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EFFECTS OF SOYBEAN PRODUCTION ON POVERTY STATUS ON FARMERS IN AGAIE AND LAPAI LOCAL GOVERNMENT AREAS OF NIGER STATE, NIGERIA

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ABSTRACT

The study examined the effects of soybean production on poverty alleviation among rural farmers in Agaie and Lapai Local Government Areas of Niger State, Nigeria. Two-stage sampling technique was employed to select a total of 123 soybean farmers for this study. Primary data were used and collected through structured questionnaires administered via Kobo Toolbox. Descriptive statistics, Gini coefficient and Foster-Greer-Thorbecke (FGT) poverty index were used to analyze the data collected. Findings from the study revealed that 96.8% of respondents were male, predominantly aged 41-50 years, with 66.7% married and 28.5% having some formal education. Household sizes were mostly fewer than six members (82.1%). The Gini coefficient of 0.183 indicated a relatively equitable income distribution among soybean farmers while FGT analysis revealed that most farmers were non-poor. The constraints faced by farmers included inadequate transport and storage facilities, as well as pest and disease outbreaks. The study concludes that soybean production significantly contributes to poverty alleviation in the study area. Therefore, the study recommends that the government should provide affordable transportation to ease the stress of moving produce from farms to markets. Additionally, adequate storage facilities should be established and soybean farmers should take measures to safeguard their farms against pilferage and theft to enhance soybean production in the study area.

Keywords: Soyabean; poverty; farmers; Gini coefficient; FGT poverty index

INTRODUCTION

Agriculture is a primary driver of economic development in African countries, addressing food shortages and reducing poverty. According to the World Poverty Clock (2018) most farmers in Africa rely on agriculture for their livelihood. Beyond providing food for humans and animals, agriculture supplies essential raw materials to industries, employing about 55% of the population across rural and urban area and about 70% of Africans engage in agricultural activities (USDA, 2017). In Nigeria, the agriculture sector contributed 25.13% to the country's GDP in 2018 (USDA, 2023). The crop subsector was rated second largest component, accounting for 25.18% of the agricultural GDP (Nigeria Bureau of Statistics (NBS), 2023). The crop sector produces food crops such as yam, groundnut, and soybeans, and tree crops like cocoa and cashew. Soybean is a significant crop for its oil and protein content, with protein levels of 40%, compared to 20% in other legumes like beans and peas (Getek *et al.*, 2014). Soybean's high protein content makes it valuable in poultry feed formulations, providing over 40% proteins (Joubert, 2013). It also serves as a source of income and contributes to food security.

According to Soystats (2021), soybean accounts for 59% of the total global oilseed production and constitutes of about 70% of total protein meal consumption. Its applications range from lowering cholesterol and aiding in blood glucose regulation to combating malnutrition (Khojely *et al.*, 2018). Soybean consumption has increased significantly, improving nutrition among urban poor and middle-income groups. Soybean-fortified products, such as soymilk and soy flour, are more affordable protein sources compared to fish, meat, and milk. The Nigerian government has declared soybean production and utilization a national priority due to its potential to improve nutrition and combat poverty. As a crop that can combat poverty among rural households, soybean is processed into various forms such as soymilk, soy flour, soy meat, soy spice, among others. The International Development Research Center (IDRC) (2006) has sponsored projects which have been instrumental to encouraging the development of more than forty soybean-based foods, including soymilk, yogurt, soy flour, biscuits, baby food, condiments, and breakfast cereals. These products are highly patronized because they are inexpensive, have acceptable tastes, and are conveniently

sold. They have become major sources of daily protein intake among children and adults, particularly rural women. Thus, it is able to address the challenges of malnutrition and poverty among rural households. Despite efforts by the Nigerian government to lift its citizens from the grips of poverty, 33.1% of Nigerians still live in poverty (World Poverty Clock, 2018). Poverty remains high, particularly among rural dwellers that rely on agriculture. Soybean's nutritional and economic benefits positions it as a crop capable of addressing poverty and malnutrition. However, detailed studies are required to evaluate the effects of soybean production on the poverty status of farmers in Nigeria, a gap identified in the literature. This study aims to fill that gap and provide insights into the socioeconomic impact of soybean production on rural households. Rapid population growth and economic challenges in many African countries, including Nigeria, have worsened living standards and eating habits, contributing to widespread malnutrition (Christiana, *et al.*, 2022). The high cost of livestock and poultry feeds, traditionally derived from cereals and legumes, has made soybean an economically viable alternative. Its high protein and oil content make it an ideal substitute for maize in poultry feed formulation. Therefore, increasing soybean production could contribute to both economic development and food security by providing an affordable, nutritious alternative to more expensive protein sources. Despite the potential of soybean to boost food security and alleviate poverty, smallholder farmers continue to face numerous challenges in maximizing its productivity. Poor access to inputs such as high-quality seeds, fertilizers, and crop protection products, as well as inadequate infrastructure, limits the ability of farmers to increase output. Weak market linkages and a lack of technical knowledge on improved production techniques further reduce productivity (USDA, 2017). Soybean's potential as a poverty-alleviating crop can only be fully realized if these structural issues are addressed. Programs aimed at improving access to credit, technical support, and market linkages could enhance smallholder farmers' ability to increase production and income. Additionally, the development of better processing and storage facilities is crucial to reducing post-harvest losses and improve the profitability of soybean farming. As part of Nigeria's broader economic strategy, supporting the soybean value chain could help stimulate rural economies and create employment opportunities. While several studies have focused on different aspects of soybean production in Nigeria, such as agricultural information dissemination and

profit efficiency (Christiana *et al.*, 2022), there remains a significant gap in the literature regarding the impact of soybean production on the poverty status of farmers. This study aims to bridge this gap by providing empirical evidence on how soybean production affects the socio-economic status of smallholder farmers. Understanding this relationship is crucial for formulating policies that can enhance the role of soybean in reducing poverty and improving the livelihoods of rural farmers in Nigeria. There is, therefore, the need to have such research information and hence the study describes the socio-economic characteristics of the soybean farmers, examine the output level of soybean farms, estimate the poverty status of the soybean farmers and examine the constraints associated with soybean production in the study area.

MATERIALS AND METHODS

Study Area

The study was conducted in Agaie and Lapai Local Government Areas (LGAs) of Niger State, Nigeria. Agaie LGA is located in Niger State, with its headquarters in the town of Agaie, situated along the A124 highway. The area covers a landmass of 1,903 km² (735 sq. mi.) at 9°01'N 6°19'E. Temperatures typically range from 63°F to 95°F, with extremes rarely falling below 56°F or exceeding 101°F (Wikipedia. 2023). Similarly, Lapai LGA is located southeast of Niger State, covering land area of 3,051 km² with a population of 110,127 (National Population Census, (NPC), 2006). Its administrative headquarters are in Lapai town, positioned along the A12A highway. The area lies within the geographical coordinates 9°00'N 6°34'E (Wikipedia. 2023). Lapai experiences distinct dry and wet seasons, with an annual average rainfall of 1,500mm which allows for the cultivation of soya beans rice, maize, guinea corn, groundnut, beans, melon, cowpea, cassava, yam, potatoes, and beniseed. Sugarcane and vegetables are also cultivated. Livestock rearing is practiced on a small scale, primarily for domestic use, involving poultry, sheep, goats, and cattle. Fishing is another significant activity.

Sampling Procedure and Sample Size

The population for the study comprised of rural farmers engaged in soybean production in the study area. A two-stage sampling procedure was adopted. In the first stage, a random sampling technique was used to select three (3) communities from each of the selected Local Government Areas (LGAs), namely Lapai, Samunaka, Agaie, Wunna, Gulu and Mashina, ensuring an unbiased representation of soybean production activities in the study area. The second stage involved the proportionate selection of rural farmers engaged in soybean production based on a list of registered soybean farmers in each selected community, obtained from the Niger State Agricultural and Mechanization Development Authority (NAMDA). A total of one hundred

and twenty-three (123) soybean farmers were selected from a population of 189 registered soybean farmers for the study. The sample size was determined using the Yamane formula, a widely recognized approach for calculating sample size in finite populations as follows:

Where;

$$n = N 1 + Ne^2 1$$

n = samples size

N = population size

e = limit of tolerable error (level of precision at 5%probability)

l = constant

Data Collection and Analysis

Data were collected from primary sources using a structured questionnaire complemented with an interview schedule. The collected data were analyzed using both descriptive and inferential statistical methods. Descriptive statistics, including mean, frequency distribution, and percentages, were employed to summarize the data. Inferential statistics such as the Gini coefficient, and the Foster-Greer-Thorbecke (FGT) model were utilized.

Model Specification

Gini Coefficient (GC)

Gini- Coefficients is a ratio of area between the Lorenz Curve of the distribution and the line of equality (uniform distribution) to the lower triangle. An equitable income distribution is indicated by a low Gini coefficient, whereas an unequal distribution of income is indicated by a high Gini coefficient. The definition of a Gini coefficient is a ratio with values between 0 and 1. Therefore, a Gini coefficient of zero (0) denotes perfect equality, while a value of one (1)

denotes perfect inequality. The general assumption is that the closest the value is to the 0, the perfect equality in income distribution of the respondents.

The Gini coefficient model as used by Harmon (2023) is mathematically expressed in equation as;

$$G = 1 t = 1 kX_1 Y_1$$

Where;

G = Gini-Coefficient,

X₁= Percentage of soybean sellers in the 1th class of marketers,

Y₁= Cumulative percentage of soybean sellers in the 1th class of marketers.

K = Number of classes

Foster Greer Thorbeck Analysis

In utilizing the Foster-Greer Thorbecke (FGT) poverty index. The respondents were disaggregated into groups of poor and non-poor categories. P_α was used in analyzing poverty. The model (P_α) relate to different dimensions of the incidence of poverty P₀, P₁, and P₂. These was used for head count (incidence), depth and severity of poverty, respectively. The three measures was based on a single formula but each index puts different weights on the degree to which a household or individual falls below the poverty line. The mathematical formulation of poverty measurements estimated as:

$$P = 1 \sum i = 1 q Z_1 - Y_1 Z_1 \alpha$$

Where,

p_α= the weighted poverty index for the ith sub-group,

α = Foster-Greer- Thorbecke (FGT) index and takes on the values of 0, 1 and 2 for incidence, depth and severity of poverty measures respectively,

Z₁ = the poverty line for ith sub-group,

q = the number of individuals below the poverty line,

N = the total number of individuals in the reference population,

Y_{ij}= the income of household j in the subgroup i,

Z - Y_{ij}= poverty gap of the ith household and

Z₁-

Y_{ij}Z₁ = poverty gap ratio

The quantity in bracket is the proportionate shortfall of income below the poverty line.

qn = the proportion of the population that falls below the poverty line.

This is called the head count or incidence of poverty.

If α = 0, then FGT measures the incidence of poverty,

If α = 1, then FGT measures the depth of poverty and

If α = 2, then FGT measures the severity of poverty.

In this study, the poverty status of soybean was defined on the basis of accrued income of the farmers; as a result, poverty line was defined on the basis of average income of the farmers per annum. Estimation of poverty based on the FGT index was used to disaggregate farmers' households into poor and non-poor categories.

Hypothesis of the study

Ho: There is no significant relationship between the selected socio-economic characteristics of the farmers in the study area.

RESULTS AND DISCUSSION

Socio-Economic Characteristics of Soya bean Farmers:

As revealed in Table 1, majority (96.8%) of respondents were male, while female constituted (3.2%). This implies that the male dominance in soybean production may be due to the involvement of females in domestic and post-harvest activities, such as marketing and processing of soybeans. This finding is consistent with the study by Lawrence *et al.*

(2023), which reported a higher male participation in soybean production in Kwara State. Moreover, 51.2% of the respondents were between 41-50 years while 29.3% were 31 years of age. This implies that majority of respondents are still within their active and productive age. This finding is in agreement with that of Lawrence *et al.* (2023) who stated that the average age of soya bean farmers in Kwara State, Nigeria was 45 years.

The results in Table 1 also showed that 66.7% of respondents were married, while (26.0%) were single. This result shows that majority of the respondent were married in the study area.

Majority (82.1%) of the respondents had household size of less than 6 persons while 13.8% of respondents had household range of 6-10. This result revealed that majority of the respondents has small household size. Small household could imply that farmers do not have access to family labour and this could contribute to poverty level in the family. Educationally, 28.5% of the respondents had tertiary education, while 26.8% of them had secondary education. This implies that most of the respondents were literate and this is expected to reduce the poverty incidence in the study area. Education grants farmers access to information that is vital to increasing output and reducing in poverty level.

Table 4.1: Socioeconomic characteristics of soya beans farmers (n=123)

Variables	Frequency	Percentage
Sex		
Male	119	96.8
Female	4	3.2
Age		
<31	36	29.3
31-40	20	16.3
41-50	63	51.2
>50	4	3.3
Marital status		
Single	32	26.0
Married	82	66.7
Divorced	4	3.3
Widow	5	4.1
Household size		
<6	101	82.1
6-10	17	13.8
11-15	3	2.4
>15	2	1.6
Educational status		
Primary	18	14.6
Secondary	33	26.8
Tertiary	35	28.5
Adult	26	21.1
Non formal	11	8.9
Year spent		
None	8	6.5
1-6	26	21.1
7-12	61	49.6
>12	28	22.8
Extension contact		
Yes	62	50.4
No	61	49.6
Cooperative		
Yes	51	41.5
No	72	58.5

Sources: Field survey, 2024

Analysis of Soybean Output Distribution Using the Lorenz Curve estimate

The Lorenz curve estimate in Figure 1 illustrates the graphical distribution of soybean output. The findings show a Gini coefficient of 0.183, indicating a relatively high level of equality in the distribution. This suggests that while the

output level is distributed in a fairly balanced manner, there is still room for further equal distribution. The curve's proximity to the equality line further supports the notion that the soybean output distribution pattern among farmers in the study area is relatively equitable.

Table 2: Lorenz estimate of total income from milling

Output level	Coefficient	Standard error
0	0	0
5	0.0262042	0.0048843
10	0.0608595	0.0056957
15	0.0967551	0.0064942
20	0.1340063	0.0072529
25	0.1736372	0.0090096
30	0.21621	0.0101178
35	0.2602394	0.0115802
40	0.3045861	0.0128821
45	0.3489328	0.0143187
50	0.3932795	0.0158535
55	0.4376262	0.0174606
60	0.4819729	0.0191218
65	0.5263196	0.0208241
70	0.5721661	0.0219067
75	0.620998	0.0225945
80	0.6706663	0.0245261
85	0.7229593	0.0251327
90	0.7781367	0.0241811
95	0.865013	0.0106552
100	1	

Sources: Field survey, 2023

Poverty status of farmers in the study area

The results presented in Table 3 reveal that the total expenditure of the respondents in the study area was ₦6037300. The average expenditure of the farmers in the study area was above ₦49083.74 while the poverty line was ₦32722.49, the number of poor household were 22. According to FGT poverty measures, 17.9% of farmers in

the study area were living below poverty line, this shows that poverty exist slightly in the study area. While the poverty depth was 0.67, this indicates that 67.0% of the poverty line is required by the poor farmers to escape from poverty that is income of soya bean farmers must be raised by 67.0% to escape poverty. In addition, the severity of poverty was 43.7.

Table 3: Poverty status of soy beans farmers

Poverty status	Frequency	Percentage	
Non poor	101	82.1	
Poor	22	17.9	
FGT indices	Head count	Poverty depth	Poverty severity
Value	17.9	67.0	43.7

Sources: Field survey, 2024

Per capital expenditure PCE = Expenditure/house

Total Per – capital Expenditure TPCE
= Summation of PCE

Mean TPCE = TPCE/ Total number of household

Poverty line PL = 2/3 x MTPE

Poverty line = 2/3x ₦49083.74 = ₦32722.49

Constraints Facing Soya beans Farmers in the Study Area

The results in Table 4 showed that transport facilities ($X = 3.67$) were the most severe constraint. This was followed by inadequate storage facilities ($X = 3.60$). This finding agrees with that of Ogbaje (2023) who stated that lack of inadequate storage facilities was the major problem facing soy bean farmers in Benue State. Other severe constraints were high incidence of pest and diseases ($X = 3.49$), high cost of farm inputs ($X = 3.44$), low technology base ($X = 3.38$), poor road access ($X = 3.35$) and limited farm land ($X = 3.23$). This finding agrees with Tafida *et al.* (2022) who reported that disease, poor road network and inadequate farm land were the major constraints affecting soya beans farmers in Kwara State of Nigeria.

Table 4: Constraint associated with soya bean production (n=123)

Variables	Very severe	Slightly severe	severe	Not severe	Not constraint	Sum	Mean
Limited farm land	15 (4.1)	3 (2.4)	100 (81.9)	5 (4.1)	0	397	3.23
Poor road access	25 (20.3)	19 (15.4)	53 (43.1)	26 (21.1)		412	3.35
Transport facilities	44 (35.8)	12 (9.7)	51 (41.5)	14 (11.4)	2 (1.6)	451	3.67
High cost of farm inputs	38 (30.9)	14 (11.4)	38 (30.9)	30 (24.4)	3 (2.4)	423	3.44
Unavailability of market	32 (26.0)	1 (0.8)	23 (18.7)	27 (21.9)		287	2.33
Insufficient rainfall	27 (21.9)	5 (4.1)	67 (54.5)	22 (17.9)	2 (1.6)	402	3.27
High incidence of pest and diseases	36 (29.3)	20 (16.2)	35 (28.5)	29 (23.6)	3 (2.4)	426	3.49
Inadequate storage facilities	41 (33.3)	17 (13.8)	43 (34.9)	19 (15.4)	3 (2.4)	443	3.60
Low technology base	33 (26.8)	12 (9.7)	46 (37.4)	29 (23.6)	3 (2.4)	412	3.38
Pilfering /theft	20 (16.2)	16 (13.0)	66 (53.7)	19 (15.4)	2 (1.6)	402	3.27

Sources: Field survey, 2024

CONCLUSION

Based on the empirical evidence from the findings of the study, it can be concluded that majority of soya bean farmers are male in their active age and married. Also, majority of the respondents had formal education and

engaged in other activities aside farming. Most of the respondents had access to extension and sourced for seeds from local market. The output level distribution pattern of soya bean farmers is perfectly equal according to Gini coefficient. Only few of the farmers are poor according to

FGT index. The most severe constraints facing soya bean farmers were transport facilities, inadequate storage facilities, and high incidence of pest and disease.

RECOMMENDATIONS

Based on the findings of this study, the following recommendations are made:

- i. It is recommended that affordable transport facilities should be provided for farmers to ease the stress of moving produce from farm to market.
- ii. Government should provide storage facilities for farmers in the study area.
- iii. Women should be encouraged to go into soya bean production.
- iv. Soya bean farmers should safeguard their farm against pilfers and theft of produce.

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