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Gender Analysis of Actors Involved in Production, Processing and Marketing of Sweet Potato in Kwara State, Nigeria

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ABSTRACT

The study examined the gender roles of actors involved in sweet potato production, processing and marketing in Kwara State, Nigeria. A three-stage sampling technique was employed to select a total of 120 respondents. Primary data were collected with the aid of a structured questionnaire. Data analysis was carried out using descriptive statistics, gross and market margin analysis and multiple regression models. The findings revealed that 85% of the producers were males, 83% of the processors were females and there was an equal share of 50% male and female marketers. The gross margin for male and female producers was ₦209,705.90 and ₦115,222.20 respectively. The male and female processors, had a gross profit margin of ₦71,000.00 and ₦52,952.00 respectively. The male and female marketers had a gross profit margin of ₦129,700.00 and ₦130,400.00 respectively. The analysis shows that the male producers and processors have greater gross margin while the female marketer has a higher gross margin than the male making the sweet potato business profitable among all the respondents in the study area. The regression result revealed that for producers, years of experience, credit accessibility, distance covered, and market price significantly affected profit margins. Among processors, years of experience, road accessibility, market price, and consumer preference were significant predictors, while age, government policy, and market price significantly influenced marketers' profit margins. The result further showed that the major constraints faced by male and female actors include land conflict, inadequate vine, inadequate labour, bad roads, low income and cost of farm inputs. The study recommends that provision of good roads and standard vehicles for transportation should be provided to ease market accessibility.

INTRODUCTION

Sweet potato (Ipomoea batatas) is an economically important crop widely cultivated across Nigeria due to its adaptability, early maturity, and high nutritional value. The crop originated from Central America and is now grown globally as a major staple food (More et al., 2019). According to the Food and Agriculture Organization (FAO, 2023), Nigeria is among the largest producers of sweet potato in Sub-Saharan Africa, with an annual production of about 4.03 million tonnes from 1.7 million hectares of land, yielding approximately 2.3 tonnes per hectare. According to El Bilali et al. (2025), Nigeria produced around 4.01 million tonnes of sweet potato, placing it as one of the top global producers after China and

Malawi. Sweet potato serves multiple purposes, it is consumed boiled, fried, or processed into flour, chips, and baked products.

Beyond its contribution to food security, sweet potato provides income opportunities at various stages of production, processing, and marketing. However, gender disparities in participation and profitability persist across these stages in Nigeria (Okoye et al., 2021). Men and women play distinct but complementary roles in sweet potato farming in Nigeria. According to Ajayi et al. (2022), men are more involved in land preparation and input procurement, while women predominantly engage in planting, harvesting, processing, and local marketing activities within sweet potato production systems. Yet, agricultural policies and interventions often fail to recognize the distinct contributions and challenges faced by men and women in the sector (Kandi et al., 2025). Compared to men, women's productivity is particularly hindered by "limited access to land, credit, and extension services" (Ikhide et al., 2021).

Despite several studies on sweet potato production and utilization, there is limited empirical evidence on how gender differences influence participation, access to resources, and profitability among farmers, processors, and marketers particularly in Kwara State. Understanding these gender dynamics is essential for developing inclusive and evidence-based interventions that enhance profitability, productivity and equity. As noted by Adeyonu et al. (2016), "sweet potato serves as a key crop for food security and poverty reduction in Nigeria", yet its full potential cannot be realized without addressing gender-related barriers.

Therefore, this study examined the gender roles of actors involved in the production, processing, and marketing of sweet potato in Kwara State, Nigeria, with specific attention to gender differences in profitability. The specific objectives were to:

i. determine the profitability of male and female producers, processors and marketers of sweet potato.
ii. estimate the factors that influence the profitability of male and female producers, processors and marketers of sweet potato.
iii. assess the constraints faced by the male and female producers, processors and marketers of sweet potato.

METHODOLOGY

Study area

The study was conducted in Kwara State, which lies between latitudes 8° 29' 48N of the equator and longitudes 4° 32' 32E of the Greenwich meridian in North Central Nigeria. It borders Niger State in the north, Kogi State in the east, Oyo, Ekiti, and Osun States in the south, and the Republic of Benin in the west. As of 2023, Nigeria's estimated population is 227,882,945, with "Kwara State covering a land area of approximately 36,825 km²". Given that farmers constitute about 70% of Kwara State's population, this implies that approximately 1,121,000 individuals in the state are engaged in farming activities. This number represents about 0.49% of Nigeria's total population (Worldometer, 2023). The state is made up of 1,530,244 males and 1,502,828 females (NPC, 2015). Its total land area is 3,682,500 hectares consisting of 16 Local Government Areas. Kwara state is predominantly agrarian characterized by extensive arable land and fertile soil. The predominant landscape of Kwara State consists of woodland savanna characterized by a tropical climate with two distinct seasons: the dry seasons, which run from November to March, and the rainy seasons, which run from April to October. Its maximum temperature ranges between 30°C and 35°C, which provides a favorable environment for the cultivation of sweet potato, a crop that thrives under warm conditions. The mean annual rainfall ranges from 800 mm to 1200 mm, creating adequate moisture for sweet potato growth and tuber development (Yahaya & Timothy, 2015). Kwara is one of the least densely populated regions in the country comprising over 185,000 farm families, each with an average of 6 to 7 members.

The combination of suitable temperature, rainfall, and availability of farm labor makes the state conducive for the production of sweet potato, a staple and income-generating crop.

Source of data

Primary data was used in this study which was obtained through the administration of structured questionnaire to the respondents in the selected study area. The questionnaire was structured and designed to collect information on respondents' socio-economic characteristics, including age, gender, level of education, household size, and years of experience. It also captured data on income levels and profitability of producers, processors, and marketers, factors influencing their productivity and profitability, and the challenges they face in the production, processing, and marketing of sweet potato, in order to achieve the objectives of the study.

Sampling technique and sampling size

A three-stage sampling technique was employed to select respondents, taking into account the population density of the study area and the need to target major producers, processors, and marketers of sweet potato. Firstly, three Local Government Areas (Oyun, Isin, and Irepodun LGAs) were purposively selected based on their prominence in sweet potato production. Secondly, two villages known for sweet potato production, processing, and marketing were purposively selected from each LGA, giving a total of six villages. Lastly, 20 respondents were randomly selected from a complete list of sweet potato producers, processors, and marketers in each village, with the assistance of ADP agents, resulting in a total sample size of 120 respondents.

Analytical techniques

Data were analyzed using descriptive and inferential methods. Descriptive statistics were used to summarize respondents' socio-economic characteristics, while gross and market margin analysis determined profitability. Multiple linear regression was applied to estimate factors influencing profitability. Respondents' constraints were assessed using a Likert scale and summarized descriptively.

Descriptive statistics

The socioeconomic characteristics of the actors involved in the production, processing, and marketing of sweet potatoes were described using descriptive methods including mean, median, mode, standard deviation, percentage, and ratios.

Gross and market margin analysis

The profitability of male and female sweet potato producers, processors, and marketers was determined using gross margin and marketing margin analyses. The Gross margin is expressed as;

$GM = TR - TVC$ .....(i)

Profitability = TR-TC .....(ii)

Where;

GM= Gross Margin (₦/ha)

TR= Total Revenue (₦)

TVC= Total Variable Cost (₦)

TC= Total Cost (₦)

The Marketing margin is expressed as;

$MMM(\%) = \frac{SP-CP}{SP} \times 100$ .....(iii)

Where:

MM= Marketing Margin (%)

SP= Selling price per bag (₦)
CP= Cost price per bag (₦)

Regression analysis

Multiple linear regression analysis was employed to identify the factors influencing the profitability and participation of male and female producers, processors, and marketers of sweet potato. A linear functional form was used, as the relationship between the dependent variable (profitability) and the independent variables (socio-economic and binary factors) was assumed to be linear and provided the best fit for the data. The relationship is expressed as:

$Y = f(X_1, X_2, X_3, X_4, - - - - - - X_{11})$ (iv)
$Y = \beta_0 + \beta_n X_n + £$ ……(v)
Where;
Y=Profitability index of sweet potato producers, processors and marketers
β_0 = Intercept (Constant term)
β = Co-efficient of the independent variables
n = 1, 2, 3, 4, 5, 6, …, 11
Ɛ = Error term
B_1-β_{11} = Regression coefficients
X_1 = Years of experience (years)
X_2 = Age (years)
X_3 = Educational level (years of formal schooling)
X_4 = Credit accessibility (0=no, 1=yes)
X_5 = Farm size (hectares)
X_6 = Extension visitation (0=no,1=yes
X_7 = Long distance covered (0=no, 1=yes)
X_8 = Road accessibility (0= no, 1=yes)
X_9 = Government policy (0=no, 1=yes)
X_{10} = Commodity's market price (0=no, 1=yes)
X_{11} = Consumer's preference for the product (0=no, 1=yes)

Likert rating scale technique

The Likert type scale was used to assess the constraints faced by the male and female actors involved in production, processing and marketing of sweet potato in the study areas. The 4-point scale rating was graded as High = 4, Moderate = 3, Low = 2 and Undecided = 1. The mean score of respondents was computed and ranked based on the 4-point rating scale.

RESULTS AND DISCUSSION

Socio-economic characteristics of producers

Table 1 reveals the socio-economic characteristics of sweet potato producers. It shows that male constituted 85%, while females made up 15%. This result aligns with Aboajah and Ekeledo (2024), that majority of sweet potato producers were males, likely due to the labor-intensive nature of production. Majority of the male producers were between the age group of 51 and 60 years old and majority of the female producers are 60 years and above. The male and female producers have mean ages of 50.53 and 53.00 years respectively indicating that both groups were in their productive age and were actively engaged in sweet potato production agreeing with Afuape et al. (2021).

The table also shows that 88.24% of males and 55.56% of females were married showing that married people are more involved in sweet potato production which may positively impact access to family labour.

58.82% and 66.67% of male and female producers respectively have a household size that is less than or equal to 5 and this would have an impact on the availability of farm labour as well. The respondents' average household size was 5.49 persons for males and 5.11 persons for females.

Result shows that 39.22% of the male producers have primary and secondary education while 44.44% of female producers have only secondary education. This supports Ejechi et al. (2020) that female sweet potato farmers in Nigeria are more likely to have formal education. Education enhances the adoption of improved technologies, which boosts productivity.

The result also shows that 88.24% and 88.89% of male and female sweet potato producers have access to credit and 11.76% of them have no access to credit. Access to credit is considered a crucial factor in enhancing farmers' productivity. 76.47% of male and 88.89% of female have access to credit majorly through the cooperative.

Table 1 also shows that extension information was accessed by 74.50% and 77.77% of the male and female producers. This implies that 38 males and 7 females have access to extension information while 13 males and 2 females do not have access to extension information.

94.12% of males and 100.00% of females belong to cooperative societies. 48 out of the 51 male respondents and all the 9 female respondents are members of a cooperative society. These associations facilitate both production and value addition.

Access to grants and loans is the highest cooperative benefit received by the male producers with a value of 41.18% while 44.44% of the female producers receive grants and loans and access market information through the cooperative society. This agrees with the journal by Olagunju et al. (2013) that the greatest benefit a farmer gets from the cooperative society is access to grants and loans.

70.59% of the male producers have between 0.2 to 0.4 hectares of land while 66.67% of the female producers have less than 0.3 hectares of land.

Socio-economic characteristics of processors

Table 1 reveals the socio-economic characteristics of sweet potato processors. It shows that 16.67% of the processors are males while 83.33% are females. This shows that majority of sweet potato processors are female, indicating that sweet potato processing is predominantly carried out by women who are often more involved in post-harvest handling and value addition. This aligns with findings by Adewale (2021), who reported that women play a dominant role in sweet potato processing among farming households in Nigeria. Majority of the male producers are between the age group of 41 to 50 years of age and majority of the female producers are between 31 to 40 years. The mean ages of male and female sweet potato processors are 41.60 years and 41.44 years respectively. This indicated that both groups were in their productive age and were actively engaged in the processing of sweet potato into various products.

Table 1 also shows that 80.00% of male and 84.00% of the female processors were married showing that married people are more involved in sweet potato processing in the study area. Ukeje (2020) reported that married individuals with children often involve them in post-harvest activities, especially when they are of working age. 60.00% of male and 64.00% of female processors have a household size that is less than or equal to 5. The average household size of the respondents was 5.40 persons for males and 4.92 persons for females.

The result shows that 40.00% of the male and 68.00% of female processors have secondary education. This suggests that the processors possess a sufficient level of education, which may enhance their ability to adopt improved processing techniques, manage resources effectively, and make informed marketing decisions, ultimately contributing to higher profitability.

The table also shows that 60.00% of male and 28.00% of female processors have farming as their main occupation. For male processors, 80.00% engage both family and hired labour, while 48.00% of female processors engage only family labour for processing. The result further shows that all male (100.00%) and 72.00% of female sweet potato processors have access to credit, while the remaining 28.00% of female processors do not. Credit is primarily accessed through cooperatives, with a few obtaining it

from banks. Access to credit enables processors to purchase inputs, adopt improved processing techniques, and ultimately enhance profitability. For male processors, 80.00% and 72.00% of female processors belong to cooperative societies. Belonging to a cooperative society enhances production and supports involvement in value addition activities (Agoh et al., 2020). Access to grants and loans is the most common cooperative benefit received, with male processors (40.00%) and female processors (44.00%) reporting this advantage.

Further analysis shows that all (100.00%) of the male processors and 20.00% of the female processors have access to extension information, while 80.00% of female processors do not have access.

Among male processors, 40.00% process sweet potato into flour and chips, and 20.00% boil and fry the potato on a commercial basis. Among female processors, 48.00% process it into chips, 40.00% into flour, 4.00% into both flour and chips, and 8.00% boil and fry the sweet potato.

Socio-economic characteristics of marketers

Table 1 also reveals the socio-economic characteristics of sweet potato marketers. It shows that 50.00% of the marketers are males while 50.00% are females. This shows that there is an even distribution of the male and female marketers. The majority of male marketers were between 31 and 40 years of age, while most female marketers were between 51 and 60 years. Their respective mean ages were 47.40 and 48.13 years, indicating that both groups were within their productive age and actively engaged in sweet potato marketing (Olagunju et al., 2013).

The table further reveals that a greater proportion of male marketers, 86.67%, and female marketers, 73.33%, were married, indicating that married individuals are more actively involved in sweet potato marketing. In terms of household size, most male marketers, 60.00%, had between 6 and 10 household members, while the majority of female marketers, 66.67%, had 5 or fewer. The mean household sizes were 5.40 persons for males and 5.73 persons for females, respectively.

The result shows that 66.67% of the male and 73.33% of female marketers have secondary education. This shows that the marketers have a good level of education that allows them to accept and employ new innovations and ideas that can improve their profitability.

The table also shows that 86.67% of male marketers have farming as their main occupation while 26.67% of female marketers are artisans and traders. 80.00% of males engage both family and hired labour while 60.00% of the females engage only family labour for their marketing activities.

The table shows that 93.33% of male and 73.33% of female sweet potato marketers have access to credit, a key factor in improving the profitability of sweet potato marketers. The result showed that 66.67% of male and 53.33% of female have access to credit mainly through cooperatives, consistent with Enwa et al. (2024), who found that cooperatives remain the most effective channel for agricultural credit delivery in Nigeria. A total of 86.67% of male and 80.00% of female sweet potato marketers belong to cooperative societies. According to Sanusi et al. (2016), belonging to a cooperative society can enhance the profitability of marketers. The most common benefit received from cooperative membership by both male and female marketers is access to grants and loans, accounting for 66.67% and 26.67%, respectively. Further analysis indicates that 53.33% of male marketers and 13.33% of female marketers reported having access to extension information, while the others did not have such access.

Table 1: Socio-economic characteristics of producers, processors and marketers

	Producers				Processors				Marketers			
	Male		Female		Male		Female		Male		Female	
Variables	**Freq.**	**%**	**Freq.**	**%**	**Freq.**	**%**	**Freq.**	**%**	**Freq.**	**%**	**Freq.**	**%**
Age (Years)												
≤30	1	1.96	-	-	1	20.00	2	8.00	1	6.67	-	-
31-40	7	13.73	2	22.22	1	20.00	11	44.00	5	33.33	4	26.67
41-50	16	31.37	3	33.33	2	40.00	9	36.00	2	13.33	4	26.67
51-60	19	37.25	-	-	1	20.00	3	12.00	4	26.67	6	40.00
>60	8	15.69	4	44.44	-	-	-	-	3	20.00	1	6.67
Mean	50.53		53.00		41.60		41.44		47.40		48.13	
Gender	51	100.0	9	100.00	5	100.0	25	100.0	15	100.0	15	100.0
Marital Status												
Single	1	1.96	-	-	1	20.00	-	-	2	13.33	-	-
Married	45	88.24	5	55.56	4	80.00	21	84.00	13	86.67	11	73.33
Divorced/Separated	1	1.96	-	-	-	-	2	8.00	-	-	1	6.67
Widow/Widower	4	7.84	4	44.44	-	-	2	8.00	-	-	3	20.00
Household size	51	100.0	9	100.00	5	100.0	25	100.0	15	100.0	15	100.0
<=5	30	58.82	6	66.67	3	60.00	16	64.00	6	40.00	10	66.67
6-10	21	41.18	3	33.33	2	40.00	9	36.00	9	60.00	5	33.33
Mean	5.49		5.11		5.40		4.92		5.40		5.73	
Educational level												
No formal education	5	9.80	1	11.11	1	20.00	-	-	1	6.67	-	-
Primary education	20	39.22	3	33.33	1	20.00	2	8.00	2	13.33	2	13.33
Secondary education	20	39.22	4	44.44	2	40.00	17	68.00	10	66.67	11	73.33
Tertiary education	6	11.76	1	11.11	1	20.00	6	24.00	2	13.33	2	13.33
Main occupation												
Farming	50	98.04	8	88.89	3	60.00	7	28.00	13	86.67	5	33.33
Others	1	1.96	1	11.11	2	40.00	18	72.00	2	13.33	10	66.67
Land source												
Rented	6	11.76	2	22.22	1	20.00	8	32.00	6	40.00	7	46.67
Inherited	32	62.75	5	55.56	1	20.00	14	56.00	6	40.00	6	40.00
Purchased	4	7.84	1	11.11	-	-	-	-	2	13.33	1	6.67
Borrowed	9	17.65	1	11.11	3	60.00	3	12.00	1	6.67	1	6.67
Type of Labour												
Family labour	4	7.84	2	22.22	1	20.00	12	48.00	2	13.33	9	60.00
Hired labour	7	13.73	2	22.22	-	-	7	28.00	1	6.67	3	20.00
Both	40	78.43	5	55.56	4	80.00	6	24.00	12	80.00	3	20.00
Credit accessibility												
No	6	11.76	1	11.11	-	-	7	28.00	1	6.67	4	26.67
Yes	45	88.24	8	88.89	5	100.0	18	72.00	14	93.33	11	73.33
Credit Source												
None	6	11.76	1	11.11	-	-	8	32.00	1	6.67	4	26.67
Cooperative	39	76.47	8	88.89	4	80.00	13	52.00	10	66.67	8	53.33
Gift	2	3.92	-	-	-	-	-	-	-	-	-	-
Government	2	3.92	-	-	1	20.00	4	16.00	3	20.00	3	20.00
Others	2	3.92	-	-	-	-	-	-	1	6.67	-	-
Access to Extension information												
No	13	25.49	2	22.22	-	-	20	80.00	7	46.67	13	86.67

Yes	38	74.50	7	77.77	5	100.0	5	20.00	8	53.33	2	13.33
Cooperative membership												
No	3	5.88	-	-	1	20.00	7	28.00	2	13.33	3	20.00
Yes	48	94.12	9	100.00	4	80.00	18	72.00	13	86.67	12	80.00
Cooperative benefit												
None	3	5.88	-	-	1	20.00	7	28.00	2	13.33	3	20.00
Grants &loan	21	41.18	4	44.44	2	40.00	11	44.00	10	66.67	4	26.67
Collective marketing	6	11.76	1	11.11	-	-	3	12.00	1	6.67	2	13.33
Collective transportation	11	21.57	-	-	1	20.00	4	16.00	1	6.67	3	20.00
Market information dissemination	10	19.61	4	44.44	1	20.00	-	-	1	6.67	3	20.00
Farm size												
<=0.2	10	19.61	6	66.67	-	-	-	-	-	-	-	-
0.2 - 0.4	36	70.59	3	33.33	-	-	-	-	-	-	-	-
>0.4	5	9.80	-	-	-	-	-	-	-	-	-	-
Mean	0.32		0.19		-	-	-	-	-	-	-	-
Processed products												
Flour	-	-	-	-	2	40.00	10	40.00	-	-	-	-
Chips	-	-	-	-	2	40.00	12	48.00	-	-	-	-
Both	-	-	-	-	-	-	1	4.00	-	-	-	-
Boiled & Fried	-	-	-	-	1	20.00	2	8.00	-	-	-	-

Source: Field Survey, 2023

Profitability of sweet Potato producers, processors and marketers

Profitability of sweet potato producers

The result in Table 2 reveals that an average of 11884.08 kg is produced per season and on the average 9458.83 kg of the produce is sold. An average producer incurs a cost of ₦221,500.00 but earns an average revenue of ₦417033.30. This indicates that an average producer earns ₦195533.30 as gross margin indicating that sweet potato production is a profitable venture in the study area. This finding is consistent with Balarabe et al. (2020), who reported that sweet potato production generates substantial profits.

Profitability of sweet potato processors

Table 2 shows that the mean price of sweet potato is ₦133.33 per kilogram, with processors converting an average of 410.25 kg into various products. An average processor incurs a cost of ₦91206.67 and earns an average revenue of ₦147166.70. The GM calculated for sweet potato processing was ₦ 55960.00, confirming it is a profitable venture, in line with Omoare (2018), who confirmed that sweet potato processing in Nigeria yields profit, especially through value-added products like flour, chips, and bread.

Profitability of sweet potato marketers

The result in Table 2 below reveals that the average amount of sweet potato bought by the marketer 3712.03 kg and 3634.1 kg is sold on the average because the marketers process or consume some certain amount of it. An average marketer incurs a cost of ₦ 205,266.70 and earns an average revenue of ₦335,316.70. The gross margin calculated for sweet potato marketing was ₦130,050.00, demonstrating the profitability of sweet potato marketing, consistent with the observations of Nabay et al. (2020).

Gross profit margin of male and female sweet potato producers, processors and marketers

Table 3 below shows the gross margin of the male and female sweet potato producers, processors and marketers. The female and male producers make an average of ₦115,222.20 and ₦209,705.90 respectively as gross margin, while the female and male processors make an average of ₦52,952.00 and

₦71,000.00 respectively as gross margin. The female marketers make a gross margin of ₦130,400.00 and the male makes ₦129,700.00 as gross margin. From the analysis, the male producers and processors have greater gross margin while the female marketer has a higher gross margin than the male. Testing the difference based on gender of the respondents, the result revealed that there exists significant difference in the profit margin of sweet potato farmers. This was significant at 5% level of confidence. Meanwhile, the similar result was obtainable from the margin of the processors. In this case, the difference was significant at 10% level of confidence while gross margin of the marketers shows no significance at all. The result suggested that the gross margin of male producers and processors differs from that of their female counterpart.

Table 2 Profitability of sweet potato producers, processors and marketers

	Producers		Processors		Marketers	
S/N	**Variables**	**Amount**	**Variables**	**Amount**	**Variables**	**Amount**
A	Output produced	11884.08 kg	Price per kg	₦133.33	Quantity bought	3712.03 kg
B	Output sold	9458.83 kg	Quantity processed	410.25 kg	Quantity sold	3634.10 kg
C	Total variable cost	₦ 221,500.00	Processing Cost	₦ 91206.67	Marketing Cost	₦ 205266.70
D	Total revenue	₦ 417033.30	Total revenue	₦ 147166.70	Total revenue	₦ 335316.70
E	Gross margin (D-C)	₦ 195533.30	Marketing margin (D-C)	₦ 55960.03	Marketing margin (D-C)	₦ 130050.00
F					Marketing efficiency	1.634

Source: Field survey, 2023

Table 3: Gross profit margin of male and female sweet potato producers, processors and marketers

Margin	Producers (₦)	Processors (₦)	Marketers (₦)
Gross margin(female)	115,222.20	52,952.00	130,400.00
Gross margin(male)	209,705.90	71,000.00	129,700.00
t-test	2.094**	1.716*	1.178

Source: Field survey, 2023

Factors that affect profitability of sweet Potato producers, processors and marketers

Factors affecting the profitability of sweet potato producers

Table 4 shows that the estimated coefficients of multiple determinations (R2) indicate that the postulated regressors (i.e included variables in the model) explained 85.98% in the variation of the regressand (i.e profitability of sweet potato production). The coefficient of the estimated variables i.e years of experience, educational level, credit accessibility, farm size and commodity market price had positive signs while, long distance covered had a negative sign.

The analysis shows that the coefficient of years of experience was positive and statistically significant at 1% level. This implies that the more the years of experience in sweet potato production, the more the profitability of the farmers. This result is in agreement with Kassali (2011) who discovered that the greater the years of experience of the sweet potato producer, the greater his profit. The educational level showed a positive significant level at 1% which implies that the higher the educational level of the producers, the greater the profits they would realize.

Also, credit accessibility had a positive coefficient which was significant at 1% level of confidence. The result showed that access to credit will enhance profit among sweet potato farmers in the study area. This result is in line with Nyagaka (2010) who found that access to credit facilities among farmers would increase their profitability.

Furthermore, farm size had a positive and significant effect on profitability at the 1% level implying that a one-unit increase in the producer's farm size leads to a corresponding increase in profitability. Producers with larger cultivated areas are therefore more likely to earn higher profits than those operating on smaller farmlands. This aligns with Onuwa et al. (2020), who found that larger-scale sweet potato production in Nigeria leads to higher profitability, indicating a strong link between commercialization and economic returns.

In addition, the coefficient of transport distance was negative and significant at the 1% level, implying that longer transportation distances reduce the profitability of sweet potato producers by 0.068. Longer transportation distances increase production costs and post-harvest losses, thereby reducing farmers' overall profitability. Lastly, at the 1% significance level, a unit increase in the market price of sweet potatoes results in a 1.454 increase in profitability, indicating a strong positive relationship between market price and profitability. This underscores the crucial role of favorable market prices in enhancing producers' profitability.

Factors affecting the profitability of sweet potato processors

The multiple regression analysis for the processors gave a R-squared value of 0.6560 showing that 65.60% of the variability in the dependent variable (Y) is explained by the independent variables specified in the model. The analysis revealed that years of experience, age, credit accessibility, commodity market price and the consumer's preference of the product were the significant independent variables in the model as shown by their p values while others were insignificant.

Years of experience had a positive value with a positive significance on the profitability of processors at the 1% level of significance. This shows that a unit increase in the years of experience will bring about a 1.590 increase in gross margin which means that the more the years of experience, the more likely the processor earns more.

In addition, the coefficient of age of processors was negative and statistically significant at the 1% level, suggesting that older processors tend to experience lower profitability.

Also, credit accessibility had a positive significance on the profits of the processor at 1% significance level. This implies that processors with greater access to credit facilities have more profits.

The market price of the commodity exhibited a positive and statistically significant effect on profitability at the 1% level. This indicates that a unit increase in market price leads to a 0.0860 rise in processors' profitability. In essence, higher market prices enhance revenue margins and overall profitability among sweet potato processors.

Consumer preference showed a positive and statistically significant effect on profitability at the 1% level. This suggests that greater consumer demand enhances the sales volume and revenue of processors, thereby improving their overall profitability.

Factors affecting the profitability of sweet potato marketers

The multiple regression analysis for the marketers gave an R-squared value of 0.6253, showing that 62.53% of the variability in the dependent variable (gross marketing margin, Y) is explained by the independent variables specified in the model.

The analysis revealed that age, educational level, road accessibility, government policy and the commodity's market price were the significant independent variables in the model as shown by their p values.

At the 5% significance level, age had a negative effect on the gross marketing margin of marketers. This implies that younger marketers are more likely to earn higher profits from sweet potato marketing than

their older counterparts. The result may be attributed to the decline in physical strength and mental agility that tends to accompany aging, as noted by Gani et al. (2020).

Educational level had a positive and statistically significant effect on marketers' profitability at 1% level of confidence. This indicates that higher educational attainment enhances the profitability of marketers. Better-educated marketers are likely to possess improved managerial skills, record-keeping ability, and access to market information, all of which contribute to higher profit levels.

Road accessibility was found to have a positive and significant effect on marketers' profitability at the 5% level. Improved access to good road networks facilitates the efficient movement of goods, reduces transportation costs, and minimizes post-harvest losses—thereby enhancing profit margins. This finding aligns with Yusuf and Wuyah (2015), who observed that efficient transport infrastructure plays a crucial role in boosting the profitability of sweet potato enterprises

Government policy had a positive and statistically significant effect on marketers' profitability at the 1% level. A one-unit increase in favourable government policies leads to a 0.287 increase in profits. This suggests that supportive policies such as subsidies, market access programs, or price stabilization measures create a more enabling environment for marketers, thereby enhancing profitability. This finding aligns with Yusuf and Wuyah (2015), who reported that favourable government interventions contribute significantly to the profitability of sweet potato marketers.

The coefficient of market price was positive and statistically significant at the 1% level, indicating that an increase in the commodity's market price leads to a 3.673 rise in the profitability of the marketer. This suggests that higher market prices enhance revenue generation and overall profitability, as marketers earn greater returns when selling at more favorable prices.

The other 5 variables were insignificant.

Table 4: Multiple regression analysis of factors that determine the profitability of sweet potato producers, processors and marketers

	Producers			**Processors**			**Marketers**		
Profit (ln)	**Coefficient**	**t**	**P>|t|**	**Coefficient**	**t**	**P>|t|**	**Coefficient**	**t**	**P>|t|**
Years of experience	1.590***	4.12	0.000	1.590***	4.12	0.000	0.101	0.18	0.759
Age	-0.028	-0.64	0.525	-0.011***	-2.89	0.001	-0.097**	-1.95	0.062
Educational level	2.876***	3.98	0.004	-0.026	-0.15	0.879	10.905***	4.54	0.003
Credit accessibility	0.084***	3.20	0.003	3.195***	5.65	0.003	0.673	0.94	0.216
Farm size	1.439***	4.36	0.003	-	-	-	-	-	-
Extension visitation	0.178	1.31	0.128	0.026	0.27	0.789	0.054	0.76	0.964
Long Distance covered	-0.068***	-3.02	0.002	0.106	0.42	0.681	0.034	0.27	0.574
Road accessibility	0.023	0.03	0.798	0.525	0.982	0.251	0.821*	2.37	0.071
Government policy	-0.237	-0.86	0.530	-0.054	-0.23	0.819	0.287***	3.61	0.012
Commodity market price	1.454***	2.13	0.042	0.0865***	4.34	0.004	3.673***	4.85	0.000
Consumer preference of product	0.478	0.39	0.446	2.246***	5.21	0.000	-0.753	-0.85	0.753
Constant	13.543	5.75	0.000	10.543	9.74	0.020	12.895	4.65	0.000
	R-squared = 0.8598			R-squared = 0.6560			R-squared = 0.6253		

*Source: Field survey, 2023 ***, **, *= 1%, 5%, 10% level of significance*

Constraints faced by sweet potato producers, processors and marketers

Constraints faced by sweet potato producers

Table 5 shows the analysis of the constraints of sweet potato producers showing that land conflict has the highest rank among the constraints with a mean score of 2.72 which is severe and this agress with the work of Adeyonu et al., 2019. Next in rank of constraints was inadequate labour with a mean score of

2.38 due to the expensive cost of hired labour. The constraint ranked third was bad roads with a mean score of 2.33 which is due to the poor road networks that affects the transportation of farm produce. With a mean score of 2.25, the farmers' low income was the fourth-ranked constraint. Poor income of the farmers discourages them and affects the rate at which they invest in the production of sweet potato for the next season. The fifth constraint faced by producers is low patronage with a mean score of 2.23. The next constraint is insect or rodent infestation with a mean score of 2.03. Farmers face the challenge of insect or pest infestation during the growth of the plant and even after harvesting. This is also in line with the work of Adeyonu et al. (2019) which showed that pest infestation is a major constraint of sweet potato producers.

These six constraints were the severe constraints because their mean scores were above 2. The mild constraints were distance from the farm to the market, cost of transportation, cost of farm inputs, inadequate vines, inadequate credit facilities, lack of storage facility and spoilage in descending order of severity with the least mean score being 1.40.

Constraints faced by sweet potato processors

The analysis of the constraints of sweet potato processors shows that land conflict ranked highest, with a mean score of 3.40, due to limited access to suitable land for establishing processing sites and storage facilities. The second most significant constraint was inadequate vine, with a mean score of 2.97, reflecting the processors' reliance on producers for their raw materials. Nkamigbo and Isibor (2021) similarly noted that many sweet potato marketers in Nigeria are also involved in production. Cost of farm inputs ranked third, with a mean score of 2.87, as the high cost and occasional unavailability of inputs hinder smooth processing operations. The fourth-ranked constraint was insufficient labor, with a mean score of 2.67, reflecting the challenges processors face in securing adequate workforce for processing. The fifth-ranked constraint was bad roads, with a mean score of 2.27, which adversely affects the transportation of sweet potatoes to processing points and markets. The next constraint faced by sweet potato processors was long distance from the farm or processing point to the market, with a mean score of 2.20, which increases transportation costs and delivery time. The seventh-ranked constraint was low patronage, with a mean score of 2.17, reflecting limited market demand for processed sweet potato products. Insect or rodent infestation ranked eighth, with a mean score of 2.10. Processors sometimes receive sweet potatoes already infested by pests from producers, which in turn affects processing. This is consistent with Adesina (2018), who reported that pest infestation is a major challenge for producers.

These eight constraints were the severe constraints because their mean scores were above 2. The mild constraints were spoilage, inadequate credit facilities, cost of transportation, low income and lack of storage facility in descending order of severity with the least mean score being 1.63.

Constraints faced by sweet potato marketers

The analysis of the constraints of sweet potato marketers shows that inadequate credit facilities has the highest rank among the constraints with a mean score of 3.23 which is severe. Next in rank of constraints was spoilage, with a mean score of 2.63, as sweet potato is highly perishable and prone to deterioration during storage and long-distance transportation. The constraint ranked third was lack of storage facility, with a mean score of 2.47, as appropriate storage structures are generally scarce and inaccessible to the marketers. The fourth ranked constraint was the inadequate labour with a mean score of 2.40. Unavailability of labour is one of the challenges faced by sweet potato marketers according to Chang and Kewa, (2014). The fifth constraint faced by marketers is low income with a mean score of 2.27. Low income discourages the marketer from investing more in the business of sweet potato marketing. The next constraint is distance from the farm to the market, with a mean score of 2.13. Long distances increase transportation costs and time, making it difficult for marketers to deliver sweet potatoes to the market efficiently. The seventh constraint is cost of transportation with a mean score of 2.10. With the high prices of fuel, the cost of transporting goods has increased drastically and this in turn increases the cost of

transporting produce such as sweet potato. The next constraint to that is insect or rodent infestation with a mean score of 2.07. This aligns with Alao et al. (2022), who found that rodents and insect pests can significantly damage sweet potato tubers during storage, especially when they are not sold or processed early. Such infestations not only reduce marketable yield but also compromise the nutritional quality of the tubers.

These eight constraints were the severe constraints because their mean scores were above 2. The mild constraints were bad road, land conflict, inadequate vine, low patronage and cost of farm inputs in descending order of severity with the least mean score being 1.70.

Table 5: Constraints faced by sweet potato producers, processors and marketers

		Producers							Processors							Marketers						
S/N	**Constraints& Challenges**	**H**	**M**	**L**	**U**	**TW**	**MS**	**RK**	**H**	**M**	**L**	**U**	**TW**	**MS**	**RK**	**H**	**M**	**L**	**U**	**TW**	**MS**	**RK**
1	Land conflict	9	11	28	12	163	2.72	1st	2	1	10	17	102	3.40	1st	7	17	6	-	59	1.97	10th
2	Inadequate vine	33	18	9	-	96	1.60	10th	1	8	12	9	89	2.97	2nd	11	11	8	-	57	1.90	11th
3	Insect/rodent infestation	11	37	11	1	122	2.03	6th	7	14	8	1	63	2.10	8th	9	11	9	1	62	2.07	8th
4	Spoilage	40	16	4	-	84	1.40	13th	8	16	6	-	58	1.93	9th	-	16	9	5	79	2.63	2nd
5	Inadequate labour	7	24	28	1	143	2.38	2nd	2	12	10	6	80	2.67	4th	5	10	13	2	72	2.40	4th
6	Cost of farm inputs	21	35	4	-	103	1.72	9th	3	6	13	8	86	2.87	3rd	15	10	4	1	51	1.70	13th
7	Inadequate credit facilities	37	16	7	-	90	1.50	11th	8	16	6	-	58	1.93	9th	3	2	10	15	97	3.23	1st
8	Lack of storage facility	41	11	7	1	88	1.47	12th	17	7	6	-	49	1.63	10th	3	12	13	2	74	2.47	3rd
9	Bad road	12	17	30	1	140	2.33	3rd	4	14	12	-	68	2.27	5th	8	15	6	1	60	2.00	9th
10	Cost of transportation	12	40	7	1	117	1.95	8th	8	16	6	-	58	1.93	9th	10	8	11	1	63	2.10	7th
11	Low patronage	9	29	21	1	134	2.23	5th	3	19	8	-	65	2.17	7th	15	6	8	1	55	1.83	12th
12	Low income	5	37	16	2	135	2.25	4th	8	16	6	-	58	1.93	9th	2	19	8	1	68	2.27	5th
13	Distance from the farm to the market	18	25	16	1	120	2.00	7th	9	11	5	5	66	2.20	6th	5	17	7	1	64	2.13	6th

Source: Field Survey, 2023. H= High, M= Medium, L=Low, U= Undecided, TW=Total weight, MS= Mean score, RK= Rank

CONCLUSION AND RECOMMENDATIONS

After carrying out this research, it is undeniable that the sweet potato industry is not only profitable but also a lucrative investment. Comparing the profitability of the three aspects of the industry that were considered in the study, it can be seen that sweet potato production is most profitable while sweet potato processing is least profitable. This is due to the years of experience of the processor, inability of the processor to access road, the commodity's market price and the consumer's preference of the sweet potato by products. Sweet potato production, processing and marketing had much room for improvement and has outstandingly high potentials of generating revenue if the constraints are looked into and the major conflicts on land is resolved.

It is advised in light of the study's conclusions that:

1. Efforts should be made to provide transportation infrastructure, such as standard vehicles and good roads.
2. Agricultural extension agencies should intensify efforts in disseminating improved production technologies especially to the women to support their efforts in sweet potatoes farming.
3. Agriculture Policy makers should make policies that are favourable to the farmers and to every other sector in the value chain.
4. Credit facilities should be made available to the value chain actors to expand their scale of operation. The interests should be negligible and collaterals should not be unaffordable. Measures should also be put in place to ensure that the credit is judiciously utilized to guarantee good and better returns on capital.

5. Land agencies should ensure that every land owner has their original land ownership documents and should be provided when needed to prevent conflicts.
6. Investment in appropriate agricultural machinery and equipment to solve the problem of inadequate labour should be encouraged and supported by the government.
7. The government should provide input subsidies for the farmers. Farmers should be provided with the essential inputs needed including quality vines and fertilizers.

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