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SUSTAINING THE GROWTH OF SMALL-SCALE FARMING: EVIDENCE FROM THE GROSS MARGINS OF SMALL–SCALE CASSAVA FARMERS IN UYO AGRICULTURAL ZONE, AKWA IBOM STATE, NIGERIA

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Abstract

Cassava production in the Southern region of Nigeria is seen as one of the prominent cultural practices of the natives. The potentials of cassava derivatives and their value chains are enormous in reducing poverty and triggering economic development in the region. Premised on these assertions, the study was designed to analyze the gross margins of cassava farmers and determine factors that affect it in the southern region of Nigeria. In the study, 120 cassava farmers were randomly sampled using structured questionnaire. The descriptive analyses of the data collected revealed that women dominated cassava production in the region. The farmers were moderately educated with an average farming experience of 11.9 years, and average social capital accumulation, age, farm income, gross margin, and farm size of 6.0 years, 44.3 years, ₦68, 694.17, ₦29, 793. 57 and 0.59 hectares respectively. The empirical findings revealed that farmers' age, education, farming experience, social capital, cassava cutting, and farm size were significant positive determinants of cassava farmers' gross margins while household size, transaction cost and access to farm credit relate negatively. Based on the findings, it is recommended that youth should be encouraged in cassava production as a way to augment the aging cassava population in the region. Also, adult education should be encouraged among cassava farmers in addition to promoting moderate household size among others.

Key words**:** *gross margin, cassava, small-scale, farmers, Nigeria*

INTRODUCTION

Cassava (*Manihot esculenta*) is one of the most popular food crops grown in the southern part of Nigeria [19, 14, 38, 41]. The crop is one of the widely consumed root crops in the country. Cassava production not only serves as a good source of food crop but also a major source of income and employment for rural dwellers in Nigeria [26, 38, 4]. Based on its wide acceptability, the crop is considered a very powerful weapon against poverty in Nigeria [28]. The crop is considered one of the most productive and sustainable crops in the Tropics [37]. Apart from its productivity and dogged nature, the crop is easily adaptable to various soil types, soil fertility levels, and climatic conditions. Nigeria is the largest producer of cassava in the world, however, the current yield of 8.2MT/ha, as opposed to a potential of 20-30MT/ha, indicates that there exists inefficiency in cassava production and technology used compared to the world's best practices [27, 33]. According to Akpan et al., [14], the crop can be processed into several derivatives such as: garri, starch, fufu, cassava flour, and cassava chips among others. Cassava tubers have excellent potential in livestock feed formulation, textile industry, plywood, paper, brewing, chemicals, pharmaceutical, and bakery industries [40, 2]. Resulting from the critical roles cassava production offered to Nigeria's economy, the government at all tiers has enunciated and set up several policies and programmes to boost its production in order to meet the rising demand for the commodity [24].

Following these interventions initiated by the government, cassava production in the southern region of Nigeria is still characterized by small-scale production, largely subsistent, utilized obsolete tools, poor varieties, and is affected by uncertainties of rain as well as other exogenous constraints inherent in arable crop production [13, 14].

Several aspects of the crop agronomical activities are still done with crude or traditional tools. According to Udoh and Akpan [43], and Akpan [6, 7] most small-scale farmers are resource poor in Nigeria. With rampaging general poverty and double digits inflation rate as well as insufficient credit facilities for the agricultural sector; farm productivity and farm income are seriously jeopardized in the country [44]. Additionally, with the increasing rural-urban migration among youths in the southern region of Nigeria [17, 18, 3], the relative scarcity of rural labour constitutes a serious impediment to small-scale farmers in the region [5, 31]. In a nutshell, a small-scale farmer in the region is mostly challenged by uncertainties in farm productivity, farm output, farm income, and gross margins including high level of macroeconomic volatility [11, 10]. The extent an individual farmer is able to cope with the cultural, environmental, climatic, and economic constraints in production in addition to the level of resource endowment and technology determined the level of investment in farm production [43].

Cassava production in the southern region of Nigeria has continued to suffer severe setbacks due to various factors ranging from continuous cropping emanated from land fragmentation, high population density, high cost of inputs, and soil deterioration thereby hindering most farmers to attain the optimum level of production [32, 17]. The inability of farmers to adequately address these issues has resulted in sub-optimal use of resources, substantial loss of cassava output, and a drastic reduction in profit/gross margins accruable to farmers [15, 20]. This connotes that, the sustainability of small-scale farm enterprise is hinged on tackling the issue of resource allocation problem with the aim of maximizing farm returns. From another perspective, the issue of deteriorating farmers' welfare in developing economies is alarming. Yet it is these farmers' that produced almost 90% of farm products meant for consumption in the region. Several submissions have shown that more than 50% of the rural farmers live below the national poverty line and are resource-poor [29, 36, 9, 12, 43, 22]. Given this report; it is pertinent to investigate and document the nature of cassava gross margins, and the factors that influence it in the southern region of Nigeria.

The reasons for the above assertions are obvious; first, the cassava sub-sector provides numerous employment opportunities to people through its value chain activities in the country. Secondly, it serves as a valuable source of dietary energy for the majority of people in Nigeria, particularly in the southern part of the country. For instance, 80% of the cassava tubers produced in Nigeria are processed into various food products that are consumed locally, and minimum quantities are exported to neighboring African countries [24, 21, 14]. Given that cassava is an important staple food in the region and the country at large, any attempt to increase its production and the farmer's productivity would be the right step toward preventing food crises in the country.

In the southern region of the country, especially in Akwa Ibom State, bold steps have been taken to tap the potential of cassava through its cassava competitiveness initiative. As a result, some bakeries adopted the use of 10% cassava flour in the contents of their bread. The Akwa Ibom State government also participated in Fadama III additional financing which targeted majorly cassava production [42]. Also, Fadama micro-finance Bank was established in the State for soft loans for small-scale farmers in the State among others. In spite of the government's good intentions regarding cassava production in the State, especially in creating a favourable production environment, the performance of the State as regards increased cassava production as a major revenue earner has still not reached its full potential. Furthermore, it is essential to understand the socio-economic and demographic factors that played leading roles in the production process of cassava in order to achieve maximum outputs and profit in the State. The generation of such information is critical in developing long-term research policies and in understanding the subsistence farming situation. Therefore, based on the

aforementioned problems, this study sort to analyze the gross margin of cassava farmers and identify factors affecting it in the southern region of Nigeria.

However, there are few studies that examined the gross margins of arable crop farmers in developing countries. For instance, Ridwan *et al.* [39] examined the determinants of the gross margin of the vegetable farmers in the Iwo zone of Osun State of Agricultural Development Programme (ASDP). The result of the findings revealed that the labour cost, cost of fertilizer, and cost of seed were the main determinants of the gross margin in vegetable production. Also, Akpan et al., [16] analyzed the gross margins of manure and fertilizer-based waterleaf (*talinum triangulare*) farmers in Nigeria. The empirical results showed that farmers' education, farm income, and gender had a significant positive impact on the gross margin of organic manure users while stem cost, household size, membership in social organization, labour cost, and farm credit showed a significant negative effect. Also, farmers' age, farm income, and household size showed a positive effect on the gross margin of fertilizer-based farmers while education, marital status, stem cost, social organization, labour cost, the quantity of Waterleaf stolen, gender, and farm size showed a significant negative impact. Besides, household size, household dependent ratio, and marital status have a negative impact. Furthermore, Mersha, et al., [30] identified factors affecting potato farmers' marketing gross margin in central Ethiopia. The empirical results showed that the educational level of household head, household size, potato cultivated land size, quantity of potato produced, input cost, livestock ownership, and access to market information had a significant effect on farmers' household gross margin. In addition, Abebe et al., [1] analyzed factors that affect the profitability of smallholder common bean producers in the central rift valley of Ethiopia. The empirical results showed that distance from the nearest market, farmers' age, family size, off-farm income, and fertilizer source were the factors that influenced the profitability of smallholder common bean producers negatively; whereas, gender; farming experience, group membership, and target market channel had a positive significant influence. In a similar vein, Ehinmowo et al., [25] analyzed the determinants of profitability among small-scale cassava processors in Southwest, Nigeria. The empirical results indicated that education, year of experience, access to extension services, household size, cost of raw materials, and types of cassava purchased were the factors that significantly determined profitability among cassava farmers. Oladoyin et al., [35] studied the economic analysis of cassava production in the Akoko area of Ondo State, Nigeria. The results showed that the majority (72.7%) of cassava farmers were male and were within the mean age of 50 years; have a mean household size of 5 persons. The majority of the farmers are married and had an average farming experience of 13 years while about 82.0% of the farmers had formal education. The cassava farmers had an average farm size of 1.9ha. The empirical result showed that agrochemical, labour, farm input, and age have a significant influence on the profit of the cassava farmers. Oladeebo and Oluwaranti's [34] reported that household size and farm size were the major significant factors that influenced the profit efficiency of cassava farmers. Akpan et al., [13] estimated farm-level profit function and its determinants among homestead-based cassava farmers in the south-south region of Nigeria. The result found that farmers' education, experience, household size, level of farming involvement, extension agent visit, soil management method adopted by farmers, and farm size were significant factors affecting farm-level profit efficiency. Akpan et al., [19] estimated translog stochastic profit function for cassava-based farmers in the southern wetland region of Cross River State, Nigeria. The findings showed that level of farming involvement, farmer's education, ability to predict rainfall, farming experience, household size, soil management technique adopted, extension agent visits, and farm size were significant determinants of profit efficiency of cassava-based farmers. Akpan et al., [8] used a

stochastic production frontier function to estimate farm-level technical efficiency and its determinants among cassava-based farmers in Oruk Anam Local Government Area of Akwa Ibom State, Nigeria. The descriptive analysis of cassava farmers revealed an average age of 45 years, and household size of 6 members. About 68% of cassava farmers were poor, while farmers' average years of social capital formation and education stood at 1.08 years and 9 years respectively. The empirical results showed that, farmers' farming experience and membership in social organization were positive drivers of technical efficiency among cassava farmers in the State. Alternatively, farmers' age, household size, gender, and poverty status were identified as negative movers of the technical efficiency of cassava farmers.

From the literature review, it is clear that there is an overwhelming need to update available information on the gross margins of small-scale farmers in the southern region of Nigeria. Again, given the critical role cassava production plays in the self-food sufficiency program of the federal government and the southern region of the country in particular, it is pertinent to analyze the gross margin of farmers being one of the indicators of agricultural sustainability.

MATERIALS AND METHODS

Area of study

The study was conducted in Uyo agricultural zone in Akwa Ibom State in the southern region of Nigeria. The State has six agricultural zones namely: Uyo, Oron, Eket, Ikot Ekpene, Etinan, and Abak. Uyo Agricultural zone consists of the following local government areas; Uyo, Ibesikpo Asutan, Itu, Uruan and Ibiono Ibom Local Government Areas [16]. The average rainfall in the Uyo zone ranges from 2,000mm and 3,000mm per annum. Uyo has two identifiable seasons; which are the rainy and dry seasons. The average annual temperature and relative humidity in Uyo agricultural zone range from 26°C to 27°C and 75% to 95% respectively. The zone is blessed with abundant mineral resources including gravel, silica sand, clay etc. Crops widely grown in the zone are cassava, leafy vegetables such as waterleaf, fluted pumpkin, and garden egg. Others include maize, yam, pepper, plantain, and cucumber. Some households grow cash crops such as oil palm, rubber, and cocoa [16].

Sources of data and instrument for data collection

Primary data consisting of socio-economic features, production and marketing data among others was used in this study. A well-developed structured questionnaire was used to elicit information from the respondents. The respondents were cassava farmers who practiced either sole or mixed cropping system.

Personal interview of the key informants was also conducted to ensure the consistency and accuracy of the data collected.

Sample size selection

Following Cochran [23], a representative sample size from a large population of cassava farmers in the Uyo agricultural zone was obtained using the equation (1) specified as thus:

$$S_n = \frac{z^2\rho(1-\rho)}{D^2} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

where: S_n is the required sample size from a large population; "Z" is the standard normal variate (at 95% confidence interval, type 1 error; 1.96). "P" is the expected proportion of cassava farmers in the population (From the record of the Akwa Ibom State Agricultural Development Programme "AKADEP" about 92% of farmers in the Uyo agricultural zone cultivate cassava either as full-time or part-time farmers). "D" is the absolute error or precision at 5% type 1 error. The sample size is derived as shown in equation 2.

$$S_n = \frac{(1.96)^2 0.92(1-0.08)}{(0.05)^2} = 113 \ldots. (2)$$

To obtain a more representative and proportional sample among selected villages, the sample size was increased to one hundred and twenty (120) cassava farmers.

Sampling procedure and sample size

The first procedure was the use of simple random sampling method to select three LGAs from the six LGAs that constitute the

Uyo agricultural zone. The selected LGAs are Itu, Uyo and Ibesikpo. The second stage involved the use of simple random sampling method to select five villages from each of the previously selected three LGAs. In the selection of the villages, emphasis was given to those villages noted for intensive production of cassava. A total of 15 villages from three local government areas were selected and used for data collection. In the third stage, the simple random sampling method was used to select eight (8) cassava farmers from each of the fifteen villages. A grand total of one hundred and twenty (120) cassava farmers (forty (40) from each of the three LGAs) were selected and used in the study.

Analytical Techniques

The determination of the gross margin of Cassava farmers

The gross margin estimated for smallholder cassava farmers is defined as follows:

GM = Total Revenue – Total variable Cost…. (3)

The total revenue consisted of annual revenue (i.e. Revenue for one full production cycle) from cassava tubers and stem sales. The total variable cost consisted of annual costs of labour, weeding, manure/fertilizer, land clearing, planting materials as well as transportation cost. The estimation of the gross margin serves as a profit index for cassava farmers. As it is conventional, the higher the Gross margin, the more profitable a farm is likely to be, and the smaller the Gross margin, the lesser the profitability.

Determination of factors affecting the gross margin of small – scale Cassava farmers

A multivariate regression model based on the Ordinary Least Squares estimation method was used to determine factors affecting the gross margin of cassava farmers in the region. The choice of the model and estimation method was based on the fact that all dependent variables were greater than zero. Implicitly, the specified model is expressed as thus:

$$GMA = \emptyset_0 + \emptyset_1 AGE + \emptyset_2 EDU + \emptyset_3 MAR + \emptyset_4 HHS + \emptyset_5 EXP + \emptyset_6 SOC + \emptyset_7 CUT + \emptyset_9 FAS + \emptyset_{10} TRA + \emptyset_{11} GEN + \emptyset_{12} CRE + \mu_i \ldots\ldots\ldots\ldots\ldots (4)$$

where:

GMA = Gross margin of cassava farmer (Naira) in one production cycle
AGE = Age of a farmer (years)
EDU = Education of a farmer (years)
MAR = Marital status (dummy: 1 for married and 0 otherwise)
HHS = Household size (number)
EXP = Farming experience (year)
SOC = Member in social organization (year)
CUT = Cost of planting materials (Naira)
FAS = Land size (hectares)
TRA = Transportation cost (naira)
Sex = Sex of a farmer (dummy: 1 for female and 0 otherwise)
CRE = Access to farm credit (amount in Naira)

RESULTS AND DISCUSSIONS

Socio-economic characteristics of cassava farmer

The social and economic characteristics of cassava farmers were analyzed and the results are presented in Table 1. The analyses revealed that the majority of the cassava farmers (70.80%) were females. The farmers' age showed an aging population with the majority (35.80%) greater than 50 years and a mean age of 44.3 years. The majority (67.40%) of the farmers were married. The mean farming experience of 11.9 years was obtained in the sample population. This implies that the majority of the cassava farmers are well experienced and this is a fundamental precursor for innovation adoption. It is also observed that the majority (98.40%) of the farmers are literate with an average year of learning of 13.1 years. Thus, the literacy level of cassava farmers is an enhanced opportunity for them to increase farm productivity. Furthermore, the social capital formation is averaged at six years. This implies that cassava farmers are socially oriented. In addition, an average household size of five members was discovered which means that family labour is important in cassava production. The analysis of the

secondary occupation revealed that all cassava farmers have complementary livelihood sources. This means that the occupational diversification tendency is very high among small-scale farmers in the southern region of Nigeria.

Table 1. The Socio-economic characteristics of cassava farmers

Characteristic	Freq.	%	Characteristic	Freq.	%
Farm income per year (Naira)			***Distribution of Secondary occupation***		
<10,000	0	0.00	Civil Servant	16	13.50
10,001-20,000	37	30.80	Pensioner	38	31.60
20,001-40,000	10	8.30	Artisan	2	1.60
40,001-60,000	10	8.30	Okada /Bus driver /Keke driver	6	5.00
60,001-100,000	37	30.80	Trading on Large Scale	5	4.20
>100,000	26	21.80	Fishing	12	10.00
Total	120	100.00	Petty Trading	41	34.10
Mean	68,694.17		Total	120	100.00
Marital Status of Farmer (number)			***Age Distribution (Years)***		
Single	35	29.20	<20	1	0.80
Married	81	67.50	20 –30	23	19.20
Divorced	1	0.80	31– 40	32	26.60
Widow	3	2.50	41– 50	21	17.60
Total	120	100.00	>50	43	35.80
Farming Experience (Years)			Total	120	100.00
<1	0	0.00	Mean	44.3	
1-5	51	42.40	***Educational Qualifications (years)***		
6-10	26	21.70	No schooling	2	1.60
11-15	8	6.70	Primary	4	3.40
16-20	9	7.60	Secondary	93	77.50
>20	26	21.60	Tertiary	21	7.50
Total	120	100.00	Total	120	100.00
Mean	11.9		Mean	13.1	
Membership of Social Organization (years)			***Mode of farmland acquisition***		
<1	71	59.20	Inheritance	82	68.30
1-5	10	8.30	Leased	22	18.30
6-10	7	5.80	Contract	1	0.80
11-15	6	5.20	Purchase farm	10	8.50
16-20	20	16.60	Cooperative farm	3	2.50
>20	6	4.90	Community farmland	2	1.60
Total	120	100.00			
Mean	6.0		Total	120	100.00
Gender (number)			***Farm Size (hectare)***		
Male	35	70.80	Less than 0.200	14	11.67
Female	85	29.20	0.201 – 0.400	27	22.50
Total	120	100.00	0.401 – 0.600	42	35.00
			0.601 – 0.800	30	25.00
Family Size of Respondents (number)			0.801 – 1.000	5	4.17
1-5	72	60.00	Greater than 1.00	2	1.67
6-10	48	40.00	Total	120	100.00
>10	0	0.00	Maximum	1.50 ha	
Total	120	100.00	Minimum	0.10 ha	
Mean	5.0		Mean	0.59 ha	

Source: compute by author, data from field work 2021.

About 98.33% of the cassava farmers' farmlands were less than one hectare, while the popular mode of land acquisition was through inheritance or family land. However, the average annual farm income of ₦68, 694.17 implies that most of the small-scale farmers in the region are resource-poor. Oladoyin et al., [35] and Akpan et al., [8] have reported similar results previously.

The determination of the gross margin of Cassava farmers

The results in Table 2 shows the frequency and percentage distribution of the gross margin of cassava farmers. The results revealed that majority (35.80%) of the farmers earned gross margin less than ₦10, 000. This clearly justified the small scale nature of cassava farmers in the study area. Only 0.80%

of the farmers generated farm income in excess of ₦100, 000.00. From the distribution of the gross margins, it is obvious that each farmer contribute insignificant share to the market supply of cassava. It is also likely that most cassava farmers devoted good proportion of their produces for home consumption while the minor portion is given out for sales.

Table 2. Gross margin distribution of cassava farmers

s/n	Annual Gross margin range (₦)	Freq.	%
1	Less than 10,000	43	35.80
2	10,001 – 20, 000	20	16.70
3	20,001 – 40, 000	19	15.90
4	40,001 – 60, 000	25	20.80
5	60,001 – 80, 000	10	8.30
6	80,001 – 100, 000	2	1.70
7	Greater than 100, 000	1	0.80
8	Total	120	100.00
9	Mean	29,793.57	

Source: compute by author, data from field work 2021.

Moreover, a mean gross margin of ₦29, 793.57 was estimated for the cassava farmers. However, the result further revealed that all cassava farmer earned positive gross margins. The findings imply that cassava production has potentials to generate stream of incomes and profits if farm resource are harnessed in an efficient manner. Another implication of the result is that, with efficient management technique, farm productivity can be enhanced within the frame work of small scale production.

Determinants of the gross margin of Cassava farmers

The factors that influence the gross margin of cassava farmers are presented in Table 3. The diagnostic statistics of the estimated equation revealed the at R – squared value of 0.5192, which implies that about 51.92% of the variability in gross margins of cassava farmers is connected to the specified explanatory variables.

This means that important variables that affect the gross margin of cassava farmers were included in the specified OLS model. The F – calculated value of 10.60 is statistically significant at 1.00% probability level. This means that the estimated gross margin equation has a goodness of fit. The null hypotheses are not rejected for the Breusch-Pagan test of heteroscedasticity and normality of the residuals. These imply that there are no significant issues of heteroscedasticity and the use of Ordinary Least Squares estimation method is justified. The null hypothesis for the RESET test is not rejected, hence the estimated equation has structural rigidity. The magnitude of the variance inflation factor (VIF) shows that there is no significant presence of collinearity among explanatory variables.

The empirical results indicate that the coefficient of age is positive and significant at 1% probability level. This implies that farmers' age has a strong positive relationship with the gross margin. By implication, it means that a 1 % increase in the age of cassava farmers would increase the gross margin by ₦292.30. The plausible reason for the result could be that older farmers are more experience and hence will adopt techniques that will help them allocate and combine farm resources efficiently. The finding corroborates the report of Akpan et al., [16]; Abebe et al., [1] and Akpan et al., [8].

The result further revealed that the coefficient of education has a positive significant relationship with the gross margin of cassava farmers. The result showed that an increase in a year of formal education will cause about ₦946. 91 increase in the gross margin of cassava farmers. The increase in years of formal education enhances the ability of a farmer to search and use new technology in addition to better market opportunities. Also, access to credit facilities is also enhanced by the level of literacy of the applicant. The findings are in consonance with Akpan et al., (2012); Akpan et al., [16]; Mersha, et al., [30]; Ehinmowo et al., [25]; Akpan et al., [13]; Akpan et al., [19].

The result also revealed that the increase in farmers' household size impacted negatively on their gross margins. The result showed that a number increase in the household size will reduce the gross margins by ₦1,852.83.

Table 3. Factors that affect the gross Margins of Cassava Farmers

Variable	Coefficient	Std. Error	t-ratio	p-value	VIF
Constant	6,083.32	14,393.8	0.4226	0.6734	–
Age of a farmer	292.304	105.311	2.776***	0.0074	2.075
Education	946.908	419.863	2.255**	0.0395	1.275
Marital status	−603.001	4,846.09	−0.1244	0.9012	1.447
Household size	−1,852.83	910.708	−2.034**	0.0444	1.247
Farming experience	41.8836	22.546	1.858*	0.0696	2.524
Socialization	23.8788	13.071	1.827*	0.0725	2.386
Cassava cuttings	0.197564	0.104439	1.892*	0.0612	2.191
Farm size	35,042.3	10,548.2	3.322***	0.0012	2.539
Transportation cost	−2.7563	0.979621	−2.814***	0.0058	2.074
Gender	1,503.45	4,585.02	0.3279	0.7436	1.220
Access to credit	−27,617.9	9,606.35	−2.875***	0.0049	1.035
Diagnostic Tests					
R-squared	0.5192	Normality test		1.9869 (0.8745)	
F(11, 108)	10.6036***	RESET test		1.2934(0.2786)	
Breusch-Pagan test	1.4532 (0.7491)	Adjusted R-squared		0.4703	

Source: from data analysis using Gretl econometric software**.** The asterisks `*`, `**` and `***`shows significance at 10%, 5% and 1% probability level respectively'.

This relationship could be explained by the fact that farmers with large household size will likely met the financial obligations of their large family members rather than farm investment. The decision will likely lower farm investment, leading to lower input productivity and lower yields as well as lower-income and gross margin. Oladeebo and Oluwaranti [34]; Akpan et al., [16]; Mersha, et al., [30]; Abebe et al., [1]; Ehinmowo et al., [25]; Oladeebo and Oluwaranti [34]; Akpan et al., [13]; and Akpan et al., [19] confirm this report previously.

The coefficient of social capital formation is positively related to the gross margin of farmers. The findings revealed that a year increase in social capital formation will lead to about ₦23.88 increase in the gross margin of farmers. This could be as a result of the fact that farmers who belong to social groups have more avenues to interact with others thereby facilitating marketing and innovation usage. The finding agrees with Akpan et al., [16] and Abebe et al., [1].

Furthermore, the result revealed that access to farm credit correlates negatively with the gross margin of cassava farmers. It showed that increased access to farm credit will lead to about ₦27,617.9 decrease in the gross margin of farmers. This perhaps could mean that as farmers' access to farm credits increase; farmers will likely benefit from economies of scale that could lead to increase in the production cost and lesser gross margin. The issues of interest rate charge could also explain the result discussed above. Servicing a high-interest rate would reduce farm total income. Similar submission has been given by Akpan et al., [16].

The finding further reveals that farm size has a significant positive relationship with the gross margin of cassava farmers. It implies that as farmland increases, it leads to an increase in the gross margin by ₦35,042.3, at 1 % level of probability. This can be explained by the fact that an increase in farm size would lead to an increase in output and corresponding gross margins. The finding align with the submission of Mersha, et al., [30]; Oladeebo and Oluwaranti [34]; Akpan et al., [13] and Akpan et al., [19].

The result also reveals that cassava cuttings have a positive relationship with the amount of gross margin earned. The results showed a unit increase in the cassava cuttings will result to the increase of the gross margin marginally by ₦0.19 at 10% probability level. This result implies that as the cassava cuttings increase the gross margin of the farmer also increases. This can be as a result of increase in the plant population. Ridwan *et al.* [39]; Akpan et al.,

[16]; Mersha, et al., [30]; and Ehinmowo et al., [25] have reported similar result.

The result further reveals that an increase in transportation costs has a negative significant effect on the gross margin of the cassava farmers. That is, an increase in the cost of transportation will lead to a decrease in the gross margin. It implies that a unit increase in transportation cost, will leads to a decrease in the gross margin by ₦2.76, at a 1 % level of probability.

The coefficient of farming experience has a positive significant relationship with the cassava farmers' gross margin. A unit increase in the farming experience would trigger about a ₦41.88 naira increase in the farmers' gross margin. An increase in farming experience has a strong correlation with innovation adoption and the educational level of small-scale farmers. A farmer with an increase in farming experience has a very high tendency to avert risks in farming. Aversion of risks and uncertainties reduces production costs, while boosting total farm revenue. The finding is supported by Abebe et al., [1]; Ehinmowo et al., [25]; Akpan et al., [19] and Akpan et al., [8].

CONCLUSIONS

Cassava production in the southern region (rainforest belt region) Nigeria is an integral part of the native culture, hence a veritable tools to combat rural poverty and ensuring self-food sufficiency in the region.

Therefore its sustainability and the future investment are conditioned on developing a sound policy framework based on empirical investigations.

As part of the contributions to develop a sustainable cassava production enterprise in the region, the study analyzed one of the indicators or indexes of sustainability known as the "gross margin".

The findings have revealed that women dominate cassava production population in the region, and the average population of cassava framers are moderately educated with more than a decade of farming experience and are in their active ages.

The findings further identified inheritance as the most popular mode of farmland acquisition while average farmland was less than one hectare and job diversification capacity was prominent.

The nature of the gross margins generated revealed great potential for improvement. The empirical findings revealed farmers' age, education, household, farming experience social capital, transaction cost, access to credit, and farm size including cassava cuttings as importance factors influencing gross margins of cassava farmers in the southern region of Nigeria.

Based on the empirical results, the following recommendations are prerequisites to achieving sustainability in the earned gross margins in cassava production:

(a)Youth should be encouraged to cultivate cassava and participate in its value chain as a business enterprises and to augment the current aging cassava population in the region.

(b)The study showed that advancement in education is an incentive that enhances gross margin among cassava farmers, hence adult education should be encouraged especially among rural based farmers.

(c)Moderate households size should be encourage among cassava farmers through child spacing and family planning programmes for rural based farmers.

(d)Subsidies on cassava cutting is encouraged as this will help to reduce production costs.

(e)Social capital formation is one of the prerequisites for enhancing gross margins, hence this should be encouraged among cassava farmers in the region.

(f)Provision of credit with minimum interest rate to cassava farmers is highly recommended.

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