

Smallholder Farmers' Livelihood Improvement through Vegetable Farming Enterprises: Insight from Ksadb/Saa in Kano State, Nigeria

¹Abdullahi, K. Y.*, ²Alhassan, A., ³Atser, G. L., ⁴Oluoch, M., ⁵Adams, E. O., ⁶Shu'aib, A.U., ⁷Kmata Abdulrashid, H. & ⁸Gambo, A.

^{1, 2, 6} Department of Agricultural Economics and Extension, Faculty of Agriculture and Agricultural Technology, Aliko Dangote University of Science and Technology, Wudil, Kano, Nigeria

^{3, 5, 7, 8} Sasakawa Africa Association, 8 Kura Road off Magajin Rumfa Road, Nassarawa, Kano, Nigeria

⁴ Sasakawa Africa Association, Gurd Shola Area, Bole Sub-City, Woreda 06 Addis Ababa, Ethiopia

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ABSTRACT

Original research paper

This study assessed the contribution of vegetable enterprises to livelihood improvement among smallholder farmers specifically, tomato, onion, and cabbage producers who benefited from the Sasakawa Africa Association (SAA) interventions under the Kano State Agro-Pastoral Development Project (KSADP). Primary data were collected from 135 respondents across major vegetable-producing LGAs in Kano State. Descriptive statistics and cost and returns analysis were employed to estimate profitability indicators such as net farm income, benefit-cost ratio (BCR), and return on investment (ROI). The results showed that the beneficiaries had a mean age of 39.88 years for tomato farmers and 35.6 years for both onion and cabbage farmers. Majority of them were youth, male and had form of formal education. It was further found that vegetable enterprises significantly enhanced farmers' livelihoods: tomato farming yielded a BCR of 2.62 and ROI of 1.62, onion farming recorded a BCR of 9.27 and ROI of 8.27, while cabbage production achieved a BCR of 2.32 and ROI of 1.35. These findings confirm that KSADP/SAA interventions not only made vegetable farming highly profitable but also improved nutrition, resilience, and household welfare. The study recommends sustained input support, access to credit, and stronger market linkages to consolidate these livelihood gains.

Keywords: Vegetable farming, Income improvement, Profitability, KSADP, Kano State.

*Corresponding author: Abdullahi, K. Y.

Department of Agricultural Economics and Extension, Faculty of Agriculture and Agricultural Technology, Aliko Dangote University of Science and Technology, Wudil, Kano, Nigeria

Introduction

Vegetables are an important part of human diets as they contribute to food security and have a high nutritional value. Tomatoes (*Lycopersicon esculentum*), onions (*Allium cepa*), and cabbage (*Brassica oleracea*) are some of the most commonly grown vegetables in Nigeria. They are important sources of income for smallholder farmers and create a large

number of jobs in rural areas (Katanga et al., 2018; Magaji et al., 2021; Ojoko et al., 2024). Due to its favorable agro-ecology and extensive irrigation schemes like Kadawa, which offer fresh food to both northern and southern markets, Kano State, which is situated in the Sudan savannah ecological zone, is a major hub for irrigated vegetable production (Kamara et al., 2021).

Despite their economic importance, vegetable farmers face challenges including high input costs, post-harvest losses, poor access to credit, and limited extension support (Grema & Gashua, 2014). These constraints hinder productivity and reduce profitability, threatening both household welfare and the broader goals of agricultural development. To address these issues, the Kano State Agro-Pastoral Development Project (KSADP), implemented with support from the Sasakawa Africa Association (SAA), introduced interventions targeting smallholder farmers of which vegetable farmers are inclusive. These interventions included training, improved seeds, fertilizer access, and agronomic advisory services, aimed at boosting farm performance and farmer resilience.

Understanding the economic outcomes of such interventions is critical for evidence-based policy and program scaling. Previous studies in northern Nigeria have shown that vegetable farming, when adequately supported, is highly profitable and contributes significantly to rural livelihoods (Amuriya & Adewuyi, 2020; Ebojei, 2016). However, empirical evidence on the profitability of vegetables under the KSADP/SAA framework in Kano State remains limited. This study therefore fills that gap by analyzing the costs, revenues, and returns of tomato, onion, and cabbage production among KSADP beneficiaries, thereby providing insights into the sustainability of vegetable enterprises under donor-supported initiatives.

METHODOLOGY

Study Area

Kano State lies between latitudes 10° 33' to 12° 37'N and longitude 07° 34' to 09° 25'E and it borders Katsina State to the northwest, Jigawa State to the northeast, Bauchi State to the southeast and Kaduna State to the southwest. Kano State occupies a total land area of 20,131 square kilometers and this landmass is divided into 44 Local Government Areas, 122 wards, 3 senatorial districts and 24 Federal constituencies for political and administrative purposes (Kamara et al., 2021). Kano State has a population of 14,253,549 people according to National bureau of statistics, with annual

increase of 2.6% by 2021. It also has a population density of 750 people per km² (1,900/sq. mi) according to demographic report (NBS, 2023). Kano State is one of the largest states among the 36 states of the Federation. The state population density is 463/ km² and an average population growth rate of 3%. The population of Kano State is 7% of Nigeria and 13% of Northern Nigeria. The state's population is almost equally divided between males (51%) and females (49%) and is predominantly youthful. The state has a Poverty Index of 72.5%, and the population below the poverty rate stands at 8 million people. The unemployment rate is 26%, with 17% for men and 39.5% for women. The real GDP growth for 2016 was 3%.



Figure 1: Map of Kano State showing LGAs & Bordering States

Sample and Sampling Technique

Multistage sampling was employed to select the study sample respondents. In the first stage, the study population was stratified based on the value and segments of the enterprises supported under the project across the 44 local government areas in Kano State. In the second stage, each enterprise was assigned a proportionate sample size based on the sample determined by the research advisors (2006). Simple random sampling was applied to select the crop production-based enterprise respondents from the dominant LGAs. Therefore, 135 farmers (beneficiaries) were selected as sample size for this study. See Table 1 below:

Table 1 Sample Size for the Onion, Tomato and Cabbage value chain supported under SAA/KSADP

Survey Type	Target Group	Specific Locations & LGA	Sample Size
Questionnaire Administration	Onion farmers	Sumaila, Takai, Gwarzo, Kobo and Karaye	45
	Tomato farmers	Bagwai, Bunkure, Gwarzo, Kura and Dambatta	45
	Cabbage farmers	Dawakintofa, Gabasawa, Garko, Makoda and Rogo	45
Total			135

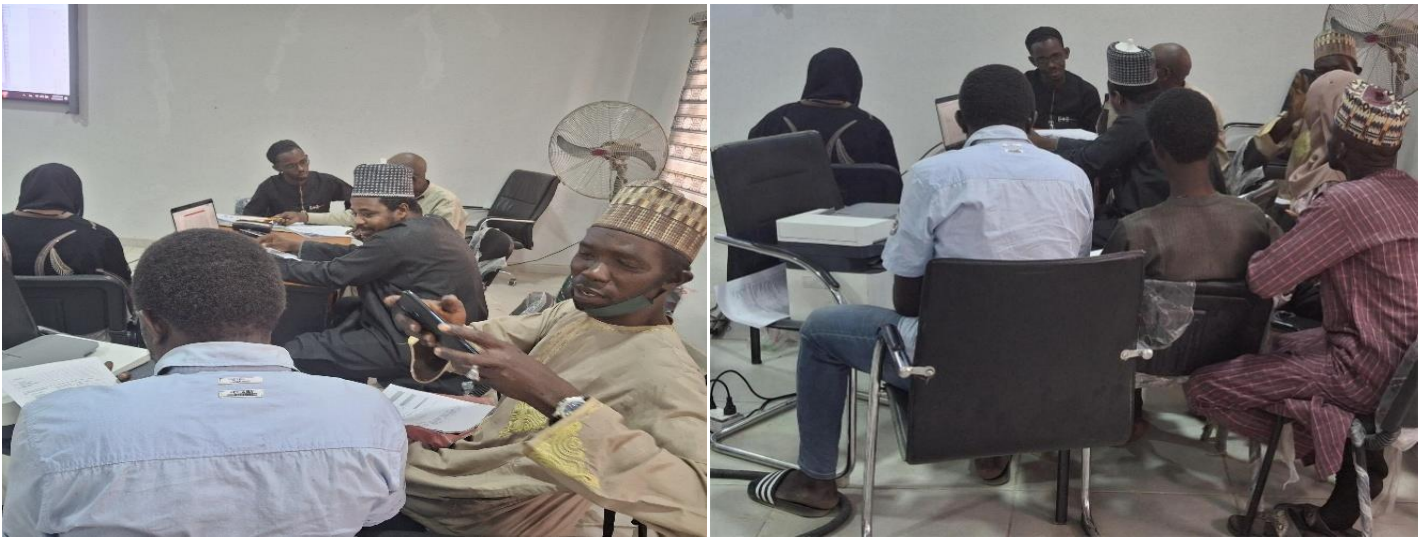
Data Collection

The data for this study were collected using structured questionnaires and schedule questions through the trained enumerators. The information elicited include production cost, yield, and income-related indicators contained in the project's logical framework



Photograph 1 Some of the Pictures during the Enumerators Training

The training dwelt more on how to ensure uniform data capture across the segments of the questionnaire: the socio-economic characteristics of the respondents, production cost, yield, and incomes of the respondents.



Photograph 2: A Cross-section of the Survey team while reviewing the questionnaire after pre-test

Data Analysis

Descriptive statistics and cost and return analysis were used to analyze the data collected for this study.

Descriptive Statistics: descriptive statistics such as frequency, percentage and mean were used to summarize socio-economic characteristics of respondents.

Cost and Returns Analysis: this was used to estimate net profit margin, net farm income, return on investment (ROI), benefit-cost ratio (BCR), and operating ratio (OR) for each enterprise. The model can be specified as:

$$\text{Total Revenue (TR)} = \sum (\text{Quantity sold} \times \text{Price per unit sold}) \dots\dots\dots(1)$$

$$\text{Net Profit Margin} = \left(\frac{\text{Net farm income}}{\text{Total Revenue}} \right) \times 100 \dots\dots\dots(2)$$

Where:

$$\text{Net Farm Income} = \text{TR} - \dots\dots\dots(3)$$

$$\text{TC} = \sum \text{TVC} + \sum \text{TFC} \dots\dots\dots(4)$$

Return on Investment (Return Per Naira Invested)

$$\text{Return on Investment (ROI)} = \frac{\text{Net farm income}}{\text{Total cost}} \dots\dots\dots(5)$$

Benefit-Cost Ratio

Benefit-Cost Ratio (BCR) is calculated by dividing the total revenue generated from selling output by the cost production of the output. The higher the BCR, the higher the profit margin. Hence, positive BC Ratio is always desirable and most recommended.

$$\text{Benefit-Cost Ratio (BCR)} = \frac{\text{Total revenue}}{\text{Total costs}} \dots\dots\dots (6)$$

BCR <1 = Means the benefits outpaced the cost of production, indicating that the enterprise is cost-effective.

BCR >1 = Indicates that the enterprise is not cost-effective as the cost is higher than the benefits

RESULTS AND DISCUSSION

Socioeconomic Characteristics of the Vegetable Farmers (Beneficiaries)

The results of the socioeconomic characteristics of the vegetable farmers (beneficiaries) are presented in Table 2'

Table 2: Socioeconomic characteristics of Tomato, Onion and Cabbage farmers (Beneficiaries)

Variables	Tomato		Onion		Cabbage	
	Freq	%	Freq	%	Freq	%
Age (years)						
18 – 24	3	6.67	2	4.44	6	13.33
25 – 34	9	20	14	31.11	11	24.44
35 – 44	16	35.56	20	44.44	20	44.44
45 – 54	8	17.78	8	17.78	7	15.56
55 – 64	5	11.11	1	2.22	1	2.22
65+	4	8.89	0	0	0	0
Mean	39.88		35.6		35.6	
Gender						
Male	45	100	45	100	45	100
Female	0	0	0	0	0	0
Education Status						
Non-formal education	10	22.22	9	20	9	20
Primary school	11	24.44	9	20	9	20
Secondary school	15	33.33	18	40	18	40
Tertiary	5	11.11	9	20	9	20
Vocational attendant	4	8.89	0	0	0	0
Marital Status						
Singe	3	6.67	0	0	0	0
Married	41	91.11	45	100	45	100
Widow/Widower	1	2.22	0	0	0	0
Total	45	100	45	100	45	100

Source: Field survey, 2025

The results in Table 2 revealed that most (35.56%) Tomato farmers (beneficiaries) were in age category of 35 – 44 years with the mean age 39.98 years respectively. While majority (79.99% and 82.21%) of the Onion and Cabbage farmers (beneficiaries) were in the age of 18 – 44 years. The mean

age of 35.6 years shows that Onion and Cabbage farmers are the most active farmers who are more agile to carry out their production activities efficiently. In general term, the project paid attention to youth as the leaders of tomorrow and had the zeal to carry out all form of activities like crop production to

help achieve self-sufficiency in food production in the nation. In addition, the project is more of poverty alleviation program looking at the parcels of younger people in it.

The results further indicated that majority (90.42%, 95.49% and 87.36%) of Tomato, Onion and 87.36% Cabbage farmers respectively were males. This implies that intervention on vegetable crop production is male skewed. This might be as a results of the culture of Kano State which mostly women sit at home to take care of the young children while their male counterpart are at farm or market to look for what to feed the family. Nevertheless, the need for more women mainstreaming into crop production is paramount as it's a lucrative venture and some women had a lot of family

responsibility on them especially, the widowed ones, it will help them earn their living and pay for the education of their children.

The results also revealed that majority (73.77%, 68.89% and 80%) of the Tomato, Onion and Cabbage farmers (beneficiaries) had one form of formal education or the other. This will help them to think well, plan for their activities effectively, keep appropriate records and adopt modern farming method. Besides, education is by proxy, a determinant of productivity of the farmers, as it makes them read instructions on the labels of some farming inputs and correctly apply. This will go a long way with optimization of productive resources.

Cost, Revenue and Profitability of Tomato Production/Acre

The costs and returns involved in the production of one acre of tomato are presented in Table 3.

Table 3: Cost, Revenue and Profitability of Tomato Production/Acre

Items	Qty (Kg/Ltr/Crate)	Amount(₦)	%TC
Variable inputs			
Seeds	3.75	29,812.5	3.79
Fertilizer (NPK)	201.25	167,605	21.28
Fertilizer (Urea)	109.5	115,011.4	14.60
Seed dress	2	600	0.08
Organic manure		43,713.33	5.55
Herbicides	3	26,561.54	3.37
Pesticides	3.42	18,825	2.39
Water Charges		19,264.71	2.45
Fuel	130	143,000	18.16
Labour cost		145,357.8	18.46
Transportation cost		19,544	2.48
Total variable cost		729,295.28	
Amortized value		7,025	0.89
Plot rental value		51,236	6.51
Total fixed cost		58,260	
Total cost of production		787,555.28	
Output			
Fruits	222.27	2,060,442.9	
Total Revenue		2,060,442.9	
Net Farm Income		1,272,887.62	
Net Profit Margin		61.78%	
Return on Investment (ROI)		1.62	
Benefit Cost Ratio (BCR)		2.62	
Operating Ratio (OR)		0.354	

Source: Field Survey, 2025

The results in Table 3 revealed that fertilizers (NPK and urea) had the highest cost of ₦282,616.4 accounting for 35.88% of total production cost. This is followed by labour cost of ₦145,357.8, fuel cost of ₦143,000 and ₦45,986.54 for agro-chemicals which accounted for 18.46%, 18.16% and 5.84% of total production cost, respectively. Others are costs of organic manure (₦43,713.33), seeds (₦29,812.5), transport

(₦19,544) and water for irrigation (₦19,264.71) all accounting for 5.55%, 3.79%, 2.48% and 2.45% of total production, respectively. The total variable costs amounted to ₦729,295.28 representing 92.60 % of total cost of production.

One the other hand, the fixed costs include the plot rental value of ₦51,236 and amortized value of fixed items

summing up to ₦58,260 and represented 7.4% of total cost of production. Therefore, the total production cost stood at ₦787,555.28. It is curious to observe that unlike other crops where labour accounted for the highest item in the cost of production, in tomato, it is fertilizer inputs that accounted for 35.88% of the total production cost, followed by labour cost. Other inputs such as fuel and water charges not common in other crops are here. This is because tomato is predominantly produced during the dry season using irrigation in the state.

The total revenue generated from both the sale of millet grains and stalks was ₦1,351,768. When the total production cost of ₦472,904.23 is subtracted from the total revenue, it gives a net farm income of ₦878,863.77 and a profit margin of 65.02%. Similarly, the ROI is 1.86, implying that for every naira invested in millet production by the beneficiaries gave a return of ₦1.86.

The total revenue that accrued from the sale of tomato fruits was ₦2,060,442.9. Thus when the total production cost is subtracted from the total revenue, it gives a net farm income of ₦1,272,887.62 and a net profit margin of 61.78% per hectare of tomato. Similarly, the ROI is 1.62 indicating that every naira invested by the beneficiaries in tomato production

yielded ₦1.62. The BCR of 2.62 is greater than unity while the operating ratio is 0.354 (which is less than unity), all indicating that tomato production is profitable since it generated total revenue that covered all production expenses and still have extra as profit for the farmer.

Based on the foregoing, it could be concluded that tomato production by the beneficiaries is a profitable enterprise which should be encouraged by the state government. All these findings are similar with those of Katanga et al. (2018) and Amurtiya and Adewuyi (2020) who opined that tomato production is highly profitable in selected Local Government Areas of Kano State.

Cost, Revenue and Profitability of Onion Production/Acre

The costs, revenue and returns involved in the production of one acre of onion are presented in Table 4. The table shows the total variable and fixed costs, total revenue, net farm income, net farm margin, the return on investment (ROI), the benefit cost ratio (BCR) and operating ratio (OR) involved in the production of one acre of onion.

Table 4: Cost, Revenue and Profitability of Onion Production/Acre

Variable	Qty(Kg/Ltr/Bag)	Amount (₦)	%TC
Variable Cost			
Seeds	1	52,000	12.75
Fertilizer (NPK)	98.3	78,640	19.29
Foliar plus	1	8,500	2.08
Seed dress	2.9	580	0.14
Herbicides	1	7,413	1.82
Pesticides	1	4,250	1.04
Empty bags	70	21,073.2	5.17
Labour		121,506	29.80
Transportation cost		24,571	6.03
Total variable cost		318,533.2	
Fixed Cost			
Amortized value		1,934.8	0.47
Plot rental value		87,238	21.40
Total fixed cost		89,172.8	
Total cost of production		407,705	
Output			
Bulb	61.3	3,777,969.6	
Total Revenue		3,777,969.6	
Net Farm Income		3,370,264.6	
Net Profit Margin		89.21%	
Return on Investment (ROI)		8.27	
Benefit Cost Ratio (BCR)		9.27	
Operating Ratio (OR)		0.084	

Source: Field Survey, 2025

The results in Table 4 showed that among the variable cost component, labour cost is the highest, amounting to

₦121,506 and representing 29.81% of the total cost of production. Fertilizer (NPK) is the second with a cost of

₦78,640 and then seeds with a cost of ₦52,000 representing 19.29% and 12.75%, respectively. Others are ₦24,571 for transport cost, ₦21,073.2 for empty bags and ₦20,743 for agro-chemicals (foliar plus, seed dressing chemicals, herbicides and pesticides), representing 6.03%, 5.17% and 5.08% of total cost of production, respectively. The total variable cost is therefore, ₦318,533.2 representing 78.13% of total production cost.

The fixed costs consisted of plot rental value of ₦87,238 and ₦1,934.8 summing up to ₦89,172.8 and representing 21.87% of the total production cost. When the variable cost is added to the fixed, it gives a total production cost of ₦407,706. It could be observed that labour (29.81%), rented plot (21.40%) and fertilizer (19.29%) constituted the highest costs of production accounting for 70.5% of total production. Curiously too, the fixed costs also accounted for 21.87% of production costs which is very high.

The total revenue realized from the sale of onion bulbs stood at ₦3,777,969.6. When the total production cost of ₦407,406 is taken from the total revenue, it gives a net farm income of ₦3,370,264.6 and net profit margin of 89.21%, indicating a

high level of profitability. The ROI is 8.27 implying that any naira invested in onion production gives a return of ₦8.27 which is very high. The BCR is 9.27 while the operating ratio (OR) is 0.084. Since the BCR is much greater than unity and the OR is much lesser than unity, then onion production is generating a high level of profitability and should be seriously encouraged by the government since the production cycle is just 3 to 4 months. All these findings are consistent with the findings of Grema and Gashua (2014) and Magaji et al. (2021) who reported that onion production was lucrative and profitable in Yobe and Kebbi States, respectively.

Cost, Revenue and Profitability of Cabbage Production/Acre

Table 5 presents the total variable and fixed costs, total revenue, net farm income, net farm margin, the return on investment (ROI), the benefit cost ratio (BCR) and operating ratio (OR) involved in the production of one acre of cabbage among beneficiaries.

Table 5: Cost, Revenue and Profitability of Cabbage Production/Acre

Variable	Qty (Kg/Ltr/Bag)	Amount (₦)	%TC
Variable Cost			
Seedlings	8	56,000	12.89
Fertilizer (NPK)	97.9	90,068	20.73
Urea	50	36,512	8.40
Seed dress	2	600	0.14
Herbicides	1	6,811	1.57
Pesticides	1	4,640	1.07
Empty bags	50	37,500	8.63
Labour		113,180.67	26.05
Transportation cost		30,340.1	6.98
Total variable cost		375,651.77	
Fixed Cost			
Amortized value		5,463.03	1.26
Plot rental value		53,427	12.30
Total fixed cost		58,890.03	
Total cost of production		434,541.8	
Output			
Cabbage	48.1	1,010,100	
Total Revenue		1,010,100	
Net Farm Income		575,558.2	
Net Profit Margin		56.98%	
Return on Investment (ROI)		1.32	
Benefit Cost Ratio (BCR)		2.32	
Operating Ratio (OR)		0.372	

Source: Field Survey, 2025

The variable cost component of the production shows that fertilizers (NPK and urea) have the highest cost and accounted for ₦126,580, representing 29.13% of total

production cost. This is followed by labour with a cost of ₦113,180 and seedlings with a cost of ₦56,000 representing 26.05% and 12.89%, respectively. Others are ₦37,500 for

empty bags, ₦30,340 for transportation and ₦12,051 for agrochemicals, representing 8.63%, 6.98% and 2.78% of total cost of production, respectively. Thus, the total variable cost stood at ₦375,651.77 representing 86.44% of total production cost.

The fixed cost component revealed plot rental value to be ₦53,427 while the amortized value of fixed assets was ₦5,463.03, all amounting to ₦58,890.03 and representing 13.56% of total cost of production. Thus, both the total variable cost and total fixed cost summed up to ₦434,541.8 as total production cost. The cost component analysis shows that fertilizers accounted for the highest percentage (29.13%) of production cost, followed by labour (26.05%) and seedlings (12.89%). Since the total fixed cost percentage of 13.56% is more than 2% of total production cost, it implies that the fixed cost items like plot and depreciated equipment are significant in the cabbage production process (Shu'aib, 2014).

The total revenue generated per acre from the sale of cabbage heads was ₦1,010,100. When the total production cost of ₦434,541.8 is deducted from the total revenue, it gives a net farm income of ₦575,558.2 and a net profit margin of 56.98% per acre of produced cabbage which go to show that cabbage production by beneficiaries of the project is profitable. Similarly, the ROI is 1.35, meaning that for every naira invested in cabbage production yields ₦1.35. The BCR of 2.32 and operating ratio of 0.372, imply that since the BCR is greater than unity and OR less than unity, the revenue accruing from cabbage production conveniently covered all production costs and generated an extra profit of ₦575,558.2. This shows that cabbage production by project beneficiaries is a viable and profitable agri-business which farmers can embark upon within 3 months to enhance their income and should therefore, be encouraged by the government. These findings are in accord with those of Ebojei (2016) and Ojoko et al. (2024) who found cabbage production to be profitable in Plateau and Katsina States, respectively.

Conclusion and Recommendations

Based on the findings of this study it is concluded that vegetable farming enterprise is highly profitable and significantly contributed to livelihood improvement. It is recommended that vegetable farmers (beneficiaries) should be encouraged on bulk purchase of inputs through cooperatives; the project should also introduce and promote affordable small-scale mechanization for certain activities to help reduce the high cost labour.

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