



TARABA JOURNAL OF AGRICULTURAL RESEARCH

ISSN: 978-978-450-9 (Online)

Publication Frequency: June & December

Journal Homepage: www.tajar.com.ng

Emails: tajar2011@gmail.com, tajar2011@yahoo.com

Investment and Technical Efficiency Scores of Smallholder Sesame (*Sesamum indicum*) Producers in Taraba State, Nigeria

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ARTICLE HISTORY

Received: 17/01/2026

Accepted: 17/02/2026

Article Type:

Research Paper

Volume: 14

Issue: 1

Pp: 93 –103

ABSTRACT

The study analyzed the investment and technical efficiency scores of Small-Holder Sesame Producers in Taraba State, Nigeria. The specific objectives were to: describe the socioeconomic characteristics of sesame producers; analyze the performance indices of investment in small holders' sesame production; describe the business-related profile of sesame producers, varieties produced, and level of investment; determine the efficiency levels of sesame production enterprise and their determinants; and examine the challenges associated with sesame production enterprise. A multistage sampling technique was used to select 120 respondents from the study areas. Primary data were collected and analyzed using descriptive and inferential statistical techniques. The results revealed that most respondents (67.5%) were male, 61% were married, and 69% had acquired one form of education. The results also revealed that 49% considered farming their primary activity, while 51% engaged in other activities apart from farming. The results also showed that the Gross Margin was ₦148,629.92 with Net Farm Income of ₦114,693.92, and a 0.54 return on investment. The results also showed that the overall mean technical efficiency is 0.882, with 0.885 and 0.139 as the highest and the lowest estimated technical efficiency. Poor extension agent contact, inadequate pricing, insufficient funds, and high input costs are the major challenges faced by farmers in the study areas. Therefore, the study recommends that Agricultural Extension Services should be strengthened, and market price information should be created, hence the presence of numerous middlemen. In addition, input subsidy programs for improved sesame seeds, fertilizers, and agrochemicals should be strengthened.

Keywords: Investment, Technical Efficiency, Production, Sesame, Extension Services

INTRODUCTION

Sesame is a crucial crop in Nigerian agriculture. It is extensively cultivated and yields well even in relatively poor climatic conditions. It is widely used within Nigeria. This makes it an important component of the country's agricultural exports. However, sesame is often given little attention. There are relatively few companies involved in its trade. As a smallholder crop, it is often intercropped with others. The extent of its cultivation is poorly known, and there is little information on yields or productivity. Sesame is a tall, annual herbaceous plant from the family Pedaliaceae and is commonly called

benniseed in Nigeria. It is an important oilseed crop believed to have originated from tropical Africa, where there is the greatest genetic diversity (Tiamiyu et al., 2013). In most cases, some parts of the surplus crop are traded, bulked up, and exported with minimal processing, usually limited to drying and cleaning. Non-oil export data from the National Bureau of Statistics (NBS) and the Central Bank of Nigeria (CBN) show that demand for sesame seed is steadily growing. Sesame is widely grown in the northern and central parts of Nigeria as a minor crop initially until 1974 when it became a major

cash earner in many northern states such as Benue, Nasarawa, Jigawa, Kano, Katsina, Plateau, Taraba, Yobe States and in Abuja, the Federal Capital Territory of Nigeria (NAERLS, 2010). Sesame is commonly grown by smallholder farmers in the major producing States of Benue, Nasarawa, and Jigawa. Sesame has been reported to be a typical crop for farmers in the developing countries (Wacal *et al.*, (2021). This is because it has deep roots and is well-adapted to withstand dry conditions. It grows on relatively poor soil in a climate generally unsuitable for other crops, and so it is widely valued for its nutritional and financial yield. It is a suitable growing environment for sesame production in Nigeria, well-suited to smallholder farming, with a relatively short harvest cycle of 90–140 days, allowing other crops to be grown in the field (Hussaini *et al.*, 2020) and often intercropped with other grains, such as maize. This makes it favourable to Nigerian farmers. Production can thus be sustained by smallholder farmers with minimal management, yielding an average of 700kg per hectare (NAERLS, 2024).

The name sesame is widely used in literature worldwide, although the crop has many regional names. It is known as “simsim” in parts of Africa and the Middle East, and as “till” in Hindi-speaking regions (Petropoulou & Petousi, 2024). Sesame is an ancient oilseed crop that has been cultivated for thousands of years and is now grown throughout tropical and subtropical regions. The precise center of domestication remains uncertain: some evidence suggests an African origin because most wild relatives occur there, whereas other studies indicate domestication from wild species native to South Asia, particularly India (Kohnert, D. 2025).

Sesame is an important crop in Nigerian agriculture. It is quite extensively cultivated, with a short harvest cycle of 90 -140 days and a pH range of 5.5 to 8.0. It yields in relatively poor climatic conditions and is an important component of Nigeria’s exports. It has over 15% margins in terms of value added

compared to other cash crops, such as Sheanut and palm kernel (Ikwaakam *et al.*, 2016). Sesame was first cultivated in the Middle Belt Zone of Nigeria in the late 1940s by the West Africa Oilseeds Mission mandate to investigate the possibility of the production of groundnut and other oilseeds. It later spread to other parts of the country. Sesame is widely grown in the northern and central parts of Nigeria as a minor crop initially until 1974 when it became a major cash earner in many northern states such as Benue, Nasarawa, Jigawa, Kano, Katsina, Plateau, Taraba, Yobe States, and in Abuja, the Federal Capital Territory of Nigeria (NAERLS, 2024). But the major producing areas in Nigeria are Nasarawa, Jigawa, and Benue States.

METHODOLOGY

The Study Area

This study was carried out in Bali, Gassol, and Karim-Lamido Local Government Areas of Taraba State, Nigeria. Bali Local Government Area (LGA) is situated between latitude 7° 46' N of the equator and longitude 11° 00' E of the prime meridian. It has a total land area of 9,716 km² and a projected total population of three hundred and thirty-two thousand (332,000) people, based on March 2022 projections from the National Population Commission using the 2006 census figures. The major agricultural activities focus on cultivating Soya Beans, Yam, Cassava, and Maize, with significant livestock rearing, especially cattle, sheep, and goats. The area supports the growth of cash crops, such as groundnuts, which are highly profitable. Farmers also engage in the production of rice, millet, sorghum, and other food crops (Taraba State Government, 2020). Gassol Local Government Area (LGA) is situated on a latitude of 8° 38'00"N of the equator and longitude of 10° 46'00" E of the Greenwich meridian with a total land area of 5,548/km² and a population of two hundred and forty-four thousand, seven and forty-nine (244,749) people (National Population Commission, 2006). The major agricultural activities include fishing and the production of yams, maize, Sesame, rice, guinea corn,

beans, and melon (Taraba State Government, 2020).

Karim-Lamido Local Government Areas (LGA) in Taraba State, Nigeria, is situated roughly between 8° 33' to 10° 21' N latitude of the equator and 10° 21' to 11° 24' E longitude of the Greenwich meridian, near the Benue River, a region with tropical savanna climate. with a total land area of 6,620 km² and a total population of one hundred and ninety-five thousand, eight hundred and forty-four (195,844) people (National Population Commission, 2006). In Karim-Lamido Local Government Area, Taraba State, major agricultural activities center on subsistence crop farming (especially rice, sorghum, cowpea, cassava, groundnut) and significant sugarcane cultivation, utilizing the Benue River for irrigation, alongside agroforestry for food/soil, and integrated with livestock and fishing, though hampered by infrastructure, high input costs, and climate issues, (Taraba State Government, 2020).

Sampling Procedure and Sample Size

Multistage sampling techniques were adopted in sampling the respondents. The first stage involves purposive selection of three local government areas (Bali, Gassol, and Karim-Lamido) because of the high level of sesame production activities. The second stage involves a purposive selection of four villages from the lists of sesame-producing villages in each Local Government Area, making a total

of 12 villages in the sample. The third stage involves a random selection of ten (10) sesame farmers from each sampled village for the study, given a total of 120 sesame farmers, using the Taro Yamane formula in relation to the sizes of the villages. Chaokromthong and Sintao (2021) employed Yamane's (1967) formula to determine the sample size:

$$n = \frac{N}{1+N(e)^2} \quad 1$$

Where:

n = Sample sizes

N = Number of Sesame farmers (sampling frame) = 172

e = Margin error = 0.05

$$n = \frac{172}{1+172(0.05)^2} = 120$$

Simple random sampling used in obtaining 120 respondents was based on the proportional size of the sesame farmers' population in their villages as presented in Table 1

$$S = \frac{X}{Y} \times \frac{Q}{1} \quad 2$$

Where:

S = Total number of respondents sampled

X = Number of sesame farmers in each village

Y = Total population of sesame farmers

Q = Total number of questionnaires to be administered

Table 1: Sample Size Selection Plan

LGA	Village	Population	Respondents
Bali	Bakundi	14	10
	Kungana	13	10
	Garbabi	15	10
	Garba Shede	13	9
Gassol	Koppi	14	10
	Buba Liman	14	10
	Mutum-Biyu	17	11
K/Lamido	Tura Keke	14	10
	Mun Daya	13	9
	Andami	15	10
	Bachama	14	10
	Bambuka	16	11
Total	12	172	120

Source: Field Survey, (2024)

Method of Data Collection

Data were collected using structured questionnaires, administered to sesame farmers during the 2024 cropping season, with the help of trained enumerators in the study areas. Therefore, information concerning the outputs and inputs used during the cropping season was collected.

Method of Data Analysis

Descriptive statistics such as frequency, percentage, mean and standard deviation were used to achieve objectives (i) and five (v). Cost and return on investment analysis, the investment function and Cobb Douglas stochastic production frontier analysis were used to achieve objectives (ii), (iii) and (iv).

Ordinary least square for determinants of investment

$$I = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7) \quad 3$$

Where:

I= Amount of current investment (₦)

X₁ = Amount of Loan (₦)

X₂ = Return on Sales (₦).

X₃ = Level of Education (years)

X₄ = Experience (years)

X₅ = Farm size (Hectares)

X₆ = Depreciation of farm equipment

X₇ = Labor force (man-days)

Stochastic frontier production function (SFPF)

The Stochastic Frontier Production Function is a powerful tool for analyzing production efficiency. Unlike OLS, it recognizes that deviations from maximum output may arise from both inefficiency and random factors, making it useful in agriculture and developing economies. The stochastic frontier production function is written as:

$$Y_i = f(X_i, \beta) \exp(V_i - U_i) \quad 4$$

Y_i = groundnut output for ith farmers

X_i = corresponding vector of inputs

$$Y_i = f(X_1 \dots \dots \dots X_n) \quad 5$$

Y_i =

$$\beta_0 + \beta_1 X_1 + \beta_2 X_2 +$$

$$\beta_3 X_3 \dots \dots \dots + \beta_n X_n + \varepsilon_i \quad 6$$

Where $\varepsilon_i = V_i - U_i$

Y_i =

$$\beta_0 + \beta_1 X_1 + \beta_2 X_2 +$$

$$\beta_3 X_3 \dots \dots \dots + \beta_n X_n + V_i - U_i \quad 7$$

V_i = is independently and identically distributed random errors, having N (0, σ²) distribution.

U_i = technical inefficiency

ε_i = error term

Functional forms of stochastic frontier production function (SFPF)

The Cobb–Douglas Stochastic Frontier function is the linearized model thus:

$$\ln Y_i = \beta_0 + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \beta_3 \ln X_3 + \beta_4 \ln X_4 + \beta_5 \ln X_5 + \beta_6 \ln X_6 \quad 8$$

Where:

Y_i = sesame output for ith farmer

X₁ = Seed/planting material (in kilogram)

X₂ = Cultivated farmland (hectares)

X₃ = Fertilizer (in kilogram)

X₄ = Labor in man-day

X₅ = Pesticides/herbicides (liters)

X₆ = Capital (Depreciation, insurance, tax, interest and rent on land)

The stochastic frontier cost functions model for estimating soybean production level overall economic efficiency is specified as:

$$C_i = Y_i; P_i; \alpha + \varepsilon_i \quad 9$$

Where:

i = 1, 2, 3, n

Where:

C_i = represents the total production cost

Y_i = represents the output produced

P_i = represents the prices of inputs

α = represents the parameters of the cost function

ε_i = represents the error term that is composed of two elements, that is:

$$\varepsilon_i = V_i - U_i$$

RESULTS AND DISCUSSION

Socioeconomic Characteristics of Respondents in the Study Area

Table 2 shows the result of the socioeconomic characteristics of respondents. The result indicated that the majority (67.5%) of respondents were male, with 32.5% female, indicating that more males were engaged in sesame production than females. This is in line with Obafemi *et al.* (2022) findings on Gender dimension in the adoption of improved sesame production varieties among sesame farmers in Kogi State, Nigeria, where they reported that the Majority (79.40%) of the sesame farmers were male while 20.60% were female. The age distribution revealed that the average age of sesame farmers was 39.59 years with a minimum of 20 years and a maximum of 73 years. This demonstrates that the farmers were robust, energetic, and still engaged in profitable agriculture. Additionally, it means that if the relevant organizations provide the necessary

agricultural inputs, the farmers may be able to increase their output. Age is a variable expressed in years. Several studies identify age as a parameter determining the profitability of agricultural production (Wacal *et al.*, 2021; Geberewold and Belayneh 2023, Dossa *et al.*, 2023). According to Sani *et al.* (2014), the more the producer is aged, the more he gains experience enabling him to improve the financial performance of its operations.

The marital status results showed that the percentages of single, married, and divorced/widowers were 25%, 61%, and 14% respectively. However, the majority (61%) of sesame farmers were married. This indicates there is a likelihood that the farmers would engage their family labour to carry out most of their farm operations to boost their output. This is in line with the findings of Tukura and Ashindo (2019) on Determinant of technical efficiency of sesame production in Kurmi Local Government Area of Taraba State, Nigeria, reported that the Majority (63.4%) of the respondents were married. Also, Rukwe *et al.* (2020) on their study on Economics of sesame production among small scale farmers in southern part of Taraba State, Nigeria, showed that 84% of the respondents were married.

The mean household size for sesame farmers was 9.38 people, ranging from a minimum of 3 people to a maximum of 21 people. The result further showed that 7% of the farmers had a household size of less than 5. While the majority (50%) of the farmers had a household size of 5-9 persons, 33% had 10-14 persons, and 10% had 15 persons and above. This indicates that there was the possibility of having more hands to help carry out the activities of sesame production. Dossa *et al.* (2023) on economic analysis of sesame (*Sesamum indicum* L.) production in Northern region of the Republic of Benin. They reported that the size of the household largely depends on the status of farmers and particularly on the number of wives the farmer has. Household size is a potential source of labor and allows farmers to increase

production. It is therefore expected to affect positively the output of the production.

The result of farming experience revealed that the majority (39%) had 10-14 years of farming experience, 36%, had 5-9 years, 13% had 15-19 years, 7% had less than 5 years, and 5% 20 and above years, with a mean farming experience of 9.38 years, and with a minimum of 3 years and a maximum of 21 years. This shows that the farmers had good experience and possessed reasonable know-how in sesame production in the study areas which could result in continuous optimum production.

This finding shared the same view as Oniah and Edem (2021). Costs and Returns Analysis of Sesame Production in Northern Cross River State. In their findings, they showed that majority of the farmers (75.5%) were married, 50.7% had no formal education while 42.9% had farming experience of 6-10 years. Farming experiences are important because the higher the farmers' experience in farming, the better the production capacity of the farmers will be.

Result of the Educational background in Table 2 revealed that most (37%) farmers had secondary education, with 19% had primary education. While 31 had No formal education, 13% had a diploma and above. This suggests that 69% of the respondents had different types of formal education which gave them the ability to efficiently utilize limited resources and maximize their output. Education is the process of acquiring knowledge, developing reasoning and judgment skills. It is measured in years and can help the farmers to get the ability to understand and assess information on techniques and processes regarding the management of the operation. So, educated sesame producers will have a higher output than their uneducated counterparts (Evangilin *et al.*, 2020).

Also in Table 2, result of the Off-farm income revealed that most (51%) farmers had Occupations apart from farming, while 49% relied on farming. This implies that most of the sesame farmers had other occupations in addition to sesame farming. This would

supplement their income and further strengthen their savings and investment propensities. This result agrees with the result of (Waheed *et al.*, 2022) on the Benefit of

financial credit among the smallholder farmers in in Plateau State, Nigeria, that farming is the primary occupation of smallholder farmers.

Table 2: Socioeconomics Characteristics of Respondents

Characteristics	Frequency (n=120)	Percentage (%)	Mean	Min.	Max	SD
Sex						
Male	81	67.5				
Female	39	32.5				
Age (year)			39.59	20	73	10.99
<20	27	22.50				
30-39	38	31.67				
40-49	28	23.33				
50-59	20	16.67				
≥ 60	7	5.83				
Marital status						
Single	30	25				
Married	73	61				
Divorce/Widow	17	14				
Household size			9.38	3	21	3.82
< 5	8	7				
5-9	60	50				
10-14	40	33				
15 & above	12	10				
Farming Exp. (years)			9.38	3	21	3.82
< 5	8	7				
5-9	43	36				
10-14	47	39				
15-19	16	13				
20 & above	6	5				
Educational background						
No formal education	37	31				
Primary	23	19				
Secondary	45	37				
Diploma and above	15	13				
Off-farm income						
Occupations	71	59				
Farming	49	41				

Source: Field Survey, (2024)

Performance Indices of Investment in

Small-Holders Sesame Production

Costs and returns associated with Sesame Production per hectare

Table 3 shows the results on Costs and returns associated with Sesame Production per Hectare of the respondents in the Study Area. Cost refers to all expenses incurred in producing a specific agricultural product, encompassing both fixed costs and variable costs. It's the total financial outlay required to bring a product to market, including inputs like seeds, fertilizers, labor, and machinery, as

well as overhead expenses and land costs. Understanding and managing these costs is crucial for profitability and sustainable farming practices. These costs include both variable and fixed expenses. Once production occurs, the output is then sold to generate income or revenue for the farmers. Return or revenue is calculated by multiplying the output by its unit price (Py. Y).

Also, the analysis of average costs and returns per Hectare can be found in Table 3. The findings indicate that the Total Cost (TC) per

hectare in the study amounted to ₦219,678, which included a Total Variable Cost (TVC) of ₦177,507 and a Total Fixed Cost (TFC) of ₦33,936. The Total Revenue (TR) generated from Sesame production was reported to be ₦326,136.92. This resulted in a Gross Margin of ₦148, 629.92 with Net Farm Income of ₦114,693.92. The return on investment was 0.54, showing that for every one naira invested per hectare they would generate a return of ₦0.54 kobo in the study areas. The totality of the results suggests that Sesame production in the study areas was economically viable. This agrees with the findings of Essien *et al.* (2020) on the Appraisal of the Investment Viability of Sesame Enterprise Among Smallholder

Farmers in Benue State, Nigeria who reported the level of investment by categorizing it into three levels as: high investment (>₦60,000), moderate investment (₦31,000- ₦60,000) and low investment (₦1,000- ₦30,000). They concluded that Sesame production is profitable, and a viable enterprise that could serve as an investment opportunity for individual investors and corporate organizations who are willing to key into the agricultural sector of the economy. Also, they added that the profits from sesame enterprises translate to increased household size, consumption and aggregate demand, and bring about sustainable development to farmers.

Table 3: Average Costs and Returns Associated with Sesame Production per Hectare

Variables	Cost (₦)	Percentage (%)
A. Variable Cost		
Fertilizer	43,416	23.4
Herbicide	32,699	17.6
Pesticide	3,545	1.9
Seed	17,433	9.4
Labour	42,930	23.1
Transport	36,570	19.7
Storage	914	4.9
Total Variable Cost (1)	177,507	
Land	26,430	77.9
Depreciation of Equipment (sprayer)	6,986	20.6
Depreciation on farm tools (hoe and cutlass)	520	1.5
Total fixed cost (2)	33,936	100
Total cost of production	211,443	
C. Total Revenue		
Average output (652kg) x Average unit price (₦500.21)	326,136.92	
D. Gross Margin (TR-TVC)	148, 629.92	
Net Farm Income (TR-TC)	114,693.92	
Returns on Investment (NFI/TC)	0.54	

Source: Field Survey, (2024)

Technical efficiency scores of sesame farmers in the study areas

Table 4 presents the technical efficiency scores for sesame farmers in the study areas, estimated using the stochastic frontier model. The overall mean technical efficiency is approximately 0.88. This indicates that, on average, farmers in the study areas achieved 88.2 percent of the maximum possible output for a given level of input during the period analyzed. Consequently, there remains an 11.8 percent potential for decision-making units (DMUs) to increase output by adopting

best-practice technologies. The highest estimated technical efficiency among the farmers was 0.89, while the lowest was 0.14. The study revealed that 6.67% of sample farmers had a mean technical efficiency between >0.80 and ≤ 0.90 percent, and approximately 20% had a mean technical efficiency between > 0.70 and ≤ 0.80 percent. About 24.17% of farmers exhibited mean technical efficiencies between >0.60 and ≤ 0.70 percent, while 10.83% fell within > 0.50 and ≤ 0.60 percent range. Furthermore,

around 17.50% had efficiencies between > 0.40 and ≤ 0.50 percent, 6.67% between > 0.30 and ≤ 0.40 percent, 5.83% between > 0.20 and ≤ 0.30 percent, and 8.33% between > 0.10 and ≤ 0.20 percent. Farmers operating

at lower efficiency levels were typically those severely affected by a range of factors, including technical production constraints, socio-economic conditions, and environmental challenges.

Table 4: Technical Efficiency Scores of Sesame Farmers in the Study Areas

Efficiency Score	Frequency	Percentage (%)
$>0.80 \leq 0.90$	8	6.67
$>0.70 \leq 0.80$	24	20.00
$>0.60 \leq 0.70$	29	24.17
$>0.50 \leq 0.60$	13	10.83
$>0.40 \leq 0.50$	21	17.50
$>0.30 \leq 0.40$	8	6.67
$>0.20 \leq 0.30$	7	5.83
$>0.10 \leq 0.20$	10	8.33
Total	120	100
Mean	0.882	
Minimum	0.139	
Maximum	0.885	
Std. Dev.	0.072	

Source: Field Survey, (2024)

Challenges associated with sesame production enterprise

The challenges confronting sesame production enterprises encompass agricultural, economic, infrastructural, and knowledge-based issues. Table 5 details the obstacles farmers face during production, ranking these constraints by severity. The table shows that the primary institutional challenge is limited contact with extension agents, as reported by the majority (18.06%) of respondents. This suggests that farmers frequently lack access to modern farming techniques and advanced technologies due to insufficient extension services. The next most severe challenge, poor pricing, affects 17.71% of respondents, who struggle with volatile market prices fueled by limited market information and the presence of numerous middlemen, resulting in low farm-gate prices, reduced profitability, and restricted market access. Inadequate funding is the third major challenge, cited by 17.53% of respondents. This suggests that many farmers cannot access affordable loans and must rely on personal savings, restricting their ability to

invest in modern equipment, improved seeds, and fertilizers.

High cost of inputs, which constituted 12.84% of the respondents, ranked fourth in the study areas. As a result, farmers may plant smaller areas because they cannot afford enough input and may abandon sesame production for cheaper crops. Following this, the next main challenge faced by respondents is low sesame output, constituting 11.81% of the respondents. This indicates that many smallholder farmers rely on traditional or local varieties that have inherently low yield potential, are susceptible to pests and diseases, and are prone to capsule shattering. Other challenges include poor storage facilities (11.45%) and perishability of the product (10.59%). Poor storage conditions cause sesame seeds to absorb moisture, lose flavor, or become discolored. Insects, rats, and birds can destroy improperly stored seeds. When storage is damp or dirty, mold develops, spoiling the sesame. Spoiled or contaminated sesame seeds fetch lower prices, causing farmers to lose a significant portion of their produce. As quality drops, profits decline as well. These findings agree with

Tenaye (2020), who reported that high input costs, low seed prices, labor shortages, and inadequate funding are significant constraints to guinea corn production. This is also consistent with Oladoyin (2022), who conducted a study on the evaluation of maize production profitability in Akoko Southwest Local Government Area, Ondo State, Nigeria,

and reported inadequate capital and high input costs as constraints to maize production. Overall, the major constraints faced by farmers in the study area are high input costs (72.2%), low seed prices (75.6%), labor shortages (50%), and inadequate funding (52.5%).

Table 5: Challenges associated with sesame production enterprise

Variable	Freq (N=120)	Percentage (%)	Ranking
Poor pricing	102	17.71	2 nd
High cost of input	74	12.84	4 th
Low sesame Output	68	11.81	5 th
Perishability of the product	61	10.59	7 th
Poor storage facilities	66	11.45	6 th
Poor extension agent contact	104	18.06	1 st
Inadequate fund	101	17.53	3 rd
Total	576	100	

Source: Field Survey, (2024)

CONCLUSION

The study concluded that investment by Small-Holder Sesame Producers in the study areas was economically viable. The farmers were still at their prime age with an average age of 39. The study concluded that more males were engaged in sesame farming, married, and they had attained one form of education or the other. Despite the growing costs of agricultural input, the result of the study shows that for every ₦1 invested in sesame production, ₦0.54 was made, which emphasizes the feasibility of Sesame production in the Study areas. The study also concludes that the overall mean of the estimated technical efficiency scores using stochastic frontier model is approximately 0.882. The study also concludes that farmers operating at lower efficiency levels were typically severely affected by a range of factors, including technical production constraints, socio-economic conditions, and environmental challenges. The study also concludes that the major challenges faced by the farmers in the study areas are Poor extension agent contact, Poor pricing, Inadequate fund, and high cost of input.

RECOMMENDATIONS

The following recommendations were made based on the study's findings:

- Government and relevant agencies should Strengthen Agricultural Extension Services as improved extension contact will help farmers close the technical efficiency gap (currently at 0.88) and move closer to the production frontier.
- Access to Affordable Agricultural Credit should be Improved as access to capital will enable farmers to invest optimally in inputs and technologies, enhancing productivity and profitability.
- Government should strengthen targeted input subsidy programs for improved sesame seeds, fertilizers, and agrochemicals as Lower input costs will further improve the already viable return of ₦0.54 per ₦1 invested.
- Government should Strengthen Market Access and Pricing Mechanisms as better pricing mechanisms will enhance farm income and reduce post-harvest losses,

- making sesame production more attractive.
- v. Given the dominance of male farmers, female Participation in Sesame Production should be encouraged through design gender-inclusive policies that support women's access to land, credit, and inputs. Broadening participation will enhance labor availability, innovation, and sustainability.

ACKNOWLEDGEMENTS

Our deep and profound gratitude goes to TETFUND, that approved our application to conduct IBR research on the topic titled "Investment and efficiency of smallholder sesame producers in selected local government areas of Taraba State, Nigeria".

REFERENCES

- Chaokromthong, K., & Sintao, N. (2021). Sample size estimation using Yamane and Cochran and Krejcie and Morgan and green formulas and Cohen statistical power analysis by GPower and comparisons. *Apheit international journal of interdisciplinary social sciences and technology*, 10 (2), 76-86.
- Dossa, K. F., Enete, A. A., Miassi, Y. E., & Omotayo, A. O. (2023). Economic analysis of sesame (*Sesamum indicum* L.) production in Northern Benin. *Frontiers in Sustainable Food Systems*, 6, 1015122.
- Essien, J., Biam, C. K., & Asogwa, B. C. (2020). Appraisal of the Investment Viability of Sesame Enterprise Among Smallholder Farmers in Benue State, Nigeria. *Journal Of Agripreneurship and Sustainable Development*, 3(2), 128-134.
- Evangilin, N. P., Murthy, B. R., Naidu, G. M., and Aparna, B. (2020). Statistical model for forecasting area, production and productivity of sesame crop (*Sesamum indicum* L.) in Andhra Pradesh, India. *Int. J. Curr. Microbiol. Appl. Sci.* 9, 1156–1166. DOI: 10.20546/ijcmas.2020.907.135.
- Geberewold, T. M., & Belayneh, N. G. (2023). Smallholder Farmers Technical Efficiency and Production Constraints in Turmeric Production: in South-western Ethiopia. *Journal of Medicinal plants and By-products*, 13(1), 209-218.
- Hussaini, A., Usman, M., Falgore, J. Y., Sani, S. S., Zakari, Y., & Muktar, H. D. (2020). A search for suitable growing environment for sesame production in Nigeria. *Asian Journal of Agricultural Extension, Economics & Sociology*, 38(8), 18-33.
- Kohnert, D. (2025). Seeding Growth: Unlocking the Potential of Agricultural Commodity Exchanges in Sub-Saharan Africa. Available at SSRN 5338006.
- NAERLS, 2010: National Agricultural Extension and Research Liaison Services (NAERLS) Ahmadu Bello University, Zaria. Retrieved from <https://naerls.gov.ng>
- NAERLS, 2024: National Agricultural Extension and Research Liaison Services (NAERLS). Ahmadu Bello University, Zaria. Retrieved from <https://naerls.gov.ng>
- National Population Commission, NPC. 2006. National Population Census, Federal Republic of Nigeria, Official Gazette, Vol. 94, Lagos. Retrieved from <https://nationalpopulation.gov.ng/>
- Obafemi, R., Adah, O. C., & Akubo, D. (2022). Gender dimension in the adoption of improved sesame production varieties among sesame farmers in Kogi State, Nigeria. *Journal of Agricultural*

- Economics, Management and Development*, 10(2), 306-320.
- Oladoyin, O. P., & Aturamu, O. A. (2022). Cost-benefit analysis of cocoa production in Idanre local government area of Ondo state, Nigeria. *Asian Journal of Advanced Research and Reports*, 16(2), 1-10.
- Oniah, M. O., & Edem, T. O. (2021). Costs and Returns Analysis of Sesame Production in Northern Cross River State, Nigeria. *Asian Journal of Agricultural Extension, Economics & Sociology*, 39(10), 265-273.
- Petropoulou, E. A., & Petousi, V. (2024). *Social Capital, Trust, and Cultivation of Bioenergy Crops: Evidence from Germany and Greece. Agriculture 2024*, 14, 363.
- Rukwe, D. T., Aboki, E., Luka, P., & Nyam, C. M. (2020). Economics of sesame production among small scale farmers in southern part of Taraba State, Nigeria. *Journal of Agricultural Economics, Environment and Social Sciences*, 6(1), 103-112.
- Sani, A., Abubakar, B. Z., Yakubu, D. H., Atala, T. K., & Abubakar, L. (2014). Socio-economic factors influencing adoption of dual-purpose cowpea production technologies in Bichi Local Government Area of Kano State, Nigeria. *Asian Journal of Agricultural Extension, Economics & Sociology*, 3(4), 257-274.
- Taraba State Government. (2020). Taraba State Government Diary. Jalingo: Author. Available at: <https://tarabastate.gov.ng>
- Tenaye, A. (2020). Technical efficiency of smallholder agriculture in developing countries: The case of Ethiopia. *Economies*, 8(2), 34.
- Tiamiyu, L. O., Ayuba, V. O., Okomoda, V. T., & Umar, S. (2014). Effect of various levels of raw Citrullus lanatus seed meal diets on growth performance of Cyprinus carpio fingerlings. *Jordan Journal of Biological Sciences*, 7(4), 269-274.
- Tukura, R. D., & Ashindo, Z. E. (2019). Determinant of technical efficiency of sesame production in Kurmi Local Government Area of Taraba State, Nigeria. *IOSR Journal of Agriculture and Veterinary Science*, 12(5), 43-51.
- Wacal, C., Basalirwa, D., Okello-Anyanga, W., Murongo, M. F., Namirembe, C., & Malingumu, R. (2021). Analysis of sesame seed production and export trends; challenges and strategies towards increasing production in Uganda.
- Waheed, K. O., Lawal, A. L., Kamal, D. A., Abiola, D. T., & Ahuoiza, A. F. (2022). Benefits of financial credit among smallholder farmers in Plateau State, Nigeria. Yamane, T. (1967). *Statistics: An introductory analysis*, 2nd Ed. New York: Harper & Row.
- Yamane, T. (1967). *Statistics: An introductory analysis*, 2nd Ed. New York: Harper & Row.