A Comprehensive Analysis of Market Structure-Conduct-Performance of Sugarcane (*Saccharum officinarum* L.) in North Central Nigeria

Umar, M.[1], Oladimeji, Y. U.[1], Egwuma, H.[1], and Owolabi, J.O.[2]*

[1]*Department of Agricultural Economics, Ahmadu Bello University Zaria, Nigeria*
[2]*Department of Agricultural Extension and Rural Sociology, Ahmadu Bello University Zaria, Nigeria*

KEYWORDS

Conduct,
Market,
Performance,
Structure,
Sugarcane

***CORRESPONDING AUTHOR**

umarapataku@yahoo.com
+2348036244493

ABSTRACT

This study investigates the market structure, conduct, and performance of sugarcane in North Central Nigeria. Employing a multi-stage sampling approach, 235 sugarcane marketers were randomly selected from a pool of 575 using the Slovin's formula. Primary data was collected through structured questionnaires and analyzed using the Gini coefficient, Lorenz curve, marketing margin, and marketing efficiency model. Market analysis reveals income inequality, with Gini coefficients ranging from 0.61 to 0.72. The closer the value of gini coefficient is to unity, the greater is the degree of income inequality and the higher is the level of concentration of sellers and vice versa. The diagonal connecting points of (0, 0) and (1, 1) on the Lorenz curve depicts the 450 line or line of perfect equality. The graph showed the cumulative percentage of sugarcane marketers against the cumulative percentage (%) of sugarcane total sales or income which reveals that the market is an imperfect market. The study identifies pricing factors influencing market conduct, with net margins and profitability ratios confirming sugarcane marketing as profitable. Sensitivity analysis suggests potential profit optimization by reducing transportation and storage costs. The study concludes that sugarcane marketing is profitable in North Central Nigeria and recommends interventions such as establishing training centers, offering capacity-building workshops, implementing flexible credit policies, and enhancing security for marketers.

INTRODUCTION

Agricultural development is one of the most effective tools for eradicating extreme poverty, boost shared prosperity, and provide sustenance for a projected 9.7 billion people by 2050 (World Bank, 2021). This is possible if industrial crops like sugarcane production and marketing can be given top priority because of its relevance in providing raw materials to our industries to achieve the sustainable development goals. Sugarcane *(Saccharum officinarum)* holds significant importance as an industrial crop on a global scale, with roughly 110 countries involved in sugar production from either sugarcane or sugar beet (ISO, 2020). Food and Agricultural Organaisation (2020), reported that sugarcane, on average, accounts for approximately 80 % of global sugar production. Sugarcane aside mainly grown for manufacturing sugar and other sweeteners, its by-products are used in chipboard and paper industries. Products derived from sugarcane also includes *falernum*, molasses, rum, *cachaça* (a traditional alcohol from Brazil), *bagasse* (cane fibres) used to produce cellulosic ethanol, a second-generation biofuel. The plant itself can be used as thatch and livestock fodder (Amita, and Sudip, 2020).

However, in Nigeria chewing cane accounts for between 55 – 65 % of the total cane production. The bulk of these are consumed raw for sweetness of the juice while some are processed into a variety of products such

as sugar, molasses, bagasse, *Jaggery (Mazarkwaila)*, sweets *(Alewa)* and left – over leaves/stalks used as thatch and livestock feeds (Oni, 2016). Despite having all these importance, sugarcane production and marketing in Nigeria has not matched the sugar and sweeteners need of the country. In 2019, the amount of sugar consumption stood at over 1.4 million MT while in 2020 it was also over 1.5 million Metric Tons (MT). However, Nigerian sugar production in 2019 stood at only 38,597 MT (0.039 million MT) while importation stood at 1.4 million MT and 1.5 million MT in 2019 and 2020, respectively (ISO, 2020b). With average unit price of $283/MT, the importation cost from the deficit gap stood at over $433 million with per capita consumption of 7.6kg; (NSDC, 2020). Hence, the country depend very heavily on imports of sugarcane products thereby making the country highly vulnerable to global market and supply shocks.

Marketing of sugarcane is a very important but rather neglected aspect of agricultural development. In developing countries more emphasis is usually placed on increase sugarcane production with little or no policies to increase how to distribute the sugarcane produced efficiently and in a manner that will enhance increased productivity (Omotesho, *et al* 2013). Sugarcane marketing by farmers and traders, mostly in the immediate post-harvest period, usually involves a lot of costs and these costs are so high that lowering the costs through efficient marketing system may be as important as increasing sugarcane production. Although, Aina, *et al* (2015), Sulaiman (2015) Oni (2016), Amita and Sudip (2020), Issa, *et al* (2020) and Darika, *et al* (2021) has carried out several studies on importance and profitability of sugarcane, but little is known in terms of their marketing as such paucity and dearth of information in sugarcane marketing in Nigeria particularly North central Nigeria is the reason this research was conceived. It is also pertinent to note that Nigeria government through several policies has aimed at boosting sugarcane production in the country such as imposition of 50 % tariff on importation of white sugar, 5 % levy on imported raw sugar, 5 year tax waver for sugar refineries and privatization of the major sugar firms in Nigeria, yet domestic production of sugar and its value addition is slightly less than 3% of the country's annual requirement (CBN, 2019 and CBN, 2020) and this is the main reason this research was conceived to look at the comprehensive analysis of market structure-conduct- performance of sugarcane in North central Nigeria.

METHODOLOGY

Study Area

The study was conducted in North Central Nigeria comprises of six states namely; Benue, Kogi, Kwara, Nasarawa, Niger and Plateau, and Federal Capital Territory (Figure 3.1). The zone has a projected population of 34,334,723 constituting 16% of Nigeria population (World Meter, 2022). The region lies approximately between Latitudes $7^0.30^{`}$ and $10^0.20'$ N and Longitude $3^0.30^{`}$ and $14^0.30'$ E occupying a land mass of about 242,425 km^2 (26.24%) out of 923,768 km^2 of Nigeria landmass (NBS, 2020). The North central has network of drainage system forming tributaries that flow from the Benue River and river Niger making it suitable for growing sugarcane using irrigation system.

North central region is mainly influenced by the climate of the Northern and Southern regions of Nigeria giving the working population opportunity to engage in farming, fishing, livestock and poultry. The ideal climate for production of maximum sugar from sugarcane is characterized as a long, warm growing season with a high incidence of solar radiation and adequate moisture (rainfall). Warm and humid climate is favorable for its growth. A temperature range of 30^0C to 40^0C with annual rainfall ranging between 700 to 1500 mm in North central is the best for its successful cultivation (FMARD, 2019). Long duration of sunlight helps in producing thicket and short sugarcane. Warm long days produce plants with more tillers, juice and high sucrose contents (FDAE, 2019).

Sampling Procedure and Sample Size

The major actors considered in this study are the sugarcane marketers in North Central Nigeria. In addition to the major actors, information's were obtained from service providers like International Sugar Organization (ISO), National Sugar Development Council (NSDC), Federal Ministry of Industry, Trade and Investment (FMITI), Federal Ministry of Agriculture and Rural Development (FMARD) Agricultural Development Projects (ADPs) and Research Institutes. A reconnaissance survey was conducted in North central Nigeria to ascertain the population of each sugarcane producers and marketers as obtained from Kogi, Kwara, Nasarawa and Niger states Agricultural Development Projects (ADPs) respectively. This study employed a multi-stage sampling approach. The first stage involved the purposive selection of four states viz: Kogi, Kwara, Nasarawa and Niger which are predominantly engaged in sugarcane production in north central Nigeria. In the second stage, three local governments each from the states were purposively selected based on the preponderance of

sugarcane production and marketing in those local governments making a total of twelve (12) LGAs. The third stage involved random selection of two hundred and thirty five (235) sugarcane marketers from a total of five hundred and seventy five (575) sample frame of marketers using the Taro Yamane formula adopted by Sani and Oladimeji (2017) with assumption of 5% expected margins of error, 95% confidence interval and applying the finite population correction factor was determined. The formula was expressed as;

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

$$Where, n = Sample\ size\ N = Total\ population\ of\ study\ 1 = Constant\ e = limit\ of\ tolerable\ error, for\ this\ study\ (0.05)$$

$$\frac{575}{1+575(0.0025)} = \frac{575}{2.44} = n = 235\ \frac{235}{575} \times 100 = 41\%$$

Table 1: Population and sample size of sugarcane Producers and Marketers

State	LGAs	Marketers SF	Marketers SS (41%)
Kogi	Bassa	63	26
	Dekina	44	18
	Koton/Karfe	39	16
Kwara	Edu	42	17
	Patigi	52	21
	Moro	54	22
Nasarawa	Awe	62	25
	Lafia	59	24
	Obi	34	47
Niger	Mokwa	33	14
	Gbako	47	19
	Edati	33	14
Total		575	235

Source: Kogi, Kwara, Nasarawa and Niger State Agricultural Development Project (ADP), 2022.

Data Analytical Techniques:

Gini Coefficient, Lorenz curve and marketing Margin (MM)

Gini Coefficient was used to analyze the structure of sugarcane market. The Gini Co-efficient according to Okereke and Anthonia (1988) gives indication about competitiveness of the market. A low Gini Coefficient indicate more equal incomes/wealth or market distribution, while a high Gini Coefficient indicates more unequal distribution. (Zero) (0) corresponds to perfect equality and 1 (one) corresponds to perfect inequality (Wikipedia, 2009). Gini Co-efficient model according to (Ihenacho, 2005) can be specified as follows

$$G\,C\ =\ 1\ -\ \sum (X\,Y) \quad (2)$$

Where, G C = Gini coefficient, X = proportion of sellers, Y = cumulative/percentage proportion of sales, and

$\sum$ = summation sign

Marketing margin was adopted to analyse the market conduct while marketing efficiency model was used to analyse the performance of the market. Marketing margin according to Olukosi and Isitor, (1990) refers to the difference in prices paid for a commodity at different stages of the marketing system. It represents difference in price of a given commodity as it passes through different stages of market channel before it gets to ultimate consumer.

The model is specified as follows:-

$$MM = \frac{SP - PP}{SP} \times 100 \quad (3)$$

Where

MM = marketing margin, SP = Selling price (retail price of sugarcane), PP = Purchase price

While marketing efficiency on the other hand is the maximization of the ratio of output to input in marketing. Thus, marketing inputs according to Olukosi and Isitor, (2007) are the cost of providing marketing services. Whereas the market outputs are the benefits or satisfaction created or value added to the commodity as it passes through the marketing system.

Marketing efficiency model is specified as follows:

$$ME = \frac{TSR}{TMC} \times 100 \quad (4)$$

Where , ME = Marketing efficiency, TSR = Total Sales Revenue, TMC = Total Marketing Cost

RESULT AND DISCUSSION

Gini coefficient to measure the variability and the distribution of income amongst sugarcane market participants

Market structure is basically a measure of the degree of competition in a particular market and one of the ways to measure the structure of the market is the use of Gini coefficient. The Gini coefficient measure inequality in the income of different population and is used to compare income distribution across different population sectors. Another importance of the Gini coefficient is that it can be used to indicate how the distribution of income has changed within a given area. When the Lorenz curve is plotted the Gini coefficient is simply calculated as the ratio of the area between the Lorenz curve and the perfect distribution (45 degrees) and the total area below the 45-degree line. The Gini coefficient measures the equality among the values of variable. The higher the value of an index, the more dispersed is the data. Alternatively, the Gini coefficient can also be calculated as the half of the relative mean absolute difference. The point of interest here is to find out the variability of sugarcane marketers in the distribution pattern. Though there was high income inequality and level of concentration in rural buyers (0.63) than the wholesalers (0.61), retailing (0.72) and producers (0.68). The Gini co-efficient ranges from 0 to 1. The closer the value is to unity, the greater is the degree of income inequality and the higher is the level of concentration of sellers and vice versa. These results are in line with the findings of Rueben and Mshelia (2011) on Structural Analysis of Yam Markets in Southern part of Taraba State, Nigeria and that of Ada Okungbowa (1998) on the Market Structure, Conduct and Performance for Yam in Ondo State, Nigeria

Table 1: Gini-coefficient for sugarcane marketers (Farmers) in North Central Nigeria

Qty Sold/Month (Kg)	Freq	% of SC Marketers (X)	Cum. % of SC Farmers'	Total value of monthly sales (₦)	% of total sales	Cum. % of total sales (Y)	∑XY
≤30000	27	0.21	0.21	100000	0.03	0.03	0.0063
30001-40000	21	0.17	0.38	200000	0.06	0.09	0.0153
41001-50000	23	0.18	0.56	300000	0.08	0.17	0.0306
51001-60000	11	0.09	0.65	400000	0.11	0.28	0.0252
61001-70000	10	0.08	0.73	500000	0.14	0.42	0.0336
71001-80000	13	0.10	0.83	600000	0.17	0.59	0.0590
81001-90000	12	0.10	0.93	700000	0.19	0.78	0.0780
>90000	9	0.07	1.00	800000	0.22	1.00	0.0700
Total	126	1.00		3600000	1.00		0.3180

Source: Field Survey, 2022

Mean value of farmers monthly sales = N28, 571.43
GC = 1 - ΣXY
1 – 0.3180
GC = **0.68**

This result reveals that the market is an imperfect market. This finding is in agreement with Ndanitsa, Mohammed and Ndako (2017) who reported imperfect market in their work on analysis of marketing structure and net margin of fresh mango fruits in Minna Metropolis of Niger State, Nigeria and that of Apata (2003) who in the analysis of vegetable market in Ibadan Metropolis, Oyo State, Nigeria also reported imperfect competition in the market.

Table 2: Gini-coefficient for sugarcane marketers (Rural buyers)

Qty Sold/Month (Kg)	Freq	% of SC Marketers (X)	Cum. % of SC Marketers'	Total value of monthly sales (₦)	% of total sales	Cum. % of total sales (Y)	∑XY
≤30000	7	0.20	0.20	78000	0.03	0.03	0.0060
30001-40000	4	0.11	0.31	120000	0.04	0.07	0.0077
41001-50000	3	0.08	0.39	148000	0.05	0.12	0.0096
51001-60000	4	0.11	0.50	365000	0.12	0.28	0.0308
61001-70000	5	0.14	0.64	420000	0.14	0.38	0.0532
71001-80000	5	0.14	0.78	510000	0.17	0.55	0.0770
81001-90000	5	0.14	0.92	655000	0.22	0.77	0.1078
>90000	3	0.08	1.00	680000	0.23	1.00	0.0800
Total	36	1.00		2976000	1.00		0.3721

Source: Field Survey, 2022
Mean value of rural buyers monthly sales = N82, 666.67
GC = 1 - ΣXY
1 – 0.3721
GC = **0.63**

This variability may be as the result of the collusive practices in buying and selling as well as the differences in the degree of risk involved in sourcing for supplies by the different categories of the marketers. The values are evidence of high inequality and high concentration level in the markets, and that the markets were operating at an inefficient level.

Table 3: Gini-coefficient for sugarcane marketers (Wholesalers)

Qty Sold/Month (Kg)	Freq	% of SC Farmers (X)	Cum. % of SC Farmers'	Total value of monthly sales (₦)	% of total sales	Cum. % of total sales (Y)	∑XY
≤30000	2	0.11	0.11	80000	0.03	0.03	0.0033
30001-40000	3	0.17	0.28	100000	0.03	0.06	0.0102
40001-50000	1	0.06	0.34	158000	0.05	0.11	0.0066
50001-60000	3	0.17	0.51	360000	0.11	0.22	0.0374
60001-70000	3	0.17	0.68	450000	0.14	0.36	0.0612
70001-80000	1	0.05	0.73	550000	0.17	0.53	0.0265
80001-90000	2	0.11	0.84	685500	0.22	0.75	0.0825
>90000	3	0.16	1.00	800000	0.25	1.00	0.16
Total	18	1.00		3183500	1.00		0.3877

Source: Field Survey, 2022

Mean value of wholesalers monthly sales = N176, 861.11
GC = 1 - ΣXY
1 – 0.3877
GC = **0.61**
This finding is consistent with the study conducted by Ojo, Ojo, Tsado and Usman (2015) titled Marketing efficiency of rice in Kwara State, Nigeria: a structure-conduct-performance model approach with a gini-coefficient of 0.71. The elements of market structure include the number and size distribution of products, entry conditions, and extent of differentiation.

Table 4: Gini-coefficient for sugarcane marketers (Retailers) in north central Nigeria

Qty Sold/Month (Kg)	Freq	% of SC Farmers (X)	Cum. % of SC Farmers'	Total value of monthly sales (₦)	% of total sales	Cum. % of total sales (Y)	∑XY
≤1000	14	0.25	0.25	12500	0.03	0.03	0.0075
1001-2000	11	0.20	0.45	25000	0.06	0.09	0.0180
2001-3000	9	0.16	0.61	37500	0.08	0.17	0.0272
3001-4000	6	0.11	0.72	50000	0.11	0.28	0.0308
4001-5000	3	0.06	0.78	62500	0.14	0.42	0.0252
5001-6000	5	0.09	0.87	75000	0.17	0.59	0.0531
6001-7000	4	0.07	0.94	87500	0.19	0.78	0.0546
>7000	3	0.06	1.00	100000	0.22	1.00	0.0600
Total	55	1.00		450000	1.00		0.2764

Source: Field Survey, 2022

Mean value of retailers monthly sales = N8, 181.82
GC = 1 - ΣXY
1 – 0.2764
GC = **0.72**

Lorenz curve showing the cumulative percentage of income of marketers as against the cumulative percentage of total sugarcane sales

The graphical representation of gini coefficient for farmers, rural buyers, wholesalers and retailers within the study markets are depicted in figure 1. The diagonal connecting points of (0, 0) and (1, 1) on the graph depicts the 45^0 line or line of perfect equality. The graph showed the cumulative percentage of sugarcane marketers against the cumulative percentage (%) of sugarcane total sales. The graphs also confirmed the highest point where 78% amongst retailer's controls 94% of sugarcane sales, 78% amongst farmers' control 93% of total sugarcane sales and 77% of rural buyers control 92% of total sugarcane sales while 75% of wholesalers control 84% of total sale per month respectively. But generally there is no greater variability in income distribution among all the four categories of marketers. All the points indicating the cumulative percentage of marketers as against the cumulative percentage of total sugarcane sales were uniformly distributed, that is, they are not far from the 45^0 line or line of perfect equality, therefore there is no greeter divergence between the diagonal and the Lorenz curve. This implies that all the points showing the level of income distribution amongst farmers, rural buyers, wholesalers and retailers are nearer to the line of perfect equality. These tend to suggest fair competition among the marketers and an indication of income inequality as the lines does not lies on the diagonal. This study agrees with the findings of Thabbal *et al* (2023) who reported inequality in income distribution among the both out-growers and non out-growers farmers in savannah Sugar Company, Adamawa state, Nigeria.

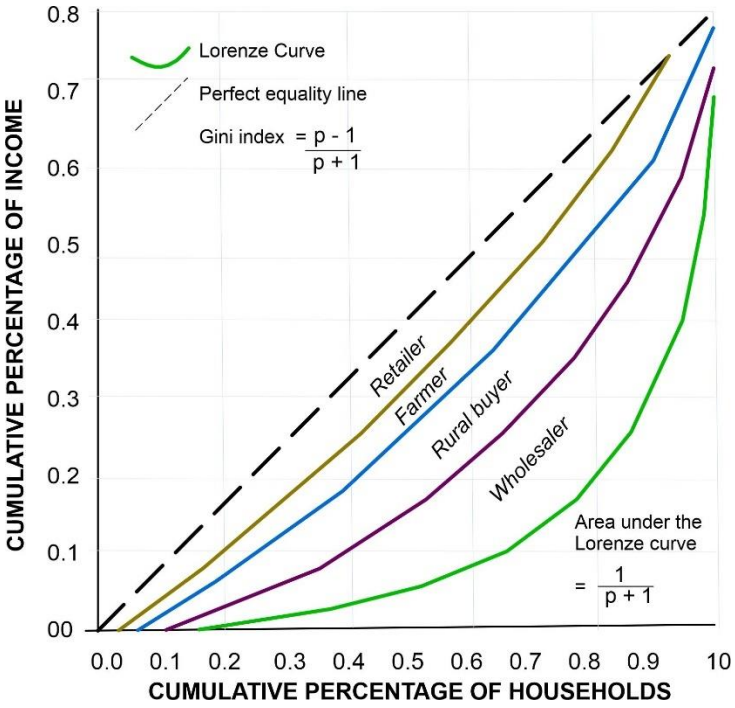

Fig. 1: Lorenz curve showing the cumulative percentage of income of marketers as against the cumulative percentage of total sugarcane sales by households

Market Conduct Analysis

Table 5 reveals that 46.38% of marketers attributed their pricing behaviour to market cost and margins, 30.64% to demand and supply forces and 22.98% to negotiation practices. These findings highlight buyers effective bargaining in price determination and the impact of marketing conduct on price outcomes. This finding is in line with that of Ojo, *et al* (2015) in their work of marketing efficiency of rice in Kwara State, Nigeria: a structure-conduct -performance model approach where they discovered 90% of the marketers indicated that their pricing behavior was determined by marketing cost and margin, while 87% indicated forces of demand and supply, and 67% indicated higgle and haggle. The result on the marketers' conduct was the evidence of buyers' ability to bargain well in price determination, and an incidence of price discrimination.

Table 5: Determinants of pricing behaviour by sugarcane marketers

Factors	Frequency	Percentage
Factors of demand and supply	72	30.64
Price bargaining (higgle and haggle)	54	22.98
Marketing cost and margin	109	46.38
TOATAL	235	100

Source: Field survey, 2022

Market performance assessment of sugarcane

Marketing margin and profitability ratios were used to determine the performance of sugarcane marketers in the study area. The cost of sugarcane purchase for wholesalers in the study area was ₦70/kg (Table 6) which was the highest share of the total cost while storage cost was ₦0.58/kg. Rural buyers' transport cost was ₦0.62/kg and the cost of sugarcane was ₦65/kg. Retailers in the study area also had the highest cost of sugarcane of ₦120/kg and highest transportation cost of ₦1.34/kg compared to wholesalers' transportation cost of ₦0.67/kg enjoying economic of scale. The operating costs for wholesalers aside cost of sugarcane was low (₦3.21/kg) when compared to farmers, rural buyers and retailers. The net margin accruing to a seller/kg was ₦20.21, ₦34.06, ₦37.11 and ₦57.54 for farmers, rural buyers, wholesalers and retailers, respectively. The profitability ratios were 0.34, 0.49, 0.50 and 0.43 for farmers, rural buyers, wholesalers and

retailers, respectively. The financial efficiency ratios were 1.34, 1.49, 1.50 and 1.43 by the different categories of marketers. In analyzing the performance of the wholesalers, storage cost was small in comparison with other variable costs, this can encourage arbitraging by evening out supplies through space and time such that sugarcane is stored with minimum cost against scarcity. The low operating cost for wholesalers is an indication that they enjoyed economies of scale. Considering the profitability ratio of 0.34, 0.49, 0.50 and 0.43 for farmers, rural buyers, wholesalers and retailers, respectively, implies that for every ₦1 invested in sugarcane marketing, 1.34k, 1.49k 1.50k and 1.43k were realized as profit by market participants, respectively. The profitability ratios for all the category of marketers was a confirmation that sugarcane marketing was a profitable business in the study area. The financial efficiency ratio showed that all the marketers were financially efficient. This result is supported by a study carried out by Ademola, (2017) which revealed that the average return on investment was 1.14 and 1.85 implies that for every ₦1 invested in sugarcane marketing under rain-fed and irrigated farming system, 1.14 kobo and 1.85 was realized by the marketers.

Table 6: Market performance assessment of sugarcane

	Category of Marketers							
Items	**Farmer (n=126)**		**Rural buyer (n=36)**		**Wholesaler (n=18)**		**Retailer (n=55)**	
	Amount (₦)/kg/sale	% of Total cost	Amount (₦)/kg/sale	% of Total cost	Amount (₦)/kg/sale	% of Total cost	Amount (₦)/kg/sale	% of Total cost
Variable costs								
Cost of sugarcane	50	83.63	65	92.94	70	93.47	120	89.25
Cost of transportation	1.49	2.49	0.62	0.89	0.67	0.89	1.34	0.99
Labour cost	2.73	4.57	1.23	1.76	1.57	2.09	2.89	2.15
Storage cost	0.52	0.87	0.25	0.36	0.58	0.77	1.73	1.29
Loading and off-loading cost	0.63	1.05	0.45	0.64	0.35	0.47	1.32	0.98
Miscellaneous	0.99	1.66	0.78	1.12	0.39	0.52	2.51	1.87
Total Variable cost	**56.36**	**94.26**	**68.33**	**97.70**	**73.56**	**98.22**	**129.79**	**96.53**
Fixed cost								
Sales tools (Tie rope/wheel)	2.86	4.78	1.34	1.92	0.98	1.31	3.87	2.88
Depreciation	0.57	0.94	0.27	0.39	0.35	0.47	0.80	0.59
Total Fixed cost	**3.43**	**5.74**	**1.61**	**2.30**	**1.33**	**1.78**	**4.67**	**3.47**
Total cost (TVC+TFC)	**59.79**	**100**	**69.94**	**100**	**74.89**	**100**	**134.46**	**100**
Returns (P*Q)	**80.00**		**104**		**112**		**192**	
Net income (TR-TC)	**20.21**		**34.06**		**37.11**		**57.54**	
Profitability Ratio TR/TC	**0.34**		**0.49**		**0.50**		**0.43**	
Efficiency Ratio	**1.34**		**1.49**		**1.50**		**1.43**	

Source: Field survey, 2023

Sensitivity analysis of the performance of the marketers

In linear programming problem shadow prices help in understanding the impact of changes in constraints on the objective function value, while allowable increase and allowable decrease provide bounds on how much those constraints can change without altering the current optimal solution. The sensitivity report of the cost and return of the marketers in table 7 reveals that the rural buyers can increase their profit to ₦2 if they can reduce their transportation cost by 45k per kg. This additional profit have the potential to increase up to ₦4.02k/kg without altering the optimal solution. The wholesalers on the other hand can increase their profit to ₦2.1k if they can reduce their cost of storage by ₦32. Therefore, the rural buyers and wholesalers have the prospect to reduce their cost of marketing by ₦24.74k and ₦16.58k respectively to maximize profit.

Table 7: Cost and Return shadow Price

Actors	Final Value	Reduced Cost	Objective Coefficient	Allowable Increase	Allowable Decrease
Farmers	0.3435	0	23.64	45.53	4.94
Rural buyers	0	24.74	35.67	Infinity	24.74
Wholesalers	0	16.58	38.44	Infinity	16.58
Retailers	1.1106	0	62.21	16.44	40.95
Constraints Activities	Final Value	Shadow Price	Constraints R.H. Side	Allowable Increase	Allowable Decrease
Cost of Sugarcane ₦/kg	150.45	0	150	0.45	Infinity
Cost of Transport	2	4.54	2	4.02	0.04
Labour cost	4.15	0	4	0.15	1E+30
Storage cost	2.1	32.44	2.1	0.48	0.0076
Loading and Offloading	1.68	0	1.56	0.12	1E+30
Miscellaneous	3.13	0	2.89	0.24	1E+30
Sales of tools	5.28	0	2.93	2.35	1E+30
Depreciation	1.08	0	1.03	0.05	1E+30

Source: Cost and Return Sensitive Report 2023

CONCLUSION AND RECOMMENDATIONS

The study concluded that sugarcane marketing is profitable in north central Nigeria. However, the income inequality can creates a competitive environment among marketers to strive to maximize their profits and increased economic efficiency within the market. It was suggested that the marketers can increase their profit by reducing the marketing cost particularly the cost of transportation and storage. The imperfect markets offer advantages for higher profits for sugarcane business with market power, and flexibility in pricing strategies and encourage resource allocation based on consumer preferences.

REFERENCES

Abdulrahman, S. (2020). *Analysis of Jatropha (Jatropha curcas) value chain in Nigeria*. A thesis submitted to the school of postgraduate studies, Ahmadu Bello University, Zaria, for the award of Doctor of Philosophy Degree in Agricultural Economics.

Ada-Okungbowa, C. I. (1988). The market structure, conduct and performance for yam in Ondo state, Nigeria. Nigeria Agro search. *Africa journals online* 4(2): 12-20

Ademola T. H. (2017). Assessment of Rain-fed and Irrigated farming systems of Sugarcane Production in Bauchi state, Nigeria. Unpublished M.Tech. Thesis, Department of Agricultural Extension and Rural Sociology, Federal University of Technology Minna.

Aina, O. S., Ajijola S., Ibrahim I., Musa I. A. and Bappah T. M. (2015). Economics analysis of sugarcane (*Saccharum officinarum)* production in Moro Local Government Area of Kwara State, Nigeria. *International Research Journal of Plant Science.* 6(1) 1-6.

Amita, P. and Sudip, D. (2020). Prospects and challenges of sugarcane Development in Nepal: Production, Market and Policy. *America Journal of Agriculture and Biological Science 15(1):98-106 Doi:10.3844/ajabssp.2020.98.106*.

Apata, O. M. and Apata, T. G. (2003). Marketing of citrus fruits (sweet orange) in some selected markets in Ibadan metropolis. Book of Proceedings of 21st Annual conference, HORTSON 180-185

CBN, (2020). Annual Statistical Bulletin- Central Bank of Nigeria. www.cbn.gov.ng

CBN, (2019). Annual Statistical Bulletin- Central Bank of Nigeria. www.cbn.gov.ng

Darika, B., Ruchuon W. and Goitseone M. (2021). Evaluation 16 elite sugarcane lines for ethanol yield and yield related traits under rainfed conditions. *Australia Journal of Crop Science* 15(07): 1020-1028.

FAO, (2020). Food and Agricultural Organisation Annual Report. http://www.fao.org/faostat/en/#data

FMARD, (2021). Federal Ministry of Agriculture and Rural Development Annual Report. www.fmard.gov.ng accessed 25th June, 2021.

Issa, F. O., Kagbu, J. H., Sunusi, S. and Oba A. I. (2020). Profitability Analysis of Sugarcane Production in Makarfi Local Government Area of Kaduna State, Nigeria. *Journal of Applied Agricultural Research,* 8(1): 12-23

ISO, (2021) International Sugar Organisation statistical bulletin www.isosugar.org accessed 11/09/2021

ISO, (2020) International Sugar Organisation statistical bulletin www.isosugar.org accessed 11/09/2021.

NBS, (2020). National Bureau of Statistics. Federal Republic of Nigeria 2006 census. Official Gazette www.nigeriastat.gov.ng

Ndanitsa, M. A., Mohammed, T. and Ndako, N. (2017). Analysis of marketing structure and net margin of fresh mango fruits in Minna metropolis of Niger state, Nigeria. *Journal of Agriculture and Agricultural technology* 8(1): 37-43

Ojo, A. O., Ojo, M. A., Tsado J. H. and Usman R. K. (2015). Marketing efficiency of rice in Kwara State, Nigeria: a structure-conduct -performance model approach. *Journal of Agriculture and Rural Development* 15(1): 48-60

Omotesho, O. A., Muhammad-Lawal A., Olatinwo K. B., Adenuga, A. H. and Bello A .J (2013). Technical efficiency of sugarcane saccharum officinarum production in Niger state, Nigeria. *Journal of Agriculture, forestry and the social sciences* 11(1): 13-15

Oni, T. O. (2016). Economic analysis of profitability and competitiveness of sugarcane enterprise in Nigeria *Journal of Development and Agricultural Economics* 8(6): 160-171.

Sulaiman, M., (2015). Economic Analysis of Sugarcane Production and its contribution to farm income of farmers in Maigana Agricultural zone of Kaduna state, Nigeria. Unpubilished MSc. Thesis, Department of Agricultural Economics and Rural Sociology, Ahmadu Bello University, Zaria

Thabbal, M.L., Ezra, A., Joel, E.1 and Bashir, A.1 (2023). Effects of Sugarcane out- growers' scheme on the livelihood of farmers in Savannah Sugar Company, Adamawa State, Nigeria *Ethiopian Journal of Environmental Studies and Management* 16(1): 17 – 30.

WB, (2021). World Bank. International Bank for Reconstruction and Development Report and International Development Association. www.worldbank.org accessed 04/02/2022.

World meter, (2022). Real time world statistics. https://www.worldometers.inf