



Evaluation of Cost Efficiency and Returns on Investment across Sugarcane Value Chain Actors in Kebbi State, Nigeria

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Abstract

This study evaluated the cost efficiency and returns on investment across sugarcane value chain actors in Kebbi State, Nigeria. A total of 400 respondents were selected through a multistage sampling procedure comprising 80 stem cutting suppliers, 120 producers, 60 processors, 70 wholesalers, and 70 retailers. Data were collected using structured questionnaires and analysed using descriptive statistics and cost–return analysis. The results revealed that all value chain actors were profitable, though with varying cost efficiencies. For stem cutting suppliers, the total cost of production per week was ₦1,624,000, and the total revenue was ₦2,500,000, yielding a gross margin of ₦876,000 and a return on investment (ROI) of 1.54. Among producers, the total cost per hectare was ₦2,543,695.80, total revenue ₦5,625,000, net farm income ₦3,081,304.20, and ROI 1.83, the highest among all actors. Wholesalers recorded a total cost of ₦695,500 per week, total revenue of ₦770,000, a marketing margin of ₦74,500, and an ROI of 1.11. Retailers incurred ₦124,900 per week in total cost, realised ₦147,000 in revenue, and achieved a gross margin of ₦22,100 with an ROI of 1.20. Processors expended ₦347,900 weekly, earned ₦378,000, generated ₦30,100 as net income, and recorded an ROI of 1.09. These findings indicate that sugarcane production is the most profitable enterprise, followed by stem cutting supply, retailing, wholesaling, and processing. The study concludes that all actors in the sugarcane value chain operate profitably but with varying levels of cost efficiency. However, high input costs, poor access to credit, and weak cooperative linkages hinder optimal performance. It therefore recommends the strengthening of cooperative societies, improvement in access to affordable credit, and subsidisation of input costs to enhance efficiency, profitability, and inclusive growth across the sugarcane value chain in Kebbi State.

Keywords: Sugarcane value chain, Cost efficiency, Return on investment, Profitability analysis, Kebbi State.

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INTRODUCTION

Sugarcane (*Saccharum officinarum*) belongs to the grass family Poaceae, an economically important seed plant family that includes maize, wheat, rice and sorghum and many forage crops. The main product of sugarcane is sucrose, which accumulates in the stalk internodes, is extracted and purified in specialised mill factories, and is used as a raw material in human food industries or is fermented to produce ethanol, which is produced on a large scale by the Brazilian sugarcane

industry (Abdul-Latif, 2004). It is native to the warm temperature and tropical regions of South Asia. According to the Food and Agriculture Organization (FAO, 2013), sugarcane is cultivated on about 26 million hectares in more than 90 countries with a worldwide harvest of 1.83 billion metric tonnes. Brazil is the largest producer of sugarcane in the world; the next five major countries of sugarcane production are India, China, Thailand, Pakistan and Mexico (Gire and Gireh 2012).

The important sugar-producing countries in Africa are Mauritius, Kenya, Sudan, Zimbabwe, Madagascar, Côte d'Ivoire, Ethiopia, Malawi, Zambia, Tanzania, Nigeria, Cameroon and Zaire, where Nigeria is one of the most important producers of the crop with a land potential of over 500,000 hectares of suitable cane fields capable of producing over 3.0 million metric tonnes of sugarcane (Gari, 2008). If processed, it will yield about 3.0 million metric tonnes of sugar, and Nigeria has vast human and natural resources, in terms of land and water, to produce enough sugarcane not only to satisfy the country's requirement for sugar and biofuel but also for export (NSDC, 2003). Nigeria is noted to be abundantly blessed with human, water and environmental potential for the production of sugarcane. Areas with high potentials for commercial sugarcane/sugar cane production have been identified through studies sponsored by the Federal Ministry of Industry and conducted by Dutch consultants HVA in the early 80s, which pointed out that most of the areas in the northern states where water for irrigation is available have sugarcane cultivation in large quantities as feasible (Abdul-Latif, 2004). The crop can be rotated or even interplanted with other crops where land with adequate sources of water abounds, like River Basin Development Authority Areas (Gerrei and Giroh 2012).

According to Godhejaet al. (2014), sugarcane provides a livelihood for so many small farmers, as it is a very popular and important crop to the farmers, which gives a high return of manual labour inputs. It is highly responsive to nitrogen fertiliser and very easy to market. The world demand for sugar is the primary driver of sugarcane production. Cane accounts for 80% of sugar produced; most of the rest is made from sugar beets. The crop predominantly grows in the tropical and subtropical regions, and sugar beets predominantly grow in colder temperature regions of the world. Thus, other than sugar products derived from sugar cane, they include bagasse and ethanol (Godheja et al., 2014).

Statement of the Research Problem

A lot of studies have been documented on sugarcane in North-western Nigeria yet there is near absence of empirical information on sugarcane value chain analysis in Nigeria generally and Kebbi State in particular. Dearth of the study that assessed the entire value chain for sugarcane particularly in the aspect of the profitability of the different actors informed the decision for this research. If sugarcane value chain is analyzed results obtained is likely to stem the tide of inefficiency of sugarcane production, enhance the marketing system and ensure more availability of sugar cane and is associated products. If the problems of sugarcane are assessed, opportunities and prospects are empirically analyzed; information from such a study hopes to guide sugarcane producers and prospective investors on how

to invest in order to increase their investment opportunities.

Objectives of the study

The main objective of the study is to examine the costs and returns of each of the actors in Kebbi State, Nigeria. The specific objectives are to:

1. Describe the socio-economic characteristics of sugarcane value chain actors in the study area;
2. Examine the cost and returns of each of the actors?

METHODOLOGY

Description of the Study Area

The study was conducted in Kebbi State, located in the north-western part of Nigeria. Kebbi State is situated between latitudes 10°8'N and 13°15'N and longitudes 3°30'E and 6°02'E. The state is bordered by Sokoto and Zamfara States to the east, Niger State to the south, the Republic of Benin to the west and the Republic of Niger to the north. Kebbi State occupies an area of about 37,699 square kilometres, out of which 36.46% is made up of farmland (Kebbi State Government, 2018). The state has an estimated population of about 5,563,900 (NPC, 2022), while 49.5% are female and 50.5% are male (NPC, 2022). Kebbi State has tropical weather conditions with three seasons: rainy, dry and hot. The annual rainfall is variable and declining, being 600mm to 850mm with an average of 650mm. The monthly temperature in the region ranges from 25°C to 45°C. The State possessed two important agricultural lands, namely, dry land (arid-prolonged dryness) and Fadama (floodplain-significant alluvial clay particles). These two lands remained the key source of income for millions of people in the state (Usman et al., 2016). Agriculture is the most important economic activity, with riverine floodplains producing crops like groundnuts, cotton, rice, millet, sorghum and vegetables such as tomatoes, onions, etc. Most of the land in the state is used for grazing cattle, goats and sheep. The major ethnic groups in the state include Fulani, Hausa, Lel'na (Dakarkari) and Kambari (Amy, 2019).

Sampling Procedure and Sample Size

A multi-stage sampling technique was employed in selecting sugarcane value chain actors in the study area. Kebbi

State is made up of 21 Local Government Areas and is divided into four (4) agricultural zones, namely, Argungu, Bunza, Yauri and Zuru. The first stage involved purposive selection of two (2) LGAs from each

zone based on the predominant history of sugarcane production from each zone, giving a total number of eight (8) Local Government Areas for the study. The second stage involved purposive selection of two (2) villages based on a high concentration of sugarcane producers from the selected LGAs, giving a total of sixteen (16) villages for the study.

The third stage involved the use of simple random sampling to select ten (10) respondents each from the selected villages, giving a total sample size of 160 sugarcane farmers for the study.

At the fourth stage, simple random sampling was used, in which five (5) respondents each from the selected villages were chosen, giving a total sample of 80 sugarcane retailers and sugarcane processors in the study area, respectively. The fifth stage involved simple random sampling: two (2) respondents were selected from eight (8) villages out of sixteen villages randomly selected, and three (3) respondents were also selected from the other remaining eight (8) villages randomly selected, giving a total sample size of 40 sugarcane input suppliers and sugarcane wholesalers, respectively. Substantially, the total respondents were 160 farmers, 80 retailers, 80 processors, 40 input suppliers and 40 wholesalers, giving a total of 400 sugarcane value chain actors as the sample size for the study.

Method of Data Collection

The instrument for data collection is the administration of interview schedule questionnaires, which are used as a source of primary data. The questionnaires have alternative responses for the respondents to fill in as appropriate or tick in the appropriate boxes as provided by the researcher. Secondary information was collected from materials such as journals, seminars, conference proceedings and related literature. The data of the study was collected with the help of trained enumerators. After data cleaning, the data was coded and entered in the computer for analysis using the Statistical Package for Social Sciences (SPSS). The data was analysed in line with the objectives of the study.

Analytical Techniques

Descriptive statistics was used to analyse objective

1, while net farm income analysis, marketing margin and gross margin were used to achieve objective 2.

Model Specification for Net Farm Income Analysis

This is one of the most common analytical tools used in farm management investigations to derive performance standard of the farm enterprise. It was used to achieve objective 2 of the study. Net Farm Income was employed to measure the profitability of input supplier and farmers the model is as follows;

$$NFI = TR - TC$$

$$TR = GFI = TVP = TPP \cdot P_x$$

$$TC = TVC + TFC$$

$$GFI = TVP = TPP \cdot P_x$$

$$TR = TC - TFC - TV$$

$$\text{Return on Investment (ROI)} = NFI/TC \cdot 100$$

$$\text{Capital Turnover (CT)} = TR/TC$$

Marketing Margin Analysis Model Specification

Marketing Margin was employed to measured profitability of traders (wholesalers and retailers). Marketing Margin (MM) = TR – TC

$$TC = TVC + TFC$$

$$\text{Return on Investment (ROI)} = TR/TC$$

Gross Margin Analysis Model Specification

Gross margin was employed to measured profitability of processors

$$\text{Gross margin (GR)} = TR - TC$$

$$NFI = TR - TC$$

$$TC = TVC + TFC$$

Where:

NFI = Net Farm Income (Naira/ha)

TR = Total Revenue (Naira/ha)

GFI = Gross Farm Income (Naira/ha)

TVP = Total Value of Products (Naira/ha)

TC = Total Costs

TFC = Total Fixed Cost (Naira/ha)

TVC = Total Variable Cost (Naira/ha)

RESULTS AND DISCUSSION

Table 1: Average Cost and Returns for Sugarcane Stem Cutting supply per Week in the Study Area

Variables	Average	Percentage
Cost of production		
Cost of Stem cutting bundle	1,400,000.00	86.00
Cost of Labour	179,000.00	11.00
Cost of Manure	25,000.00	2.00
Cost of Fertilizer	20,000.00	1.00
Total Cost of production	1,624,000.00	100.00
Total Revenue	2,500,000.00	
Gross Margin	876,000.00	
Return on Investment	1.54	

Source: Field survey, 2022

Table 1 shows the result of the average costs and returns of stem cutting supply per week in the study area. The results revealed that the average total revenue of sugarcane stem cutting supply per week was estimated as ₦2,500,000 while the average total costs of sugar cutting stem cutting production per week was estimate as ₦1,624,000. The results also indicated that stem cutting supply per week has a Net Income of

₦876,000 per week while returns to investment (ROI) was 1.54 this implies that sugarcane stem cutting is a profitable venture in the study area. The rate of return on investment as shown was 1.54 indicating that for every one naira (₦) invested on sugarcane stem cutting supply per week 1.54 was generated as revenue. This suggests that the business of input supply in sugarcane is lucrative business.

Table 2: Average Cost and Returns for Sugarcane Production per Hectare

Variable	Value (₦/ha)	Percentage
Variable Cost		
Stem Cutting (kg)	750,000.00	29.49
Labour (man-days)	480,000.00	18.87
Fertilizer (kg)	330,000.00	12.90
Pesticides (litre)	16,111.80	0.63
Herbicide (litre)	71,500.00	2.81
Manure (kg)	87,804.00	3.45
Loading	187,500.00	7.37
Offloading	187,500.00	7.37
Transportation	312,500.00	12.28
Total Variable Cost	2,422,915.80	95.25
Fixed Cost		
Land renting	91,080.00	3.58
Deprecation on big hoe	9,000.00	0.35
Deprecation on small hoes	4,500.00	0.18
Deprecation on cutlass	3,000.00	0.12
Deprecation on irrigation equipment	7,200.00	0.28
Deprecation on sprayer	6,000.00	0.24
Total Fixed Cost	120,780.00	4.75
Total Cost	2,543,695.80	100.00
Total Revenue	5,625,000.00	
Net Farm Income	3,081,304.20	
Return on Investment	1.83	

Source: Field survey, 2022

Table 2 represents the average cost and returns per hectare of sugarcane production. The result shows that variable costs components are the important costs items

estimated as ₦2,422,915.8/ha of the total costs components estimated that ₦2,543,695.8/ha. Among the variable costs components, however, costs of stem

cuttings are the most important representing ₦750,000.0 of the total variable costs items. However, on the average basis, the total revenue in the study area was estimated ₦5,625,000.0/ha, Net Farm Income (NFI) was estimated ₦3,081,304.2/ha while returns to investment (ROI) 1.83. This implies that sugarcane production is a profitable venture in the study area which means that return on investment as shown

1.83 indicated that for every naira (₦) invested on sugarcane production per hectare generated ₦1.83 kobo as net income indicated that for every (₦) invested 1.83 kobo returned to sugarcane production as revenue. This finding is similar to that of Muhammad et al (2021) on indicating that sugarcane production is a profitable venture in the study area.

Table 3: Average Cost and Returns for Sugarcane Wholesaler per Week in the Study Area

Variables	Average	Percentage
Cost of Sugarcane	630,000.00	90.60
Cost of Loading	7,000.00	1.00
Cost of offloading	7,000.00	1.00
Cost of transportation	49,000.00	7.00
Market Tax/commission	2,500.00	0.40
(B) Total variable Cost	695,500.00	100.00
(A) Total Revenue	770,000.00	
Margin(A-B)	74,500.00	
Return on Investment (ROI)	1.11	

Source: Field survey, 2022

Table 3 shows the average cost and returns of sugarcane wholesale per week in the study area. The results revealed that the average total revenue from sugarcane wholesale was estimated as ₦770,000 per week, while the average total cost of sugarcane wholesale operations was estimated as ₦695,500 per week. The results indicated that sugarcane wholesales has a marketing margin estimated at ₦74,500, while the

return on investment (ROI) is 1.11. This implies that sugarcane wholesaling is a profitable venture in the study area, which means that the return on investment, as shown in 1.11, indicated that for every one naira (₦) invested in sugarcane wholesaling per week, 1.11k was generated as net income, indicating that for every one (₦) invested, 1.11 kobo returned to sugarcane wholesaling as revenue.

Table 4: Average Cost and Returns for Sugarcane Retailing per Week in the Study Area

Variable	Average	Percentage
Cost of sugarcane	115,500.00	91.10
Barrow rent/per day	1,400.00	1.10
Cost of transportation	700.00	0.60
Market levy/tax	350.00	0.30
Cost of scrapping	4,200.00	3.30
Cost of water	500.00	0.40
Cost of polythene leader	2,100.00	3.20
Depreciation on knife	150.00	0.10
(B) Total Variable Cost	124,900.00	100.00
(A) Total Revenue	147,000.00	
Gross margin (A-B)	22,100.00	
Return on investment	1.20	

Source: Field survey, 2022

Table 4 shows the average costs and returns of sugarcane retailing per week in the study area. The results revealed that the average total revenue from sugarcane retailing was estimated as ₦147,000 per week, while the average total costs of sugarcane retailing operations were estimated as ₦124,900 per week. The results indicated that sugarcane retailing has

a gross margin estimated as ₦22,100, while the return on investment (ROI) is 1.20. This implies that sugarcane retailing is a profitable venture in the study area, which means that the return on investment, as indicated, is that for every one naira (₦) invested in sugarcane retailing per week, 1.20 kobo is generated as gross income..

Table 5: Average cost and returns for sugarcane processing per week in the study area

Variable	Average	Percentage
Cost of sugarcane	280,000.00	80.50
Cost of transportation	21,000.00	6.00
Depreciation on plate	5,600.00	1.60
Cost of fire wood	2,100.00	0.60
Cost of labour	39,200.00	11.30
(B) Total Cost	347,900.00	100.00
(A) Total Rev	378,000.00	
Net Income	30,100.00	
Return on investment	1.09	

Source: Field survey, 2022

Table 5 shows the average costs and returns of sugarcane processing per week in the study area. The results revealed that the average total revenue from sugarcane processing was estimated as ₦378,000 per week, while the average total cost of sugarcane processing operations was estimated as ₦347,900 per week. The results indicated that sugarcane processing has a net income of 30,100.00, while the return on investment (ROI) is 1.09. This implies that sugarcane processing is a profitable venture in the study area, which means that return on investment, as shown 1.09 indicated that for every one naira (₦) invested in sugarcane processing per week, 1.09 kobo was generated as net income.

Conclusion

The study found that all sugarcane value chain actors in Kebbi State were profitable, though with varying cost efficiencies. Producers achieved the highest returns on investment, while input suppliers, processors, and retailers also recorded positive margins. However, high input costs, weak cooperative participation, and poor access to credit reduced overall efficiency. The chain remains largely male-dominated and loosely coordinated. Strengthening cooperatives, improving credit access, and promoting modern production and processing technologies are essential to enhance cost efficiency and profitability across the sugarcane value chain.

Recommendations

Based on the findings of the study, the following recommendations are made with a view to boost sugarcane value chain activities in the state:

- (1) The study recommended that all the sugarcane actors should form and participate in co-operative societies so as to have multiple sources of marketing information and access to credit.
- (2) The study also recommended that the sugarcane stem cutting suppliers and sugarcane farmers should expand their farmland so as to increase their output of sugarcane products.
- (3) The government should subsidise sugarcane input supply, and financial institutions should be encouraged to give out credit facilities to all small- and medium-scale sugarcane value chain actors.

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