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Profitability of Sweet Potato (*Ipeoma batatas*) Marketing in Toro Local Government Area of Bauchi State, Nigeria

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ABSTRACT: Sweet potato [*Ipomoea batatas*(L.) Lam.] plays a significant role in ensuring food security and incomes for local communities, Hence, the objective of this paper was to assess the Profitability of Sweet Potato (*Ipeoma batatas*) Marketing in Toro Local Government Area of Bauchi State, Nigeria using 116 respondents from the three markets studied (Magama-Gumau, Tilde-Fulani, and Toro) using structured questionnaires. The findings of the study revealed that sweet potato marketing was profitable with a gross margin of N67.14/kg and a return on investment of 17 kobo for every Naira invested. The marketing efficiency was 86%. Five factors were found to be statistically significant in affecting sweet potato profitability. The quality of product, selling price, storage costs, and years of experience were positive and statistically significant ($p<0.01$). The cost of purchasing sweet potato was negative and statistically significant ($p<0.05$). Inadequate and high cost of burrowing was ranked first among the eight challenges of sweet potato marketing in the area. The study recommended among others that, the government and lending institutions should develop more policies and conditions that are burrower-friendly to enable marketers easily access marketing credit.

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Sweet potato [*Ipomoea batatas* (L.) Lam] is an important root crop that is grown traditionally by small-scale farmers mainly for household consumption. It ranks as the seventh most important food crop in the world after wheat, rice, maize, potato, barley, and cassava with a global annual production of over 133 million tons (Balarabe *et al*., 2022). Nigeria is the largest producer of sweet potato in Sub-Saharan Africa with annual production estimated at 3.9 million tons (Onubogu *et al*., 2022; Olayinka 2016). Sweet potato has potentials for increasing food production, food security and income in Nigeria like other agricultural crops. Various parts of the leaves are utilized. The leaves and roots of sweet potato are consumed by humans as well as used as animal feed. It can be industrially used to substitute wheat flour in bread marking or maize flour in balance diet. It is also used in brewing of alcoholic drinks and non-alcoholic drinks in the brewing Industries. Sweet potato is an antioxidant which prevents inflammatory diseases (such as asthma, arthritis, and gout). Sweet potato is healthy for the digestive tract. Sweet potato is rich in vitamin A, and a source of fiber, potassium and many other nutrients. It has gained prominence due to its

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ability to adapt to wide production ecologies and yield response to minimal external inputs (Balarabe *et al*., 2022; Isibor *et al*., 2021; Adeyonu *et al*., 2019). Consequently, the objective of this paper is to assess the Profitability of Sweet Potato (*Ipeoma batatas*) Marketing in Toro Local Government Area of Bauchi State, Nigeria.

MATERIALS AND METHODS

Study Area: The study was carried out in Toro Local Government Area of Bauchi State, Nigeria which has its headquarters at Toro. The local Government has three districts namely Toro, Jama'a and Lame district. It has shares boundary with Plateau, Kaduna, and Kano States. The local government is the largest in Nigeria and West Africa. It has an area of 6,9322km^2 and a population of 346,000 as at the 2006 population census which was projected to be 631,236 by 2023, based on a growth rate of 3.6% (NPC, 2006). It has an average temperature of 32^{o}C. Most of the people in the study area are farmers growing food crops such as maize, guinea corn, rice, sweet potatoes, and cassava. They also produce vegetables such as tomatoes and onions. Similarly, they engaged in livestock production such as cattle, sheep and goats (Bose *et al*., 2020).

Sampling Technique and Sample Size: The multi-stage sampling technique was adopted in selecting respondents for the study. First, purposive sampling technique was used to selecting three (3) sweet potato markets in Toro Local Government Area namely Magama-Gumau, Tilden Fulani, and Toro because they have the highest supply of sweet potato. Secondly, from a population of 115 and 217 sweet potato wholesalers and retailers respectively, 40 wholesalers and 76 retailers (which aggregated to 116 marketers representing 35%) were selected using simple random sampling from the three markets respectively.

Data Collection Instrument: The study used primary data collected in August, 2024 through the use of a structured questionnaire to obtain pertinent information on sweet potato marketing from the selected three sweet potato markets. Data gathered covered both socioeconomic characteristics like: age, education, and location of the market. Other sections of the questionnaire captured marketing data such as: business operation capital, number of workers, annual income, income level, expenditures, nature or types of sweet potato marketed, frequency of supplies, costs and sales data.

Data Analysis: Data was analyzed using descriptive and inferential statistics. Gross margin analysis, and rate of return on investment were used to determine profitability while and the Shepherd-Futrel model were applied to measure efficiency (pursuant to meeting Objective i). Multiple linear regression analysis was used to analyze the factors affecting profitability of sweet potato marketing (Objective ii). Descriptive statistics were used to analyze the sweet potato marketing constraints (Objective iii). The statistical package of social sciences (SPSS) version 22 was used for the data analysis.

Gross margin (GM) analysis: Applied to marketing, the gross marketing margin is one of the measures of profitability which is essentially difference between the observed gross marketing income (GMI) and total variable cost (TVC) of marketing. It is usually applied when the fixed cost component is considered a small component of the total cost of production (Isibor *et al*., 2021; Olukosi and Erhabor, 2005) as represented by equation 1.

$$GM = GI - TVC \quad \ldots (1)$$

Where; GM = Gross margin; GI = Gross income; TVC = Total variable cost (e.g. cost of buying sweet potato, transport, rent, tax, levies e.t.c).

Gross margin of sweet potato marketing was therefore applied to reflect the cost involved in moving the product from the point of production to the point of consumption and profits of the various marketing functionaries involved in moving the produce from the point of production to consumer. The gross margin was applied to achieve Objective i of the study.

Rate of return on investment (RORI): The Rate of Return on Investment (RORI) portrays the extent of profitability of an entreprise and is an important consideration in the choice of investment. In this context, it was used to assess the returns to retailers and wholesalers involved in the marketing of sweet potato. The RORI model adopted by Babatunde *et al*. (2020) and Sambe *et al*. (2016) expressed by equation 2 was adopted:

$$\text{RORI} = \frac{TR-TC}{TC} * \frac{100}{1} \ldots (2)$$

Where, TR= Total revenue (of sweet potato); TC = Total cost

Market efficiency: The Shepherd-Futrel model was used to estimate the coefficient of marketing efficiency in line with the work of Isibor *et al.* (2021). The model, (equation 3) expresses marketing efficiency as the ratio of total cost to total revenue

expressed as percentage. The lower percentage, the better the marketing efficiency, meaning that less proportion of the revenue is expended on total cost of marketing by the intermediaries.

$$M.E = \frac{TC}{TR} = \frac{100}{1} \ldots (3)$$

Where; ME = Marketing efficiency (of sweet potato); TC = Total cost; TR = Total revenue

Multiple Linear Regression: This tool was used to measure the determinants of the profitability of sweet potato marketing in three markets where the study was conducted. The model was applied to determine the effect of the independent variables on the dependent variable (which is profitability of sweet tomato marketing).The model used for the analysis was of the following explicit form given by equation 4.

$$PSPm = \beta 0 + \beta 1X1 + \beta 2X2 + \beta 3X3 + \beta 4X4 + \beta 5X5 + \beta 6X6 + \beta 7X7 + \mu \quad (4)$$

Where, PSP_m = Profitability of sweet potato marketing; β_0 = Constant; β_{1-6} = Coefficient of independent variables (or factors) 1-7; X_1 = Secondary occupation (dummy); X_2 = Experience in sweet potato marketing (years); X_3 = Quality of sweet potatoes (Very low =1; low=2, moderate = 3; high =4; very high = 5); X_4 = Purchase price (₦); X_5 = Storage cost (₦); X_6 = Selling price (₦); X_7 = Transport costs (₦); μ = Error term;

RESULTS AND DISCUSSION

Profitability of Sweet Potato Marketing: Profitability is crucial for all stake-holders in the marketing process. Incidences of continuous losses can have long-term implications such as abandonment of the marketing of the product by the middlemen for more profitable ones, disincentive to farmers to produce more which also impacts on other participants in the value-chain. The results (Table 1) showed that the average gross margin (GM) of sweet potato was N56, 400.00 or N67.14 for every kilogram sold. The rate of return on investment was 117%, meaning that the marketers made a profit 17kobo for every Naira invested. This was lower than the 18kobo found by Balarabe *et al*. (2022).

Sweet Potato Marketing Efficiency: Marketing efficiency essentially reflects market performance indicated via a ratio of the relationship between gross income and costs (Ocholi *et al*., 2017). This study (Table 2) found that sweet potato marketers were operating at 85.52% efficiency meaning that their marketing costs were below their gross income. This was in tandem with the findings of Balarabe *et al*. (2022) who also found 85% but much higher than the 56% reported by Isibor *et al.* (2021).

Table 1: Cost and Returns of Sweet Potato Marketing

Variable	Average Monthly Value	Value/Kg
Gross income – GI (₦)	276,000.00	328.57
Variable Costs (₦)		
Cost of sweet potatoes	180,000.00	214.29
Commission payments	12,000.00	14.29
Labour	9,600.00	11.43
Transport	18,000.00	21.43
Storage	15,000.00	17.86
Taxes/levies	1,440.00	1.71
Total variable cost –TVC	236,040.00	281.00
Gross Margin – GM (₦)	39,9600.00	47.57
Rate of return on investment –RORI (%)	117	117

Source: Field Survey (2024)

Table 2: Marketing Efficiency of Sweet Potato

Variable	Monthly Average	Value/Kg
Gross Income (₦)	276,000.00	328.57
Total variable cost TVC (₦)	236,040.00	261.43
Marketing Efficiency (%)	85.52	85.52

Source: Field Survey (2024)

Factors Affecting Profitability of Sweet Potato Marketing: The regression analysis (Table 3) revealed that the effects of the seven factors affecting the profitability of sweet potato marketing had an F-value of 10.62 which was statistically significant ($p<0.01$). The r^2-adjusted value was 0.46 meaning that 46% of the variability in sweet potato marketing in the area was explained by the factors included in the regression model.Four factors (cost of quality, selling price, storage costs, and years of experience) were positive and statistically significant at 1% significance level. The finding on the positive effect of marketing experience was similar to the finding by Gani *et al*. (2020) which also agrees with theoretical expectations. But the effects of the storage and selling costs were contrary to expectations. However, purchase price was negative and significant at 5% meaning that an increase in purchase price reduces the profit of the marketer.

Challenges of Sweet Potato Marketing: The respondents ranked inadequate and high cost of finance or borrowing first as their most pressing challenge followed by taxes and levies (Table 4) this may be the reason why majority (51%) of them relied on their savings to finance their business (Table 3). Although the finding of this study is similar to that of Nabay *et al*. (2020) who also reported inadequate finance as the topmost challenge, with varies with that of Ocholi *et al*. (2017) who found inadequate storage facilities and lack of standard or uniform

measurement/weights as the first and second respectively in the ranking of marketing challenges.

Table 3: Determinants of Profitability of Sweet Potato Marketing

Factors	Coeff.	Std Error	t-Ratio	p-Value
Constant (a)	0.260	0.734	1.812	0.074*
Occupation (x_1)	0.122	0.761	1.591	0.116
Years of exp (x_2)	0.065	0.105	2.811	0.006***
Quality of S/potato (x_3)	0.921	0.753	2.550	0.013***
Purchase price (x_4)	-0.533	0.865	-1.998	0.050**
Cost of storage (x_5)	0.588	0.075	2.776	0.007***
Selling price (x_6)	0.320	0.051	6.291	0.000***
Transport cost (x_7)	0.638	0.899	0.710	0.480
F-value	**10.616*** **			
R^2	**0.511**			
R^2-Adj.	**0.463**			

*Note: Significance levels; * = 10%; ** = 5%; and *** = 1%*
Source: Field Survey (2024)

Table 4: Sweet Potato Marketing Challenges

Challenge	Mean Score	Rank
Inadequate/high cost of finance	3.61	1
Taxes/levies	3.47	2
Inadequate/poor market infrastructure	3.41	3
Inadequate storage facilities	3.39	4
Inadequate market information	3.36	5
Insecurity challenges	3.32	6
Poor road condition	3.20	7
High cost of transportation	2.99	8

Source: Field Survey (2024)

Conclusion: Sweet potato marketing in Toro Local Government Area of Bauchi State was profitable and provided a means of livelihood to the retailers, and wholesalers. Sweet potato marketers generally play a vital role in making sure that products are delivered from the farmers or producers to the final consumers in the form, place, and time required. The challenges of sweet potato marketing in the area necessitate that the government and lending institutions should develop more burrower policies and conditions that will make it easier for marketers to burrow towards financing the marketing functions. The problem of high and multiple taxes/levies by the government should be addressed especially as it adds to the cost of products and reduces purchasing power of consumers. The problem of poor road conditions and insecurity especially in the rural areas where sweet potatoes are produced is a serious threat which needs be tackled to safeguard livelihoods and food security in the area.

Declaration of Conflict of Interest: The authors declare that they do not have any conflict of interest.
*Data Availability Statement:*The authors of this research paper in compliance to ethical standards declare that the data of this research are available upon request from the corresponding author.

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