Analysis of the Determinants and Profitability of Maize Value Chain in Southeast Nigeria

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Abstract— *The study analysed the determinants and profitability of maize value chain in Southeast, Nigeria. The study used primary data collected from four hundred and eighty (480) actors spread across Anambra and Ebonyi states of southeast, Nigeria. Data collection lasted from January 2025 to June 2025 and covered the 2023/2024 production season. The results of the study show that the average total revenue realized by maize seed suppliers, producers, processors and marketers respectively were ₦477,280.08, ₦3,420,276, ₦619,554.8 and ₦1,385,393.2 per ton with a total variable cost of ₦36,795.0, ₦228,777, ₦111,964 and ₦397,565 respectively and total fixed cost of ₦6,702, ₦18,890, ₦3,885.0 and ₦17,788 respectively. The maize actors made a net income of ₦433,783, ₦3,172,609 ₦503,705 and ₦970,040 respectively. The profitability index estimated are 9.97, 12.81, 4.35 and 2.34 respectively indicating that for every ₦1 invested by the respective actors yielded ₦9.97, ₦12.81, ₦4.35 and ₦2.34 to maize seed suppliers, producers, processors and marketers respectively. The results further show that maize seed producers contributed (2.03%) to the value chain while the marketers, seed suppliers and processors contributed (0.62%), (0.36%) and (0.33%) respectively. The determinants of maize seed supply are age, marital status, household size, educational level, years of experience, input cost, transportation cost, preservation and products costs, while gender, marital status, educational level, farm size, labour costs, input cost and product cost are the determinants of maize seed production. The determinants of maize seed processing are gender, age, household size, educational level, input cost and product cost while age, educational level, years of marketing experience, membership of marketing association, transportation cost, input cost and product cost are the determinants of maize seed marketing.*

Keywords— Determinants, Profitability, Maize, Value chain, Southeast, Nigeria.

I. INTRODUCTION

Maize as one of the most important cereal crops in the world is produced in a large quantity in Nigeria with the country as the tenth largest producer of the crop in Africa (IITA, 2012). Maize production in Nigeria is characterized by seasonality in production and lack of storage facilities. Due to the poor storage condition of maize in the area, prices fall during the peak production season thus resulting in low net returns to farmers. Despite being a staple crop with high local demand, the maize value chain in Southeast Nigeria suffers from low farm productivity, high post-harvest losses, weak processing and storage capacity, poor access to quality inputs and finance, and fragmented markets. Transportation of maize to the local markets is expensive due to poor road infrastructure in the area while packaging of maize in extended bags of 100kg has led to exploitation of farmers by traders. On the supply side, few local processors engage in meaningful value addition such as fortified flour, animal feed and starches thus leaving farmers to depend on market sales which are vulnerable to price swings. Market inefficiencies resulting from weak aggregation systems and limited market information constrain farmers' access to formal finance and insurance. Furthermore, institutional and policy gaps due to weak extension system, inconsistent input subsidy policy and limited public investment in storage facilities further exacerbate these problems. As a result of these, there is reduction in farmers' incomes and limitations in the region's capacity to supply value-added maize products. In view of the above, this study therefore seeks to:

1) Examine the socio-economic characteristics of maize value chain actors in the area,
2) Estimate the net margin and profitability of maize value chain in the area,
3) Evaluate the determinants of value addition of maize input suppliers, producers, processors and marketers in the study area.

This study was carried out covering the entire south-eastern states so as to fill the gap in knowledge observed when it was first executed in Imo state, Nigeria.

II. LITERATURE REVIEW

The value chain is defined as the full range of activities that firms and workers perform to bring a product from its conception to final use (Gereffi, 2011). It involves understanding all the different stages of manufacturing including intermediary phases under which a product goes through until it becomes a final product ready for consumption. It has its roots in the commodity chain concept and the world system approach which was conceived as a network of labour and production process whose end result is a finished commodity. The value chain approach to analysis allows one to understand how industries are organized by examining the structure and dynamics of different actors involved in that particular industry (Gereffi, 2011).

Maize is the fourth most consumed cereal during the past two decades, below sorghum, millet and rice (FAOSTAT, 2012). It is widely used in the preparation of traditional foods such as Pap, tuwo, gwate and donkunu, with the cereal cooked, roasted, fried, ground, pounded or crushed (IITA, 2012). IITA (2012) estimated that approximately 60% of maize produced in the country is used for industrial end uses for both human (flour, beer, malt drinks, cornflakes, starch, dextrose, syrup) and animal consumption, mainly poultry. This poses particular challenges to the capacity of the country to sustainably supply the volumes of maize needed by the consuming population. As a result of climate change, Ignaciuk and Mason-D'croz, D. (2014) estimated that maize prices could increase by up to 30% in the foreseeable future. However, there are some viable solutions that can be deployed to mitigate the challenges. While there are fewer opportunities for land expansion, there are significant avenues for improved maize germplasm and sustainable intensification to raise and stabilize yields and close yield gaps (Foley et al., 2011).

III. MATERIALS AND METHOD

3.1 The Study Area:

The study was carried out in southeast, Nigeria. Southeast geo-political zone comprises of Abia, Anambra, Ebonyi, Enugu and Imo states. The states in the area are basically agrarian. The area experiences two major climatic seasons, the rainy season which starts in March and ends in October and a four month dry season which lasts between November to February. The major food crops grown in the area are cassava, maize, yam, cocoyam, melon and different varieties of vegetables. The major economic activities include; farming, trading, food processing and craft making etc.

3.2 Method of Data Collection:

Multistage sampling technique was adopted in selecting the sample of 480 suppliers, producers, processors and marketers for the study. Two (2) states out of the five states that make up the area were purposively selected for the study because of the quantity of maize produced in these states. The states are Anambra and Ebonyi. In the first stage, 3 local government areas were randomly selected from each of the two states making a total of 6 local government areas. In the second stage, four communities were randomly selected from each of the 6 local government areas to make a total of 24 communities. In the third stage, 10 villages were randomly selected from each of the 24 communities earlier selected to give a total of 240 villages spread evenly across the two states which were used for the study. The sampling frame for the study comprised all the maize value chain actors in the villages. In the fourth stage, the sample was divided into 4 strata which comprised the value chain actors notably suppliers, producers, processors and marketers from each village. Random sampling technique was then used to select two (2) maize value chain actors from each village which gave a total of 480 respondents used for the study thus 120 suppliers, 120 producers, 120 processors and 120 marketers. Primary data were used for the study. The major instrument used for data collection was the questionnaire using handheld Garmin GPS-Map 64csx. The questionnaires were pretested in Abia state, Nigeria.

3.3 Method of Data Analysis:

The primary data collected were analysed using descriptive and inferential statistical tools. The net margin and profitability of maize input suppliers, producers, processors and marketers were achieved using the net income and profitability index model expressed as:

$$NIi = TR-TC \quad (1)$$

$$TCi = TVC+ TFC \quad (2)$$

Where,

NI = Net income (N/ha), TR = Total Revenue (N/ha)

TVC = Total variable cost (N/ha), TFC = Total fixed cost (N/ha)

TC = Total cost (N/ha)

The net income model was used for further measure of profitability of maize in the study area. The Profitability index model is expressed as:

$$PI = TR / TC \quad (3)$$

Where

PI= Profitability Index

Other variables remain as previously defined

The contributions of the major actors in the maize value chain in the area were achieved using the market share-ratio given as follows:

$$\text{Market Share (\%)} = (\text{Average Return per Actor} / \text{Total Return for all Actors}) \times 100 \quad (4)$$

The determinants of value addition of maize input suppliers, producers, processors and marketers were analysed using multiple regression analysis. The model is implicitly stated as:

$$Yi = f(X1, X2, X3, X4, X5, X6 \ldots X15) + e \quad (5)$$

Yi = Value added (N)

X1 = Gender (dummy, 1= male, 0 = female)

X2 = Age (years)

X3 = Marital Status (dummy, 1 = single, 0 = married)

X4= Household Size (persons)

X5 = Educational Level (years spent in school)

X6 = Experience (number of years in business)

X7 = Membership of cooperative association (dummy, 1 = yes, 0 = otherwise)

X8 = price of maize seeds (N)

X9 = Product cost (N)

X10 = Labour cost (N)

X11 = Transport cost (N)

X12 = Processing cost (N)

X13 = Preservation cost (N)

e = random error

IV. RESULTS AND DISCUSSION

4.1 Socio-Economic Characteristics of Maize Value Chain Actors:

The distribution of maize value chain actors in southeast, Nigeria by socio-economic characteristics is presented in Table 1.

TABLE 1
DISTRIBUTION OF MAIZE VALUE CHAIN ACTORS BY SOCIO-ECONOMIC CHARACTERISTICS

Variables	Suppliers (%)	Producers (%)	Processors (%)	Marketers (%)
Gender				
Male	40	40	30	58
Female	60	60	70	42
Age				
15-29	5	10	20	15
30-44	10	20	35	30
45-59	55	50	40	45
60-74	30	20	5	10
Mean	45	42	36	38
Household size				
1-3	20	20	45	43
4-6	60	75	45	50
7-9	20	5	10	7
Mean	4	4	3	3
Educational level				
No education	5	5	7	6
1-6	25	35	10	4
7-12	44	30	56	50
13-18	26	30	27	40
Mean	7.6	7.3	8.3	9.3
Experience				
1-10	35	35	40	45
11-20	30	30	30	30
21-30	22	20	10	13
31-40	8	8	12	7
41-50	5	7	8	5
Mean	14	15	14	13
n	120	120	120	120

Source: Field Survey, 2025

Table 1 shows that majority (60%, 60% and 70%) of the respondents were female maize suppliers, producers and processors respectively. This result implies that females are more actively involved in maize seed supplies, production and processing than the males. That the females are more involved in these activities could be because maize seed supply, production and processing are believed to be female activities and less strenuous. The result is consistent with the findings of Eboiyehi (2006), Fodor (2006) and Joda (2010), Muhammed-Lawal et al. (2013) who observed that maize seed supplies, production and processing are predominantly female activities. Similarly, majority (58%) of the respondents are male maize seed marketers. This agrees with the findings of Ogunniyi and Omotesho (2011) who reported that maize marketing activities were carried out by males. Further analysis show that majority of the maize seed suppliers, producers, processors and marketers (55%, 50%, 40% and 45%) are within the age bracket of 45 and 59 years. The mean ages were 45, 42, 36 and 38 years respectively. This may suggest that the respondents were in their active and productive age during which they would be willing to engage in various risky economic activities that could enhance their income generation. This agrees with the findings of Amao et al.

(2007); Obasi et al. (2012; 2015) and Oluwasola (2010) who observed that younger household heads are more dynamic with regards to adoption of innovations.

Furthermore, (60%, 75%, 45% and 50%) of maize seed suppliers, producers, processors and marketers have household size within 4-6 persons. The mean household sizes were 4, 4, 3 and 3 persons for maize seed suppliers, producers, processors and marketers respectively. With respect to educational attainment, (44%, 30%, 56% and 50%) of the maize seed suppliers, producers, processors and marketers had secondary education, 25%, 35%, 10% and 4% had primary education while 26%, 30%, 27% and 40% had tertiary education respectively. However, 5%, 5%, 7% and 6% of the maize seed suppliers, producers, processors and marketers respectively had no formal education. The mean numbers of years spent in school were 7.6, 7.3, 8.3 and 9.3 respectively. This implies that majority of the respondents were literate and could adopt innovation. According to Ajao et al. (2012) the more educated farmers are, the higher their ability to utilize agricultural innovation. Finally, majority (35%, 35%, 40% and 45%) of the maize seed suppliers, producers, processors, and marketers respectively had between 1-10 years of experience. About 30%, 30%, 30% and 30% respectively had 11-20 years of experience. However, 22%, 20, 10% and 13% of the maize seed suppliers, producers, processors and marketers respectively had 21-30 years of experience. The mean years of experience were 14, 15, 14 and 13 for seed suppliers, producers, processors and marketers respectively. According to Amao et al. (2007) lengthy years of experience are an important requirement for the success of any business. The Findings of the study agrees with Dauda and Ndanitsa (2009) who observed that the length of years of experience of a working population in any occupation determines its performance in the competitive economic environment.

4.2 Net Margin and Profitability of Maize Value Chain Actors:

The costs and returns associated with maize seed suppliers, producers, processors and marketers are presented in Table 2. The net margin and profitability of the value chain actors were estimated from the table.

TABLE 2
COSTS AND RETURNS PER TON AMONG MAIZE VALUE CHAIN ACTORS (NAIRA)

Variables	Suppliers	Producers	Processors	Marketers
Average return	477,280.08	3,420,276	619,554.80	1,385,393.20
Depreciation	6702	18,890	3,885	17,788
Total fixed cost	6702	18,890	3,885	17,788
Product cost	8000	27,555	8,825	184,957
Preservation cost	12,698	-	-	-
Market levy	3,740	-	-	28,509
Cooking gas	-	-	22,658	-
Labour	-	76,810	24,333	-
Fertilizer	-	54,616	-	-
Pesticides	-	35,158	-	-
Fuel	-	-	19,847	29,748
Transportation	6,400	10,724	29,024	108,707
Packaging material	5,957	28,914	7,277	45,644
Total variable cost	**36,795**	**228,777**	**111,964**	**397,565**
Total cost	**43,497**	**247,667**	**115,849**	**415,353**
Gross Income	440,485	3,191,499	507,590	987,828
Net Income	**433,783**	**3,172,609**	**503,705**	**970,040**
Profitability index	**9.97**	**12.81**	**4.35**	**2.34**

Source: Field survey, 2025

The results in Table 2 show that the average total revenue realized by maize seed suppliers, producers, processors and marketers respectively were N477,280.08, N3,420,276, N619,554.8 and N1,385,393.2 per ton with a total variable cost of N36,795.0, N228,777, N111,964 and N397,565 respectively and total fixed cost of N6,702, N18,890, N3,885.0 and N17,788 respectively. The maize actors made a net income of N433,783, N3,172,609 N503,705 and N970,040 respectively. These figures suggest that the actors made profit from their investments. With regard to the profitability of the various enterprises by the actors, the profitability index estimated are 9.97, 12.81, 4.35 and 2.34 respectively indicating that for every N1 invested by the respective actors yielded N9.97, N12.81, N4.35 and N2.34 to maize seed suppliers, producers, processors and marketers respectively. This implies that maize seed supply and production are most profitable enterprises in the maize value in the area. However, marketing was found to be the least profitable enterprise in the maize value chain in the study area. The profitability index estimated for each enterprise measures the overall financial success of that enterprise among the maize value chain actors in the area. A ratio greater than one is preferable for any enterprise because the higher the ratio, the higher the profit.

4.3 Maize Value Chain Actors Market Share:

The maize value chain actors' market share is presented in Table 3.

TABLE 3

DISTRIBUTION OF MAIZE MARKET SHARE BY VALUE CHAIN ACTORS

Variables	Suppliers	Producers	Processors	Marketers
Total return per ton	134,462,064	168,077,580	190,487,924	224,103,440
Average return per ton	477,280.08	3,420,276	619,554.80	1,385,393.20
Market share (%)	0.355	2.03	0.325	0.62

Source: Field survey, 2025

Table 3 shows the results of the contributions of the major actors in the maize value chain in southeast, Nigeria. The findings show that maize seed producers contributed more (2.03%) to the market than any other sector of the value chain. This was followed by marketers (0.62%), seed suppliers (0.36%) and least by processors (0.33%). This suggests that the various actors can choose to move to maize production or any other activity to increase their income.

4.4 Determinants of Value Addition:

4.4.1 Determinants of value addition among maize input suppliers:

The result of the multiple regression analysis on the determinants of maize seed supply is presented in Table 4. The results show that the exponential functional form has eight significant variables with R2 of 0.798 while the semi-log functional form has nine significant variables with R2 of 0.864 respectively. Therefore, based on the magnitude of the coefficient of multiple determination (R2) and the number of statistically significant variables, the semi-log function was chosen as the lead equation and used for further analysis.

TABLE 4
RESULTS OF MULTIPLE REGRESSION ANALYSIS ON DETERMINANTS OF VALUE ADDITION AMONG MAIZE INPUT SUPPLIERS

Variable	Linear	Exponential	Semi-Log	Double-Log
Constant	-7808.503	2.333	-139061.459	-39.962
	(-1.538)	-0.742	(-4.615)	(-4.141)
Gender(X1)	-159.116	0.192	45.493	0.233
	(-0.190)	-0.371	-0.034	-0.54
Age(X2)	108.44	0.155	2302.849	5.959
	(2.745)***	(3.340)***	(2.356)**	(2.876)***
Marital status(X3)	-76.598	-1.328	6428.854	-1.452
	(-0.064)	(-1.780)**	(1.630)*	(-1.150)
Household size(X4)	-359.66	-0.34	2133.304	-0.346
	(-1.826)**	(-3.024)***	(1.713)**	(-0.694)
Education level(X5)	-99.351	-0.01	1075.188	-0.016
	(-0.810)	(-0.127)	(2.579)***	(-0.027)
Experience(X6)	93.396	0.049	180.508	0.17
	-1.258	-1.066	(2.165)**	-0.487
Association memb.(X7)	-181.608	-0.874	-7.547	-0.397
	(-0.223)	(-1.733)**	(-0.005)	(-0.873)
Input cost(X8)	-6.153	-0.008	7765.175	-1.441
	(-3.921)***	(-5.795)***	(4.355)***	(-2.525)***
Transport cost(X9)	-0.87	0.001	-1849.489	-0.046
	(-0.675)	(1.698)**	(-1.535)*	(-0.120)
Preservation cost(X10)	-0.85	-0.001	917.034	-0.158
	(-1.578)*	(-3.209)***	(2.661)***	(-1.434)
Product cost(X11)	1.073	0	12077.509	3.662
	(25.727)***	(10.405)***	(14.634)***	(13.857)***
R2	0.949	0.798	0.864	0.855
F-ratio	81.729	17.198	27.707	25.689
Standard error	2377.47291	1.47254	3895.32738	1.24731
n	120	120	120	120

******Significant at 1%, **Significant at 5% and *Significant at 10%***
Source: field survey, 2025

Age(X2) of maize seed suppliers was found to be positively related to net margin and statistically significant at 5% level. This implies that an increase in the age of the farmers will lead to an increase in net margin. This result disagrees with the findings of Martey et al. (2013) who observed a negative relationship between net margin and age of respondents in their study on performance and Constraints of Small Scale Enterprises in Accra Metropolitan Area of Ghana. Marital status(X3) of maize seed suppliers was found to be positively related to net margin and statistically significant at 10% level. Household size(X4) was also found to be positively related to net margin and statistically significant at 5% level. This implies that as farmers' household size increases, there would be a corresponding increase in net margin earned from maize seed supply. Education level(X5) was found to be positively related to net margin and statistically significant at 1% level. This implies that as the farmers acquire higher level of education, there will be an increase in their net margin. Education we know is the key that unlocks the potentials in people and leads to more prudent management of scarce resources. Furthermore, years of experience(X6) was found to be positively related to net margin and statistically significant at 5%. Similarly, input cost(X8) was found to be positively related to net margin and statistically significant at 1% level. This implies that as the cost of producing the maize seed increases, there will be a corresponding increase in the net margin of the enterprise. Transportation

cost(X9) was found to be negatively related to net margin of input suppliers and statistically significant at 10% level. This implies that as the cost of transportation increases there will be a corresponding decrease in the net margin of the enterprise. Preservation cost(X10) and product cost(X11) were found to be positively related to net margin and statistically significant at 1% level respectively. This implies that as the cost of producing and preserving the maize seeds increases, there will be a corresponding increase in the net margin of the enterprise.

4.4.2 Determinants of value addition among maize Producers:

The result of the multiple regression analysis on the determinants of value addition among maize seed producers is presented in Table 5.

TABLE 5

RESULTS OF MULTIPLE REGRESSION ANALYSIS ON DETERMINANTS OF VALUE ADDITION AMONG MAIZE SEED PRODUCERS

Variable	Linear	Exponential	Semi-Log	Double-Log
Constant	-245539.572	4.671	-705044.256	-10.078
	(-1.686)	-0.667	(-0.453)	(-0.223)
Gender(X1)	-56275.367	-1.674	-52148.493	-1.528
	(-2.487)**	(-1.839)*	(-1.462)	(-1.784)*
Age(X2)	2712.648	0.067	173165.822	1.405
	-1.523	-0.788	-1.193	-0.334
Marital status(X3)	-13304.962	-0.831	-84542.905	-2.362
	(-2.550)**	(-0.715)	(-2.877)**	(-0.845)
Household size(X4)	8253.884	0.288	44230.566	1.38
	-1.031	-0.748	-0.872	(1.939)*
Education level(X5)	1223.686	0.102	-18209.24	0.264
	(2.597)**	(1.834)*	(-0.822)	-0.411
Experience(X6)	1101.96	0.059	27089.975	1.972
	-0.825	-0.925	-0.694	(2.743)***
Association memb.(X7)	29754.068	-0.67	40818.844	-0.739
	-1.173	(-0.549)	-1.023	(-0.638)
Farm size(X8)	34631.836	0.368	102790.307	0.561
	(4.007)***	-0.885	(3.959)***	-0.745
Labour cost(X9)	-4.611	0	-83155.445	-1.946
	(-2.571)***	-0.425	(-2.801)***	(-2.261)**
Fertilizer cost(X10)	11.699	0	-18214.864	0.796
	-0.54	-0.122	(-0.107)	-0.162
Transport cost(X11)	9.834	-0.001	13615.586	-0.495
	-0.801	(-1.088)	-0.558	(-0.699)
Input cost(X12)	5.066	0	-7904.466	0.548
	(2.933)**	-1.048	(-0.552)	(3.321)***
Product cost(X13)	0.82	9.18E-06	90730.229	1.68
n	(13.700)***	(3.192)***	(6.701)***	(4.279)***
R2	0.868	0.628	0.667	0.447
F-ratio	23.196	2.31	7.095	2.856
Standard error	81343.9324	3.91056	128982.216	3.73976
n	120	120	120	120

******Significant at 1%, **Significant at 5% and *Significant at 10%***

Source: field survey, 2025

Based on the number of variables statistically significant at 1% to 10% levels, the signs associated with the coefficients and the magnitude of the coefficient of multiple determination (R2), the linear function was chosen as the lead equation and used for further analysis of the data. Gender(X1) of the maize producers was found to be inversely related to net margin and statistically significant at 5% level. Gender in this study was used as a dummy variable. The result here implies that as more maize seed producers tend to be women, there will be a decrease in the net margin of the producers. Marital status(X3) of maize producers was found to be inversely related to net margin and statistically significant at 5% level. This implies that as more unmarried farmers engage in maize seed production, there will be a significant reduction in their net margin. This result agrees with the findings of Amao, Adesiyan and Salako (2007) who observed that high performance of married farmers could be attributed to fact that the spouses can serve as a form of labour by reducing the cost on hired labour and hence increasing the profit base of the enterprise. Similarly, Educational Level(X5) was found to be positively related to net margin and statistically significant at 5% level. This suggests that the more the farmers acquire higher levels of education, the higher the increase in the net margin. Farm Size(X8) of maize producers was found to be positively related to net margin and statistically significant at 1% level. This implies that an increase in farm size allotted for maize production will result to a significant increase in their net margin. Labour Cost(X9) was found to be negatively related to net margin and statistically significant at 1% level. This implies that as the cost of hired labour increases, there will be a corresponding decrease in the net margin of the enterprise. Input cost(X12) was found to be directly related to net margin and significant at 5% level. This may suggest that the more the farmers continue to use hybrid maize seeds which cost more, the higher will be the increase in the net margin of the farmers. Product cost(X13) was found to be directly related to net margin and statistically significant at 1% level. This implies that as the output of the maize producers' increases, there will be a corresponding increase in the net margin of the enterprise.

4.4.3 Determinants of value addition among maize Processors:

The result of the multiple regression analysis on the determinants of maize processing is presented in Table 6. The result shows that the linear and double log functional forms have six statistically significant variables each with R2 of 0.81 and 0.45 respectively. Based on the number of variables statistically significant at 1% to 10% levels, the signs associated with the coefficients and the magnitude of the coefficient of multiple determination (R2), the linear function was chosen as the lead equation and used for further analysis of the data.

Gender(X1) is positively related to net margin of the processors and statistically significant at 5% level. Gender in this study was used as a dummy variable. The result obtained here suggests that an increase in the number of males who engage in maize processing, the higher the increase in the net margin. Similarly, Age(X2) of maize processors was found to be directly related to net margin and statistically significant at 5% level. This suggests that an increase in the number of aged farmers who engage in maize processing, will lead to higher net margin. The result further shows that Household size(X4) is positively related to net margin and significant at 5% level suggesting that an increase in household size will increase the net margin of processors. Educational attainment(X5) was also found to be directly related to the net margin of processors and statistically significant at 1% level. This was expected on apriori because higher levels of education unlock potentials in people and enable them to learn new processing techniques including the use of modern processing machines. Input cost(X9) or raw maize seeds for processing was found to be negatively related to the net margin and statistically significant at 1% level. This implies that as the cost of maize seed for processing increases, there will be a corresponding decrease in the net margin of the enterprise. Finally, Product cost(X11) was found to be positively related to net margin and statistically significant at 1% level. This implies that as the output of the maize processors increases, there will be an increase in the net margin of the enterprise.

TABLE 6
RESULTS OF MULTIPLE REGRESSION ANALYSIS ON DETERMINANTS OF VALUE ADDITION AMONG MAIZE PROCESSORS

Variable	Linear	Exponential	Semi-Log	Double-Log
Constant	568.163	2.444	28382.65	5.413
	-0.123	-2.483	-1.112	-1.34
Gender(X1)	450.286	-0.55	-5055.939	-1.092
	(2.200)**	(-1.139)	(-1.421)	(-1.924)*
Age(X2)	269.764	-0.047	-25678.048	-2.82
	(2.214)**	(-1.817)*	(-1.449)	(-0.998)
Marital status(X3)	2928.783	0.623	13683.233	1.439
	-1.298	-1.289	-0.7	-0.461
Household size(X4)	308.675	0.06	-4306.07	-0.575
	(2.430)**	(2.394)**	(-2.404)**	(-1.938)**
Education level(X5)	54.081	-0.013	5.396	-0.056
	(3.288)***	(2.313)**	(2.701)**	(2.771)***
Experience(X6)	114.147	0.017	6276.649	0.989
	-0.556	-0.389	-1.144	-1.129
Association memb.(X7)	1610.743	0.611	5868.81	1.107
	-0.671	-1.19	-1.51	(1.784)*
Labour cost(X8)	-1.358	-0.001	-1040.197	-0.217
	(-0.718)	(-1.328)	(-0.588)	-0.771
Input cost(X9)	-1.345	0	-2649.845	-0.026
	(-6.531)***	(-3.208)***	(-3.889)***	(-3.055)***
Transport cost(X10)	-0.255	0	-486.952	-0.669
	(-0.316)	(-1.361)	(-0.151)	(-1.296)
Product cost(X11)	0.945	0	5287.969	0.693
	(11.795)***	(6.804)***	(4.081)***	(3.352)***
R2	0.808	0.647	0.462	0.448
F-ratio	18.406	7.986	3.74	3.541
Standard error	5749.38442	1.23018	9637.28289	1.53765
n	120	120	120	120

******Significant at 1%, **Significant at 5% and *Significant at 10%***
Source: field survey, 2025

4.4.4 Determinants of value addition among maize product marketers:

The result of the multiple regression analysis on the determinants of value addition among maize product marketers is presented in Table 7.

TABLE 7
RESULTS OF MULTIPLE REGRESSION ANALYSIS ON DETERMINANTS OF VALUE ADDITION AMONG MAIZE PRODUCT MARKETERS

Variable	Linear	Exponential	Semi-Log	Double-Log
Constant	-6229.071	2.035	-62988.825	2.312
	(-3.782)	-2.16	(-1.106)	-0.63
Gender(X1)	93.224	0.204	-4550.166	-0.065
	-0.271	-1.036	(-0.977)	(-0.218)
Age(X2)	-28.111	-0.039	29781.869	-2.149
	(-1.908)**	(-2.441)**	-0.805	(-1.902)*
Marital status(X3)	329.562	0.424	-19962.67	-0.042
	-0.479	-1.068	(-0.523)	(-0.017)
Household size(X4)	-3.03	0.065	4259.078	0.796
	(-0.018)	-0.688	-0.221	-0.641
Education level(X5)	283.931	-0.058	22414.68	0.446
	(2.854)***	(-1.015)	-0.607	-0.187
Experience(X6)	41.391	0.025	-3717.589	0.572
	(1.987)*	(1.929)*	(-1.845)*	(1.825)*
Association mem.(X7)	973.847	1.211	8907.774	1.436
	(2.330)**	(5.064)***	-1.506	(3.769)***
Transport cost(X8)	-1.601	0	-7584.993	-0.408
	(-8.910)***	(-2.642)***	(-1.984)**	(-1.658)
Input cost(X9)	-1.031	-2.47E-05	-12142.339	-0.646
	(-5.073)***	(-2.310)**	(-4.270)***	(-3.528)***
Product cost(X10)	1.009	6.22E-05	17656.991	1.362
	(4.079)***	(8.220)***	(5.264)***	(6.303)***
R2	0.998	0.889	0.579	0.745
F-ratio	2103.417	39.279	6.735	14.322
Standard error	1260.41028	0.7209	16966.99995	1.0929
n	120	120	120	120

******Significant at 1%, **Significant at 5% and *Significant at 10%***
Source: field survey, 2025

Based on the number of variables statistically significant within 1% to 10% levels, the signs associated with the coefficients as they aid in the economic interpretation of the results, and the magnitude of the coefficient of multiple determination (R2), the linear functional form was chosen as the lead equation and used for further analysis of the data. Age(X2) of maize product marketers was found to be inversely related to net margin and statistically significant at 5% level. This suggests that an increase in the number of aged farmers who engage in maize product marketing, will lead to a decrease in net margin. Educational level(X5) of the maize marketers was found to be directly related to net margin and statistically significant at 1% level. This implies that as the maize marketers advance in their educational level, there will be a significant increase in their net margin. Years of marketing experience(X6) was found to be directly related to net margin and statistically significant at 10% level. This implies that as the marketers acquire more years of experience in maize product marketing, there will be an increase in their net margin. This could be due to the awareness of innovative ideas and strategies in product packaging and advertising which result in higher volume of sales and higher net margin. Association membership (X7), was also found to be directly related to net margin and significant at 5% level. Transportation Cost(X8) was found to be inversely related to net margin and statistically significant at 1% level. This implies that as the cost of transporting goods from one market to another increase there will be a corresponding decrease in the net margin of the enterprise. Input cost(X9) was found to be inversely related to net margin and statistically significant at 1% level. This implies that as the cost of the various maize product increases there

will be a corresponding decrease in net margin of the enterprise. Finally, product price(X10) was found to be directly related to net margin and statistically significant at 1% level. This implies that as product prices of the maize marketers increase there will be a corresponding increase in net margin of the enterprise.

V. CONCLUSION

The study analysed the determinants and profitability of the maize value chain in Southeast Nigeria. Key findings indicate that maize production is the most profitable segment (Profitability Index = 12.81), while marketing is the least profitable (PI = 2.34) due to high transportation and packaging costs. Producers also contributed the largest share (2.03%) to the chain's total value. The determinants of profitability vary across actor groups but consistently highlight the significant negative impact of transportation and input costs, and the positive role of education, experience, and cooperative membership. These findings underscore the need for targeted interventions, such as improved rural infrastructure, input subsidy programs, and the promotion of farmer cooperatives, to enhance efficiency and profitability across the maize value chain in Southeast Nigeria.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

REFERENCES

[1] Ajao, A. O., Oginniyi, L. T., & Adepoju, A. A. (2012). Economic efficiency of soybean production in Ogo-Oluwa Local Government Area of Oyo State, Nigeria. *American Journal of Experimental Agriculture, 2*(4), 667–679.

[2] Amao, J. O., Adesiyan, O. I., & Salako, B. A. (2007). Economic analysis of cassava processing into gari in Ogo-Oluwa Local Government Area of Oyo State, Nigeria. *Pakistan Journal of Social Sciences, 4*(2), 266–270.

[3] Dauda, M., & Ndanitsa, M. A. (2009). Economic analysis of timber production sawmill operation in selected Local Government Areas of Ogun State. In *Proceedings of the 23rd National Conference of FAMAN* (pp. 198–208). Sokoto, Nigeria.

[4] Eboiyehi, F. A. (2006). Work, women employment and feminization of poverty in Nigeria. *Gender & Behaviour, 4*(1), 642–658. https://doi.org/10.4314/gab.v4i1.23350

[5] Fodor, E. (2006). A different type of gender gap: How women and men experience poverty. *East European Politics and Societies, 20*(1), 14–39. https://doi.org/10.1177/0888325405284248

[6] Foley, J. A., Ramankutty, N., Brauman, K. A., Cassidy, E. S., Gerber, J. S., Johnston, M., Mueller, N. D., O'Connell, C., Ray, D. K., West, P. C., Balzer, C., Bennett, E. M., Carpenter, S. R., Hill, J., Monfreda, C., Polasky, S., Rockström, J., Sheehan, J., Siebert, S., Tilman, D., & Zaks, D. P. M. (2011). Solutions for a cultivated planet. *Nature, 478*, 337–342. https://doi.org/10.1038/nature10452

[7] Food and Agriculture Organization of the United Nations. (2012). *FAOSTAT statistical database*. FAO. https://faostat.fao.org

[8] Ignaciuk, I., & Mason-D'Croz, D. (2014). *Modelling adaptation to climate change in agriculture* (OECD Food, Agriculture and Fisheries Papers No. 70). OECD Publishing. https://doi.org/10.1787/5jxrclljnbxq-en

[9] International Institute of Tropical Agriculture. (2001). *Annual report on maize production*. IITA, Ibadan, Nigeria.

[10] International Institute of Tropical Agriculture. (2012). *Growing in Nigeria: Commercial crop production guide series*. Information and Communication Support for Agricultural Growth in Nigeria (ICS-Nigeria), USAID.

[11] Joda, A. (2010). Women as agents for development as agricultural entrepreneurs in Adamawa State, Nigeria. In *Proceedings of the 24th Annual National Conference of the Farm Management Association of Nigeria (FAMAN)*, Adamawa State University, Mubi, Nigeria. https://doi.org/10.15580/gjbms.2013.4.010613360

[12] Martey, E., Annin, K., Attoh, C., Wiredu, A. N., Etwire, P. M., & Al-Hassan, R. M. (2013). Performance and constraints of small-scale enterprises in the Accra Metropolitan Area of Ghana. *European Journal of Business and Management, 5*(4), 83–93.

[13] Muhammad-Lawal, A., Omotesho, O. A., & Oyedemi, F. A. (2013). An assessment of the economics of cassava processing in Kwara State, Nigeria. Paper presented at the *4th International Conference of the African Association of Agricultural Economists*, Hammamet, Tunisia.

[14] Obasi, P. C., Okparadim, G. I., & Henri-Ukoha, A. (2012). Economics of agroforestry in Imo State, Nigeria. *International Journal of Agriculture and Food Science, 2*(1), 7–13.

[15] Obasi, P. C., Henri-Ukoha, A., Anosike, O. N., & Ibekwe, U. C. (2015). Net returns to cassava-based crop mixtures in Imo State, Nigeria. *European Journal of Agriculture and Forestry Research, 3*(1), 15–21.

[16] Ogunniyi, L. T., & Omotesho, O. A. (2011). Economic analysis of swine production in Nigeria: A case study of Ibadan Zone, Oyo State. *Journal of Agricultural Economics and Development, 35*(2), 137–142.

[17] Oluwasola, O. (2010). Stimulating rural employment and income for cassava (*Manihot* spp.) processing farming households in Oyo State, Nigeria through policy initiatives. *Journal of Development and Agricultural Economics, 2*(2), 18–25.