Comparative analyis of cost and return of improved cassava production in Awka South LGA, Anambra State, Nigeria

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Nwigwe Cecilia[1]
Obot Akaninyene[2]
Ozor Maurice[3]
Nwabueze Loveth[4]

(Corresponding Author)

[1,2,3,4]*Department of Agricultural Economics and Extension, Nnamdi Azikiwe University, Awka, Anambra State, Nigeria.*
[1]*Email: ca.nwigwe@unizik.edu.ng*
[2]*Email: ap.obot@unizik.edu.ng*
[3]*Email: mu.ozor@unizik.edu.ng*
[4]*Email: chinedulinti@gmail.com*

ABSTRACT

IITA developed several new varieties during 1976-1985 for the benefit of cassava farmers. The study had four specific objectives which described the socio-economic characteristics of the cassava farmers, identify the perception of cassava farmers on the IITA improved varieties, ascertain the cost and profitability of cassava production and the constraints faced by the farmers. A multi stage and purposive sampling method was used in the selection of 100 respondents, 50 adopters and 50 non-adopters of IITA intervention in the study area. A structured questionnaire was used to collect data from the respondents and these data were analyzed using gross margin, likert and descriptive analysis (frequency, percentage and mean). The result showed that majority of cassava farmers in the study area were male and majority of them were married. The mean farm size was 1.8ha which implied that production was in a small scale in the study area. The result also revealed the net return for adopters was N230,800 and N146,000 for non-adopters, which denoted that cassava production was more profitable to the adopters of the improved cassava varieties. The result further revealed that the inadequate information on availability of planting materials was the main constraints faced by the cassava farmers. This study concluded that the International Institute of Tropical Agriculture (IITA) improved cassava varieties increased the profitability of cassava production. Therefore, it is recommended that extension agents should train and encourag farmers to use IITA varieties to increase their profitability in the study area.

Keywords: *Adopter and non-adopters, Cassava production, Cassava varieties, Cost and returns, IITA, Profitability.*

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Highlights of this paper

- The findings from this research will aid farmers in adopting improved cassava variety in order impove their productivity and profitability.
- The findings will also help government to develop policies that will ensure farmers to have access to the cassava varieties at sudsidized rate.

1. INTRODUCTION

Agriculture plays a critical role in the development of Nigeria as it provides food, employment, generates revenue and the provision of raw materials for industrial development which makes it occupy a key position in the economy of Nigeria.

Cassava (Manihot spp) is the fourth most important crop for farmers in the tropics after rice, wheat, and sugarcane, consumed by up to a billion people globally. The two significant types of cassava usually cultivated in West Africa are the sweet cassava (Manihot palmata) and the bitter cassava (Manihot utilisima). Among the cash crop mostly planted by farmers in Nigeria, cassava occupies a central position as a crop with enormous potentials which serves as food for the populace, components in livestock feeds and raw materials for industries. According to Aderinto, et al. [1]; Ajani and Onwubuya [2], almost every household in rural Nigeria grows cassava on small farms as one of the staple food crops to feed families and supply the local markets. Cassava is suitable for the making of fufu, garri, flour, tapioca, animal feed, ethanol, starch, gum, glucose, adhesive for pharmaceutical industries and flour for confectioneries industries. Its roots are eaten as food, fed to stock, or used in the manufacture of starch, Eguono [3] and the leaves are sources of vitamins, minerals, and proteins.

Nigeria stands out as the world's largest producer with increased production. In order to ensure that the cassava production in the country meets the local needs and also generate foreign exchange to the economy, the government of Nigeria and international organizations embarked on several programmes like the Nigerian Presidential Initiative on cassava production and export in 2002 which called for increased production to meet both local and export markets [4].

The cassava production system in Awka south and elsewhere in Nigeria is characterized by smallholders that cultivate not more than 2 hectares of cassava (average of 0.5 ha) and is subsistent in practice, primarily grown for the traditional food market. Any excess cassava is either processed on the farm or sold to local processors. To reverse this trend, the International Institute of Tropical Agriculture (IITA) and National Roots Crop Research Institute (NRCRI) in Nigeria led the development of Improved Cassava cultivars through their breeding programmes to obtain higher quality yields that are pest and diseases resistant, with early maturity and can adapt to wide ranges of ecological conditions and farming systems to help increase the farmers yields and also their profits. IITA in 2017 introduced more than 40 CMD-resistant and high-yielding cassava varieties and promoted to farmers in 'intervention villages' and the establishment of many cassava processing centers where modern processing technologies were introduced and facilitated between 2002 and 2010 by ICP; in addition, participants in intervention villages were trained on crop management.

This necessitated the need to answer the following research questions:

i) What are the socio-economic characteristics of cassava farmers in Awka South Local Government Area of Anambra State?
ii) What are the perceptions of cassava farmers on the IITA improved varieties?
iii) What is the cost and return of cassava farming between adopters and non-adopters?
iv) What are the constraints associated with adoption of the improved the IITA varieties in Awka South Local Government Area of Anambra State?

1.1. Objectives of the Study

The broad objective of this study was to carry out a comparative cost and return analysis of cassava production by adopters and non- adopters of improved cassava varieties among farmers in Awka South, Anambra State. The specific objectives were to:

i. Describe the socio-economic characteristics of cassava farmers in Awka South Local Government Area of Anambra State;
ii. Identify the perceptions of cassava farmers on the IITA improved varieties;
iii. Ascertain the cost and return of cassava production among the adopters and non-adopters.; and
iv. Identify the constraints associated with adoption of improved the IITA varieties in Awka South Local Government Area of Anambra State.

1.2. Significance of the Study

Low productivity in agriculture is blamed on poor adoption of agricultural innovations. It is expected that this study will add to the available literatures.

2. LITERATURE REVIEW

2.1. Theoretical Framework

Two theories inform this study; they are the theory of production and cost theory.

2.1.1. Theory of Production

The theory of production explains the transformation of physical inputs or raw materials (e.g. labour and capital) into outputs or finished products. According to Agom, et al. [5], in economics, the production transformation expresses itself mathematically using the production function.

2.1.2. Production Function

The production function is the mathematical expression, which indicates the maximum output that a producer can produce, given available physical input [5].

The mathematical expression of the crop production function is:

$$Qt = f(mt, zt, xt)$$

Where Qt denotes agricultural productivity or yields per hectare of a specific crop, mt represents farmers' characteristics, zt represents climatic variables, xt represents endogenous variables and the sub-index t, represents the time or the year observed.

2.1.3. Theory of Cost

According to Ojiako, et al. [6], the cost of production at a given time is dependent on the prices of the factor inputs, the quantity of output produced and the production period. Mathematically, it is as follows;

$C = f(X, T, P, K)$

Where; C = Total cost.

X = Quantity of output.

T = Technology.

P = Prices of the factor input.

K = Fixed factors.

Afolami, et al. [7] using descriptive analysis to assess the impact of adoption of improved cassava varieties on annual income from cassava production found out that there was a significant difference in farm size of adopters (2.9ha) and non-adopters (3.2ha). Despite the difference in the farm size, the profit generated by the adopters was ₦210, 967.2 while that of non-adopters of the technology was ₦155, 571.4 with significant mean difference of ₦55, 395.8. This implied that the adopters of improved cassava varieties had a significantly higher annual income than the non-adopters and consequently are able to spend more (₦119, 120.6) on agricultural production than the non-adopters with annual expenditure value of ₦107,790.6. This result was consistent with other related studies on the impact of agricultural technologies on poverty [8-10].

Itam, et al. [11] examined the determinants of cassava production and profitability in Akpabuyo local government area of Cross River State, Nigeria. They found out that cassava farming with improved varieties was more profitable to the adopters with a total variable cost per hectare ₦56,455.00, total revenue ₦134,005.00 and with a gross margin of ₦77,550.00, while the total variable cost for non-adopters was ₦36,850.00 with a total revenue of ₦73,410.00 and a gross margin of ₦36,560.00 in the study area. Cost of labour and fertilizer on the adopters accounted for more than 60% of the total variable cost, while cost of cassava cuttings and fertilizer were the major costs of production for non-adopters. The implication was that, the adopters of improved cassava varieties made more profit, though they incurred more production cost than the non-adopters.

3. METHODOLOGY

3.1. Research Design

The research design adopted for this research was a descriptive research design.

3.2. Area of Study

The study was carried out in Awka South Local Government Area which is one of the Local Government areas in Anambra State. Awka South Local Government Area (LGA) is made up of nine towns, namely, Amawbia, Awka, Ezinato, Isiagu, Mbaukwu, Nibo, Nise, Okpuno and Umuawulu.

Isiagu community is a town in Awka south local government area. It is one of the agricultural areas in the state with rich fertile soil for farming. The area is blessed with fertile and favourable climate with an annual temperature of 28^{0}C which promotes the production of both food and cash crops such as cassava, yam, plantain, banana, maize, cocoyam and oil palm. Subsistence farming is predominant in the area and most of the peasant farmers form cooperatives to enable them source for credit facilities, input and labour.

3.3. Sampling Technique and Simple Size

Multistage sampling procedure was used to select one hundred (100) respondents. The first stage involved the purposive selection of two communities based on the intensity of cassava production. In the second stage, the farmers were stratified into beneficiaries and non-beneficiaries. The third stage involved the random selection of 50 farmers from each of the community in the ratio of 25 beneficiaries and non-beneficiaries making it a total of 50 beneficiaries and 50 non-beneficiaries respectively. In all, a total number of one hundred (100) cassava farmers were interviewed.

3.4. Instrument for Data Collection

Primary data for this research were collected through the administration of a structured questionnaires and personal interview schedules.

3.5. Method of Data Analysis

Objective (i) was analyzed using descriptive statistics such as mean, percentage and frequency.

Objective (ii) & (iv) were analyzed using a 4 points likert scale of agree, disagree, strongly agree and strongly disagree and;

Objective [iii] was analyzed using budgetary method.

3.6. Specification of Model

Objective [iii]: Gross margin analysis is a simple tool to assess the financial performance of an enterprise. Profitability was estimated using gross margin tool which measured the difference between total cost (TC) and the total revenue (TR). Net return is given as TR-TC.

Gross margin is the difference between the gross farm income (total revenue) and the total variable cost. It is given as;

$$GM = TR - TVC$$

Where;

GM = Gross Margin

TR = Total Revenue

TVC = Total Variable Cost

Since fixed cost is negligible in subsistence farming, the profitability of adopters and non-adopters of improved cassava varieties was explained by the gross margin analysis.

4. RESULTS AND DISCUSSION

4.1. Socio-Economic Characteristics of Cassava Farmers Involved in Awka South LGA

4.1.1. Sex

The result (Table 1) showed that majority (68.0%) of the farmers that benefited from the IITA intervention programme were male, and likewise majority (58.0%) of the farmers that were non-beneficiaries were male. This implies that male play more active role in cassava production than female in the study area.

4.1.2. Marital Status

The study found that majority (50.0%) of the beneficiaries were married, while for non- beneficiaries 58.0% were married. This could be responsible for the relatively large household size which contributed to the family labour. This finding corroborates [12] who reported that there were more married farmers in his study areas.

4.1.3. Age

The study revealed that greater proportion (40.0%) of the farmer's age fall within 40 – 49years with mean age of 46.6 for beneficiaries, while majority (30.0%) of the non-beneficiaries' age fall within 30 – 39 years with mean age of 38.6. It implies that farmers were in their active age and can actively contribute to cassava production.

4.1.4. Level of Education

The result (Table 1) shows that (38.0%) of the beneficiaries attended primary school, (28.0%) attended secondary school and (12.0%) attended tertiary education. Only (22.0%) had no formal education, while for non- beneficiaries (26.0%) of the farmers had no formal education, (42.0%) attended primary school, (28.0%) attended secondary school and (4.0%) attended tertiary education. The average years of formal education was 8 years. The implication is that

many of the farmers did not complete secondary school. This implies that many of them may not have the potentials to adopt new technologies and innovation. This finding will be a source of concern to the extension workers during dissemination of extension packages. This finding, however, is at variance with Alawode and Abegunde [13] whose studies reported that more than half of the farmers in their study areas were literate.

Table 1. Socioeconomic characteristics of cassava farmers.

Variables	Frequency (Percentage) beneficiaries	Mean	Frequency (Percentage) non-beneficiaries	Mean
Gender				
Male	34 (68)		29(58)	
Female	16(32)		21(42)	
Marital status				
Single	12(24)		7(14)	
Married	25(50)		29(58)	
Divorced	3(6)		3(6)	
Widow	10(20)		11(22)	
Age distribution (Years)				
20-29	4(8)		9(18)	
30-39	14(28)	46.6	15(30)	38.6
40-49	20(40)		14(28)	
50-59	8(16)		8(16)	
>59	4(8)		4(8)	
Educational qualification				
No formal education	11(22)		13(26)	
Primary	19(38)	8	21(42)	6
Secondary	14(28)		14(28)	
Tertiary	6(12)		2(4)	
Primary occupation				
Farming	20(40)		32(64)	
Trading	16(32)		11(22)	
Civil servant	9(18)		4(8)	
Student	5(10)		3(6)	
Household size				
1-5	25(50)		17(34)	
6-10	21(42)	6	30(60)	6
10-15	4(8)		3(6)	
Farm size(Hectare)				
0-1	25(50)		29(58)	
1-2	13(26)	1.8	10(20)	
2-3	6(12)		8(16)	
>4	6(12)		3(6)	
Farming experience (Years)				
1-10	5(10)		30(60)	
11-20	24(48)	15	5(10)	12
21-30	10(20)		12(24)	
>30	11(22)		3(6)	

4.1.5. Occupation

The result (Table 1) shows that (40.0%) of the beneficiaries were farmers, (32.0%) traders, (18.0%) were civil servants and (10.0%) were still students while (64.0%) of the non-beneficiaries were farmers too, (22.0%) were traders, (8.0%) were civil servants and (6.0%) were students. The study revealed that majority of the farmers occupation was farming.

4.1.6. Household Size

The study revealed that majority (50.0%) of the- beneficiaries' household size ranges from 1-5 people, 6-10 people had share of (42.0%) and above 10 were (8.0%). Equally, the average household size was found as 6-10 people, while for non- beneficiaries 1-5 persons were (34.0%), 6-10 were (60.0%) and greater than 10 were (6.0%). Mean household size was equally 6 persons. The implication is that this household size is large enough to supply cheap family labour for production in the study area. The finding confirms Ajani [14] who observed that rural households in Nigeria are characterized by large family size with high dependency ratio. The author reiterated that large household size could serve as source of labour for farming activities.

4.1.7. Farm Size

The result (Table 1) shows that majority (50.0%) of the beneficiaries' farm size ranges from 0.41 -1ha, while others ranged from >1 – 2 ha (26.0%) and greater than 2ha (12.0%). The mean farm size was found as 1.8 ha. This implies that cassava production is in small-scale in the study area. They simply use simple farm tools like hoes and cutlasses.

4.1.8. Farming Experience

The result (Table 1) shows that majority (48.0%) of the beneficiaries' farm had experience of 11-20 years. Mean farming experience was 15 years. It means that farmers had enough experience in cassava production.

4.2. Distribution of Respondents According to Perceptions on IITA Improved Varieties

Table 2. Distribution of respondents according to perceptions on IITA improved varieties.

S/N	Perceptions	Beneficiaries mean (X)	Decision rule	Non-beneficiaries mean (X)	Decision rule
1	Higher yields	2.68	Agree	2.56	Agree
2	Greater resistance to pests and diseases	2.74	Agree	2.32	Disagree
3	Increased income	2.82	Agree	2.56	Agree
4	Survive poor soil condition	2.12	Disagree	2.32	Disagree
5	Requires less attention	2.46	Disagree	2.48	Disagree
6	Tolerates weed infestation	2.52	Agree	2.22	Disagree
7	Better nutritive value	3.10	Agree	2.12	Disagree
8	Reduced cost of production	3.24	Agree	2.44	Disagree
9	Withstands adverse weather conditions	2.62	Agree	2.62	Agree
10	Improved storage quality	2.42	Disagree	2.22	Disagree
11	Early maturity	3.22	Agree	2.82	Agree

The farmers' perceptions on the IITA improved cassava varieties were analyzed from the information generated from the field work. The study used 4-points likert scales to capture their responses which was later interpreted as greater than or equal to 2.5 (Agree) and less than 2.5 (Disagree). Based on the eleven (11) items of perceptions on the IITA improved cassava varieties. Table 2 shows that 8 were above the mean threshold of 2.5 while 3 were below mean threshold of 2.5 on the beneficiaries' side, implying that the beneficiaries have the perception that the IITA improved cassava varieties have higher yields, mature early allowing them to crop 2 times a year thereby increasing their income, are resistant to pests and diseases thereby reducing their cost of production, and have better nutritive value than local varieties. They are also of the perception that the IITA improved varieties withstand adverse weather conditions thereby making them resistant to the effects of climate change. This explains their acceptance of the improved cassava varieties. On the side of the non-beneficiaries, 3 perceptions were above the mean threshold of 2.5 while 8 were below the mean threshold of 2.5. This implies that the non-beneficiaries believe that the IITA improved

cassava varieties do not have better pests and diseases resistance potential than their local varieties. Even though they believe the improved varieties give higher income, they are of the opinion that the local varieties have better nutritive value and better storage quality than improved varieties. This explained why they resisted adopting the improved varieties. They believe their local varieties requires less attention and tolerates weed infestation better. They also believe their local varieties survive poor soil conditions better than the improved varieties. All these add up to the reason they preferred their local varieties to the IITA improved varieties.

4.3. Average Cost and Return Per Hectare for Non-Beneficiaries to Estimate Profitability of Cassava Production

Table 3a. Average cost and return per hectare for non-beneficiaries to estimate profitability of cassava production.

Item	(₦)	(₦)
Gross return / ha		
Cassava tuber (Consumption+ sales)		290,000
Cassava cuttings		50,000
Total gross return (A)		340,000
Variable cost		
Labour	470,000	
Cassava cuttings	12,000	
Herbicide	9,000	
Harvesting	25,000	
Transportation	45,000	
Fertilizer	24,000	
Disease and pest control	18,000	
Total variable cost (B)	180,000	
Gross margin (A+B) = C		160,000
Depreciation on fixed cost		
Land (Cost of rent)	10,000	
Hoes	1,000	
Cutlasses	1,500	
Baskets/Sacks	1200	
Total depreciation on fixed cost (D)	13,700	
Net return (C-D)		146,000

Table 3(a) revealed Cost and return per hectare for non-beneficiaries and estimated the profitability of cassava production. The gross return was ₦340,000/ ha and it emanated from sales of cassava tuber (consumption+ sales) and cassava cuttings. Items of variable cost were labour (₦47,000), cassava cuttings (₦12,000), herbicide (₦9,000) harvesting (₦25,000) transportation (₦45,000), fertilizer (₦24,000), disease and pest control (₦18,000). Total variable cost was ₦180,000 and the gross margin was ₦160,000. Depreciation was factored in. Items of depreciation were land (cost of rent), hoes, cutlasses, and baskets/ sacks. Total depreciation based on straight line method was ₦13,700. The net return was then calculated to be ₦146,000. This implies that cassava production is profitable.

4.4. Average Cost and Return Per Hectare for Beneficiaries to Estimate Profitability of Cassava Production

Table 3(b) revealed Cost and return per hectare for non-beneficiaries and estimated the profitability of cassava production. The gross return was ₦460,000/ ha and it emanated from sales of cassava tuber (₦390,000) (consumption+ sales) and cassava cuttings (₦90,000). Items of variable cost were labour (₦45,000), cassava cuttings were giving to farmers free of charge herbicide (₦9,000) harvesting (₦45,000) transportation (₦80,000), fertilizer (₦24,000), disease and pest control (₦12,000). The cost of controlling pests and diseases is lower because IITA varieties were resistant to disease, the cost incurred in this regard was majorly spent on pest control. Total variable

cost was ₦215,000, this showed an increase over what obtained in the case of non-beneficiaries and the gross margin was ₦245,000, this value is high than that of non-beneficiaries. Depreciation was factored in. Items of depreciation were land (cost of rent), hoes, cutlasses, and baskets/ sacks. Total depreciation based on straight line method was ₦14,200. The net return was then calculated to be ₦230,800. This implies that cassava production is more profitable using the IITA improved varieties.

Table 3b. Average cost and return per hectare for beneficiaries to estimate profitability of cassava production.

Item	**(₦)**	**(₦)**
Gross return / ha		
Cassava tuber (Consumption+ sales)		390,000
Cassava cuttings		70,000
Total gross return(A)		460,000
Variable cost		
Labour	45,0000	
Cassava cuttings	-	
Herbicide	9,000	
Harvesting	45,000	
Transportation	80,000	
Fertilizer	24,000	
Disease and pest control	12,000	
Total variable cost (B)	215,000	
Gross margin (A+B) = C		245,000
Depreciation on fixed cost		
Land rent	10,000	
Hoes	1,200	
Cutlasses	1,500	
Basket/Sack	1,500	
Total depreciation on fixed cost (D)	14,200	
Net return (C-D)		230,800

4.5. The Constraints Associated with Cassava Production using IITA Improved Cassava Varieties

The constraints associated with cassava production using IITA improved cassava varieties was captured on a 4-points Likert scale presented in Table 4. Table 4 reveals that Inadequate credit facility (X = 2.86), Inadequate information on availability of planting materials (X = 3.22, Inadequate market information (X = 2.88), Land tenure system (X = 2.68), Poor government support (X = 3.12), High technical involvement (X = 3.02, Inadequate storage facility (X = 2.54), Low extension coverage (X = 2.98), Cultural bias (X = 2.74), High risks/uncertainty (X = 2.87), Inadequate finance (X = 2.89) and high demand for agrochemicals (X = 2.64) were the perceived constraints to the adoption of improved IITA cassava varieties. Inadequate information on the availability of planting materials, poor government support and high technical involvement were the most three perceived constraints to adoption of the IITA improved varieties.

5. SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1. Summary of Findings and Conclusion

The study examined the assessment of International Institute for Tropical Agriculture intervention on cassava production in Awka South Local Government Area, Anambra State. The study revealed that cassava production in the study area is profitable and the adopters earned more profits and incurred more costs than the non -adopters of the improved cassava varieties.

Table 4. The constraints associated with cassava production using IITA improved cassava varieties.

S/N	Perceived constraints	Mean	Decision rule	Ranking
1	Inadequate credit facility	2.86	Agree	8th
2	Inadequate information on availability of planting materials	3.22	Agree	1st
3	Inadequate market information	2.88	Agree	6th
4	Land tenure system	2.68	Agree	10th
5	Poor government support	3.12	Agree	2nd
6	High technical involvement	3.02	Agree	3rd
7	High demand for agrochemicals	2.64	Agree	11th
8	Inadequate storage facility	2.54	Agree	12th
9	Inadequate processing facility	2.22	Disagree	15th
10	Low extension coverage	2.98	Agree	4th
11	Cultural bias	2.74	Agree	9th
12	Does not do well in local conditions	2.42	Disagree	14th
13	High risks/Uncertainty	2.87	Agree	7th
14	Low consumer preference	2.44	Disagree	13th
15	Inadequate finance	2.89	Agree	5th

Based on the results from the findings of this study, it is concluded that most activities of cassava production in the area of study were undertaken by mostly males, who are married, educated and have experience in cassava production. This study also concluded that the beneficiaries believe IITA improved cassava varieties gave them higher yields, increased their income, reduced their cost of production, and improved the nutritive value of their output. From the study, it was evident that the adoption of improved cassava varieties had considerable influence on the welfare of farmers in that it improved the incomes and farm yields of cassava farmers, and also reduced their labour costs. Therefore, adoption of improved cassava varieties for planting was economically beneficial to cassava farmers in the study area. Adoption of improved cassava varieties is therefore pro-poor in nature with the adopters having a lower poverty rate than the non-adopters. It could be concluded also credit facility, inadequate information on availability of planting materials, inadequate market information, land tenure system, poor government support, high technical involvement, inadequate storage facility, low extension coverage, cultural bias, high risks/uncertainty, inadequate finance and high demand for agrochemicals were the perceived constraints to the adoption of improved IITA cassava varieties in the study area.

5.2. Recommendations

Based on the finding of this study and the conclusion drawn. The following policy recommendations were made:

i. Extension agents should train and encourage farmers to use the IITA cassava variety to increase their yield and maximise profits.
ii. Stockholders should make funds and machineries available to enable farmers to operate mechanized and commercial farms.
iii. Research should intensify effort to discover more usage of cassava to stabilize the market price.
iv. The International Institute of Tropical Agriculture cassava varieties should be made available to the farmers at affordable price.
v. Extension delivery systems in the area should intensify their efforts to ensure that all cassava farmers in Awka South Local Government area gain access to improved cassava cuttings as this will invariably improve the economic well-being of cassava farmers in the area.

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