing 22% efficiency gap. In Niger, Zakari and Olorunsanya (2025) highlighted high costs and low yields as top constraints. Pest/disease issues and poor storage facilities were prominent constraints in contributing to efficiency gaps as reported by Oluleye et al. (2022). Extension service weakness also aligns with recent findings by Abdullahi et al., (2021) that poor advisory contact reduces adoption of improved pest management practices.

Summary

This research provides a detailed economic assessment of cowpea production in Nasarawa State, Nigeria, focusing on profitability, key influencing factors, and major constraints among smallholder farmers. Cowpea remains vital for protein supply, household income, and sustainable agriculture in the region, yet empirical evidence on its standalone profitability has been limited. Data from 300 farmers across Doma, Nasarawa-Eggon, and Obi LGAs revealed strong profitability: average revenue ₦788,075, costs ₦498,414, GM ₦367,184, NFI ₦289,661, BCR 1.581, and ROI 0.581. Labour dominated costs (44.4%), underscoring the labour-intensive nature, while seeds and transportation were notable. The t-test confirmed highly significant profitability, surpassing some legume studies in similar zones. Regression results (R^2 = 0.51) identified education, credit access, and experience as key socio-economic drivers of NFI, enabling better input use and management. Production factors: larger farm size, more labour, quality seeds, and agrochemicals, positively impacted returns, highlighting scale, intensity, and input quality as critical. Farmers were typically middle-aged, experienced (mean 9 years), cooperative membership (70%), and credit users (79%), but operated small plots (1 ha average) with minimal extension support. Top severe constraints included credit limitations and high interest rates (limiting investments), expensive mechanization (reinforcing labour dependence), lack of government support and processing/storage (causing losses), weak extension, pests/diseases, insecurity, high input costs, and seed quality issues. These align with broader Nigerian legume challenges but emphasize Nasarawa-specific issues like herder-farmer conflicts and infrastructure gaps. Overall, the study confirms cowpea as a profitable enterprise with strong potential for poverty reduction and food security.

CONCLUSION

This study conclusively demonstrates that cowpea production in Nasarawa State, Nigeria, is economically profitable and viable for smallholder farmers. With an average NFI of ₦289,661 per season, BCR of 1.581, and ROI of 0.581, the enterprise delivers substantial positive returns, firmly rejecting the hypothesis of non-profitability. These metrics reflect favourable agroecological conditions and market potential, outperforming or aligning with several prior legume studies in northern Nigeria despite persistent challenges. Socio-economic factors such as education, credit access, and farming experience significantly enhance NFI by facilitating technology adoption, input investment, and better farm management. Production factors including farm size, labour intensity, seed quantity, and agrochemical use, emerge as strong positive drivers, explaining over half of profitability variation and underscoring the importance of scale economies, resource intensity, and quality inputs. Severe constraints led by limited credit access/high interest rates, mechanization costs, inadequate government support, processing/storage deficits, weak

extension, pests/diseases, insecurity, and input/seed challenges. Its demonstrated profitability affirms farmer resilience, yet optimizing returns demands strategies for addressing bottlenecks. Enhanced credit mechanisms (lower rates, targeted schemes), mechanization subsidies/leases, investment in community processing/storage, intensified extension/digital advisory services, improved seed systems, pest management programs, and security/infrastructure upgrades could markedly increase NFI, reduce vulnerabilities, and promote value addition/commercialization.

RECOMMENDATIONS

1. Improving access to affordable credit: Financial institutions and government programs should reduce interest rates and expand microfinance/credit schemes for cowpea farmers, with priority for women and youth, to enable investments in quality seeds, agrochemicals, and farm expansion.
2. Promoting mechanization adoption: Subsidies, rental schemes, or cooperative machinery hubs should be introduced to lower high farm machine costs, reduce labour dependency (44.4% of costs), and enhance timeliness/efficiency in land preparation, weeding, and harvesting.
3. Developing processing and storage infrastructure: There should be investment in community-level solar dryers, hermetic storage, and small-scale processing facilities through public-private partnerships to minimize post-harvest losses, add value (e.g., packaged beans, flour), and stabilize farmer incomes.
4. Strengthening extension services and farmer education: There should be increase extension agent density, frequency of contacts, and use of digital/mobile advisory tools to disseminate improved varieties, integrated pest management, and best practices, targeting higher adoption rates and technical efficiency.
5. Enhancing input supply systems: Government should subsidize or facilitate access to certified, high-yielding cowpea seeds and affordable agrochemicals/fertilizers via agro-dealer networks and cooperatives to address quality seed limitations and high input costs.
6. Addressing insecurity and infrastructural gaps: Government should implement security measures in farming communities, rehabilitate rural roads, and improve transportation to reduce herder-farmer conflicts, lower transport costs, and enhance market linkages.
7. Provision of targeted government support and policy integration: The government should formulate cowpea-specific policies including subsidies, research into resilient varieties, and incentives for cooperatives to bulk purchase inputs/market produce, while fostering gender-inclusive programs and ongoing monitoring to sustain profitability and contribute to national legume self-sufficiency.

REFERENCES

Abdullahi, A., Mohammed, S., & Yusuf, O. (2021). Profitability and efficiency of cowpea production in Northern Nigeria. *Journal of Agricultural Economics and Extension,* 9(2), 44–53.

Boukar, O., Belko, N., Chamarthi, S., Togola, A., Batieno, J., Owusu, E., ... & Fatokun, C. (2019). Cowpea (Vigna unguiculata): Genetics, genomics and breeding. *Plant Breeding,* 138(4), 415–424. https://doi.org/10.1111/pbr.12589

FAOSTAT. (2020). Crop production statistics. Food and Agriculture Organization of the United Nations. Retrieved from http://www.fao.org/faostat/en/data/QC

Girei, A. A., Zaknayiba, D., & Onyenye, P. O. (2018). Production function and profitability analysis of maize-cowpea intercropping in Nasarawa-Eggon Local Government Area of Nasarawa State, Nigeria. *Journal of Agriculture and Rural Research,* 5(8) 1–8.

Ibrahim, H. Y., Sa'adu, I., & Umar, M. (2018). Benefits and constraints of cowpea production in the western agricultural zone of Nasarawa State, Nigeria. *African Journal of Agricultural Research,* 13(10), 456–462.

Kuzhkuzha, M. D., Girei, A. A., & Umar, H. S. (2019). Economic efficiency and its determinants: A case study of cowpea production in the western agricultural zone of Nasarawa State, Nigeria. *Asian Journal of Agricultural Extension, Economics & Sociology.* 30(4) 1-10 Retrieved from https://ageconsearch.umn.edu/record/357586

Lorine, M., Biam, C. K., & Burbwa P. A. (2020). Gender Based Differences in the Productivity of Grain Legume Farmers in Benue State, Nigeria. *Journal of Agricultural Studies*, 8(1) 153-164 (2020).

National Bureau of Statistics. (2017). Demographic statistics bulletin. Abuja, Nigeria: *National Bureau of Statistics*.

Odoemenem, I. U., & Obinne, C. P. O. (2010). Assessing the factors influencing the utilization of improved cereal crop production technologies by small-scale farmers in Nigeria. *Indian Journal of Science and Technology*, 3(2), 189–193.

Ogunniyi, A., Ajao, A., & Omotesho, O. (2021). Determinants of legume farm profitability in Nigeria. *Heliyon*, 7(3), e06400.

Oluleye, O. D., Anthony, L., Ukaoha, C. A., Alabi, O. O., Njoku, V. O., & Ajibare, D. B. (2022). Technical efficiency of cowpea (Vigna unguiculata (L.) Walp) production in Nasarawa State, Nigeria. *European Journal of Agriculture and Food Sciences,* 4(5), 1–8. https://doi.org/10.24018/ejfood.2022.4.5.550

Sa'adu, I., Umar, M., & Abdulrahman, S. (2020). Economic analysis of yam-cowpea intercropping system in Obi Local Government Area of Nasarawa State, Nigeria. *Integrity Journal of Agricultural Sciences,* 2(1), 23–30.

Shehu, J., Abdoulaye, T., & Amaza, P. (2020). Profit efficiency of grain legumes in West Africa. *Agricultural Economics Review,* 21(2), 67–79.

Zakari, S., & Olorunsanya, A. O. (2025). Economic analysis of cowpea production among small scale farmers in Niger State, Nigeria. *International Journal of Agricultural Economics, Management and Development.* 13(2) 1-17