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ASSESSMENT OF ADOPTION OF IMPPROVED CASSAVA PRODUCTION TECHNOLOGY AMONG LARGE SCALE FARMERS IN ANAMBRA STATE, NIGERIA

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Abstract
The study asssessed the adoption of improved cassava production technologies among large scale farmers in Anambra state, Nigeria. Specifically, the study determined the level of awareness of high-yielding cassava production technologies among farmers, ascertained the extent of adoption of the identified high yielding cassava production technologies among the farmers and identify the major constraints limiting the adoption of high-yielding cassava production technologies among the cassava farmers. The population for the study comprised all cassava farmers' in Anambra State. Purposive and simple random sampling techniques were used to select one hundred and fifty (150) cassava farmers for the study. Data were collected from primary sources, while mean statistics was used for data analysis. The findings showed that the level of awareness of high yielding cassava production technologies were mainly on improved cassava varieties ($\bar{x}$ = 4.00) use of healthy improved stem cuttings ($\bar{x}$= 3.95) and the least was on mechanized cassava production practices ($\bar{x}$= 0.88). The adoption index was high at 80% and the extent of adoption of the identified high yielding cassava production technologies were mainly on timely planting ($\bar{x}$= 3.70) use of healthy cassava stem cutting ($\bar{x}$= 3.67), and the least technology were high cost of improved cassava planting materials ($\bar{x}$= 3.60, SD= 0.480) high cost of fertilizer ($\bar{x}$= 3.55, SD= 0.473) and poor access to markets ($\bar{x}$ =1.80, SD=0.234). It was recommended that the financial institutions should provide accessible and affordable agricultural credit to large-scale cassava farmers. The government should develop measures to reduce the cost of improved cassava stems, and other essential inputs. Input subsidies or targeted support programmes should be made available to genuine large-scale cassava farmers to encourage sustained adoption.

Keywords: Assessment, Improved, technologies, Adoption, cassava, production.

1.0 Introduction

Cassava (*Manihot esculenta Crantz*) is one of the most important root and tuber crops cultivated in tropical and subtropical regions of the world. In Nigeria, cassava occupies an important position in the agricultural economy because it contributes to food security, employment generation, household income and raw materials for agro-processing industries. The importance of cassava has also increased with the growing demand for processed products such as garri, high-quality cassava flour, starch, chips and other industrial derivatives (Wikipedia, 2026).

The extent or intensity with which farmers apply a technology is another important dimension of adoption. Sanusi et al. (2024) argued that adoption should not only be viewed as whether or not a farmer uses a technology, but also in terms of the proportion of farmland devoted

to the technology. Similarly, Adah, et al., (2024) examined improved production technologies among contract and non-contract cassava farmers in Kogi State.

At the national level, recent research further shows that adoption is influenced by both farmer characteristics and characteristics of the technology itself. Akinwole, et al., (2025) found that education, farm size, extension contacts and market-related characteristics were important drivers of the adoption and intensity of adoption of bio fortified cassava varieties in Southwest Nigeria. They also found that farmers placed considerable importance on traits such as yield, maturity period, root size, pest and disease resistance and market demand. These findings suggest that farmers' adoption decisions are not determined by technology availability alone but also by the expected economic and production benefits of the technology. This creates a need to determine the extent to which large-scale cassava farmers in Anambra State are aware of, adopt and utilize available high-yielding cassava production technologies. Understanding these issues will provide useful information for agricultural extension personnel, policymakers, researchers, input suppliers and other stakeholders seeking to improve cassava productivity and commercialization in Anambra State. Therefore, this study focuses on the adoption of high-yielding cassava production technologies among large-scale farmers in Anambra State, Nigeria.

2.0 Objectives of the study

The broad objective was to assess adoption of improved cassava production technologies among large scale farmers in Anambra State, Nigeria. The specific objectives were to:

1. determine the level of awareness of high-yielding cassava production technologies among farmers.
2. ascertain the extent of adoption of the identified high yielding cassava production technologies among the farmers.
3. identify the major constraints limiting adoption of high-yielding cassava production technologies among cassava farmers.

3.0 Methodology

The study was carried out in Anambra State, Nigeria. The State is located between latitudes $6^{0}45^{1}$ and $5^{0}44^{1}$N and longitudes $6^{0}36^{1}$ and $7^{0}29^{1}$E. Anambra State occupies an area of 4,416 sq. km and has a 2016 population projection of 5,527,809 (National Bureau of Statistics (NBS), 2018). Anambra State consists of twenty one (21) Local Government Areas (LGAs), 177 autonomous communities and four (4) agricultural zones namely, Onitsha, Aguata, Awka and Anambra agricultural zones. The State has great potential for agricultural development. The climate of the area is comparatively good and it is favourable for crop production, livestock farming, fishery and agro-forestry. Crops, livestock and fisheries are the main stay in the farming system of the State.

The population for the study comprised all cassava farmers' in Anambra State. A multi-stage sampling technique was used to select one hundred and fifty (150) respondents for the study. In the first (1^{st}) stage, a purposive sampling method was used to select three (3) zones (Awka, Aguata, Anambra) based on their prominence in cassava production and also the government projects are more active in these zones. The second (2^{nd}) stage involved a random sampling technique of five (5) extension blocks each from the three (3) selected zones to get fifteen (15) blocks. The third (3^{rd}) stage involved selection of one (1) circle from the 15 selected blocks to get a total of fifteen (15) circles. The fourth (4^{th}) stage involved a simple random selection of ten (10) cassava farmers each from the 15 circles to get a total of 150 respondents. Data for the study were collected from primary and secondary sources.

4.0 Results and Discussion

4.1 The level of awareness of high yielding cassava production technologies among the farmers

Table 1 indicates that the farmers had varying levels of awareness across the different technologies. This indicates that the farmers were particularly familiar with the technologies directly associated with improved planting materials and basic agronomic practices. The very high awareness of improved/high-yielding cassava varieties is consistent with recent research in Anambra State. Adejoh, et. al, (2025), in their study of cassava production technology adoption in Ayamelum LGA of Anambra State, found that improved stem cuttings and plant spacing were among the technologies widely adopted by farmers. Their study also showed that education and access to credit significantly influenced technology adoption, suggesting that farmers' exposure to information and resources can facilitate the movement from awareness to actual adoption. The finding is also supported by the 2025 study by Udemezue et al., which examined adoption of improved cassava varieties and good agronomic practices in Anambra State. The researchers reported a high adoption index of 78% for improved cassava varieties, with TME-419 being particularly prominent. However, adoption of some agronomic practices was much lower; for example, only 16.0% adopted recommended planting distance and 2.2% adopted fertilizer application. This suggests that farmers may be highly aware of improved varieties while having substantially less awareness or uptake of some complementary production practices.

Table 1: Distribution of cassava farmers according to level of awareness of improved cassava production technologies (n=150)

Improved cassava technologies	Mean ($\bar{x}$)	S.D	Rank
Improved/high yielding cassava varieties	4.00*	0.614	1st
Use of healthy, improved stem cuttings	3.95*	0.621	2nd
Appropriate spacing	2.88*	0.711	3rd
Timely planting	2.55*	0.766	4th
Proper land preparation	2.20	0.829	5th
Recommended fertilizer application	1.45	0.878	6th
Appropriate weed control methods	1.33	0.910	7th
Integrated pest and disease management	1.12	0.955	8th
Proper harvesting time	1.00	0.972	9th
Proper cassava stem storage	0.98	0.900	10th
Soil fertility management	0.90	0.888	11th
Mechanized cassava production practices	0.88	0.870	12th

Source: Field Survey (2026).*= **$\bar{x} \geq 2.50$ = high level participation; SD= standard deviation.**

This finding agrees with Adah, et. al, (2024), who studied improved cassava production technologies among contract and non-contract farmers in Kogi State. Their study included improved varieties, recommended planting time, recommended planting space and depth, herbicide use and tractorization among the technologies assessed. They found out that improved varieties and recommended planting practices were among the technologies considered in the adoption process, although adoption levels differed considerably between contract and non-contract farmers.

The relatively high awareness of appropriate spacing (mean = 2.88) and timely planting (mean = 2.55) also corresponds with findings from Owigho, et. al. (2023) in Delta State, their study reported adoption of planting space and planting date at moderate levels, with planting date adopted by 55.6% and planting space by 54.5% of farmers. This suggests that basic agronomic practices such as when to plant and how to space cassava plants are relatively familiar to farmers, possibly because these practices are routinely discussed through farmer-to-farmer interaction and extension activities. However, the table shows a substantial decline in awareness from timely planting to proper land preparation (mean = 2.20). This indicates that although farmers may know when to

plant, their awareness of the recommended procedures for preparing the land may be less pronounced. Michael (2022) similarly reported that adoption of recommended cassava production practices remained limited among farmers in Bwari and Kuje, Abuja, partly because some technologies were complex, funds were insufficient and farmland was limited or unevenly distributed. The study therefore recommended technologies that are simple, affordable and easier for farmers to adopt.

The low mean scores indicates that awareness is concentrated around improved varieties and simple planting practices, while more technical, input-intensive and mechanized technologies receive considerably less attention. The low awareness of fertilizer application is consistent with the findings of Owigho et al. (2023), who recorded relatively low adoption of fertilizer application, disease control and pest control among cassava farmers in Delta State. Their study recorded fertilizer application at about 40.7%, disease control at 36.7% and pest control at 27.9%. Although improved cassava varieties were highly adopted, adoption of fertilizer application was only 2.2%, while planting distance was 16.0%. Also, high cost of cassava cuttings, limited access to credit, inadequate knowledge of weather-related problems, pest and disease pressure, and limited extension services were identified as important constraints. The low awareness of mechanized cassava production practices (mean = 0.88) may reflect the relatively high capital and technical requirements associated with mechanization. This finding is relevant to the study population because even though the present study focuses on large-scale farmers, mechanized production requires access to machinery, finance, technical services and appropriate farm infrastructure. In a 2026 study, Onyemekonwu, et al., found that poor extension contact and attributes of the technologies were serious constraints to cassava technology adoption, they also reported that education, income, cooperative membership and extension contact were significantly related to adoption. The low awareness of proper harvesting time, stem storage and soil fertility management may therefore indicate an important information gap among the farmers.

4.2 The extent of adoption of the identified Improved cassava production technologies among farmers

The result shows an overall adoption index of 80%, indicating that the respondents had a high level of adoption of the identified high-yielding cassava production technologies.

The high adoption of improved/high-yielding cassava varieties agrees with Udemezue, et al, (2025), who studied adoption of improved cassava varieties and good agronomic practices in Anambra State. Their study found a high adoption index of 78% for improved cassava varieties, with TME-419 particularly prominent because of its high yield and disease resistance. They however, observed that adoption of individual agronomic practices varied considerably. This finding is very close to the 80% adoption index obtained in the present study and therefore provides strong support for the results.

The high adoption of healthy cassava stem cuttings (mean = 3.67) is also consistent with the findings of Udemezue et al. (2025), who reported that 54.1% of farmers adopted the use of improved cassava cuttings in Anambra State. The difference between the present result and their percentage could be associated with differences in the sampling population, measurement scale and study design. Nevertheless, both studies demonstrate the importance attached by farmers to improved planting materials. The high adoption of recommended planting spacing (mean = 3.57) and timely planting (mean =3.70) is supported by Adah, et. al., (2024) in their study of improved cassava production technologies among contract and non-contract farmers in Kogi State. They found that recommended planting time was adopted by 49.2% of pooled respondents, while recommended planting space and depth had an adoption rate of 50.0%. Among contract farmers,

adoption was considerably higher, with 82.5% adopting recommended planting time and 91.7% adopting recommended planting space and depth.

Table 2: Distribution of cassava farmers according to the extent of adoption of the identified improved cassava production technologies (n=150).

Variables	Mean ($\bar{x}$)	SD
Timely planting	3.70*	0.683
Use of healthy cassava stem cutting	3.67*	0.698
Use of improved/high yielding cassava varieties	3.61*	0.648
Recommended planting spacing	3.57*	0.577
Recommended fertilizer application	3.48*	0.757
Proper weed control	3.33*	0.712
Pest and disease management	3.18*	0.724
Appropriate harvesting time	2.40	0.796
Soil fertility management	2.22	1.108
Mechanized land preparation	1.96	1.008

Source: Field Survey (2026). ***= M ≥ 2.50 = major reason; SD = standard deviation.**

The high adoption of recommended fertilizer application (mean = 3.48) in the present study is particularly noteworthy. It indicates that fertilizer use is relatively well established among the farmers studied. This finding is in contrast with the result of Udemezue et al. (2025) in Anambra State, where only 2.2% of farmers adopted fertilizer application. The difference may be explained by the fact that the present study focuses on large-scale farmers, who may have greater financial capacity, access to inputs and commercial incentives to use fertilizer than the smaller-scale farmers included in the Udemezue et al. study.

Evidence from Iwuagwu, et. al (2024) further demonstrates the importance of fertilizer management in cassava production in Anambra State. Their experiment at the Nnamdi Azikiwe University farm in Awka evaluated different fertilizer types and improved cassava accessions and examined their effects on agronomic characteristics, yield and disease incidence. Thus, the relatively high adoption of fertilizer application observed in the present study may reflect farmers' recognition of the role of nutrient management in improving cassava productivity. Proper weed control also recorded a relatively high adoption mean of 3.33, indicating that weed management is an important component of farmers' production practices. This finding is consistent with the literature showing that weed management is an important part of improved cassava production.

The adoption of pest and disease management recorded a mean score of 3.18, which is also above the 2.50 cut-off. This suggests that farmers recognize the importance of protecting cassava from pests and diseases. This result agrees with Udemezue et al. (2025), who reported relatively high adoption of pest and disease control, at 67.9%, among cassava farmers in Anambra State. The adoption of disease-resistant varieties may also contribute to farmers' interest in managing pests and diseases because disease resistance is an important trait in improved cassava varieties. However, adoption declined substantially for appropriate harvesting time, which recorded a mean score of 2.40. Similarly, soil fertility management recorded a relatively low mean of 2.22. This suggests that despite the relatively high adoption of fertilizer application, broader soil fertility management practices are not being adopted to the same degree. This distinction is important: fertilizer application represents only one component of soil fertility management, whereas sustainable soil fertility management can involve organic manure, appropriate nutrient management, soil conservation and other practices. The lowest adoption was recorded for mechanized land preparation, with a mean score of 1.96. This finding indicates that mechanization remains a relatively weak component of the cassava production technology package. This result is consistent with Adah et al. (2024), who reported relatively limited pooled adoption of tractor use for land preparation, although adoption was much higher among contract farmers than

non-contract farmers. The low adoption may be associated with the high cost of machinery services, limited availability of suitable equipment, accessibility of farms and the availability of alternative labour-based land preparation methods. The finding is also consistent with Onyemekonwu, et. al., (2026), who examined factors affecting cassava technology adoption in Delta State. Their study identified extension-related and technology-related factors as important considerations in adoption and emphasized the role of farmer characteristics and access to information in technology uptake. The high overall adoption index of 80% is encouraging because it indicates that the farmers have generally moved beyond mere awareness and incorporated most of the identified technologies into their production systems. However, the differences among individual technologies demonstrate that adoption is not uniform. Farmers readily adopt technologies such as timely planting, improved planting materials, improved varieties, recommended spacing, fertilizer application, weed control and pest/disease management, whereas adoption is weaker for harvesting management, comprehensive soil fertility management and mechanized land preparation.

4.3 The constraints limiting the adoption of high-yielding cassava production technologies among the farmers.

The finding on the high cost of improved planting materials is consistent with Ume, et al, (2022), which states that extension services, education and fertilizer availability influenced adoption of improved TMS cassava varieties in Abia State. Their findings imply that farmers' ability to adopt improved varieties depends not only on awareness but also on their capacity to obtain the necessary inputs. The findings is also in line with the findings of Uchemba et al., (2025) which states that high cost of labour and inability to access land for farming were the constraints affecting youth involvement in cassava production. Similarly, Nwigwe, et. al., (2023), in their study of improved cassava production in Awka South, reported that inadequate information on the availability of planting materials was a major constraint. They also found that farmers adopting improved varieties obtained higher returns than non-adopters, indicating that although improved planting materials can enhance profitability, difficulties in accessing them may limit adoption. The high cost of fertilizer reported in the present study is also important because fertilizer is a critical input for achieving the yield potential of improved cassava varieties. Nwaobiala and Nottidge (2023) reported non-availability of farm inputs, including fertilizer, as one of the constraints to adaptation among cassava farmers in Abia State. They further identified lack of credit and high labour costs as important constraints. The result concerning lack of access to credit (mean = 3.45) is particularly significant. Credit enables farmers to purchase fertilizer, herbicides, improved stems, labour and machinery at the appropriate time.

Umeh, et. al., (2023) found out that cooperative membership, farming experience, farm size and extension contact significantly influenced access to credit among small-scale cassava farmers in Anambra State. They also found that farmers with credit access had substantially higher farm income than those without access. Inadequate collateral and high interest rates were major barriers to credit access.

The finding on labour and machinery costs is also supported by recent research. Ismaila, et.al. (2026) reported that high labour costs, poor transportation, land scarcity and inadequate or delayed credit were major production constraints among cassava farmers in Ona-Ara, Oyo State.

The second category in the table consists of technical and information constraints. These findings demonstrate that access to technology alone does not guarantee adoption. This agrees strongly with Owigho, et. al, (2023), who studied improved cassava production technologies in Isoko North and South LGAs of Delta State. They found constraints including inadequate access to planting materials, lack of information on improved cassava cultivars, irregular extension visits and inadequate agricultural inputs. Their study also found that education and extension contact significantly influenced adoption. The result is further supported by Adah, et al.,

(2024) in Kogi State. Their study showed that access to extension services, education, awareness and farming experience influenced participation and adoption of improved cassava production technologies.

The importance of transportation infrastructure is supported by Ismaila et al. (2026), who identified transportation problems as the most serious constraint among microcredit beneficiaries and also a major constraint among non-beneficiaries. Land scarcity and labour scarcity were also important. Likewise, Nwaobiala and Nottidge (2023) identified limited availability of farmland and insecure/inherited land arrangements as constraints to cassava farmers' adaptation. This provides support for the finding in the present table concerning small/fragmented farm plots and land-tenure problems. The finding concerning inadequate access to farm machinery is particularly consistent with Adejoh, et. al, (2025).

Table 3: Distribution of cassava farmers according to the constraints to (n=150)

Variables	Mean ($\bar{x}$)	SD
Economic constraints		
High cost of improved cassava planting materials	3.60*	0.480
High cost of fertilizer	3.55*	0.473
High cost of herbicides/pesticides	3.50*	0.466
Lack of access to credit	3.45*	0.459
High cost of labour	3.41*	0.453
High cost of farm machinery	3.39*	0.450
Technical/Information constraints		
Inadequate knowledge of recommended technologies	3.33*	0.442
Inadequate extension services	3.30*	0.438
Lack of training on improved cassava production	3.28*	0.435
Difficulty obtaining technical information	3.00*	0.396
Unavailability of improved cassava varieties	2.59*	0.328
Institutional constraints		
Poor road access to farms	2.57*	0.325
Inadequate access to farm machinery	2.40	0.315
Small/fragmented farm plots	2.10	0.275
Land tenure problems	1.91	0.249
Poor access to markets	1.80	0.234
Unstable prices of cassava	1.75	0.226
Inadequate storage/processing facilities	1,60	0.207

Their study in Ayamelum LGA, Anambra State, found that high machinery costs and limited credit access were among the major barriers to adoption of cassava production technologies.

5.0 Conclusion and Recommendations

5.1 Conclusion

Overall, the findings indicate that awareness among the respondents was varying for improved cassava varieties, improved stem cuttings, appropriate spacing and timely planting, but weak for fertilizer management, weed control, pest and disease management. This pattern suggests that awareness does not automatically extend across the complete cassava production technology package. The result is consistent with the broader literature from 2022–2026, which generally shows that Nigerian cassava farmers are more familiar with improved varieties and basic agronomic practices than with more input-intensive or technically demanding technologies. The findings also revealed that the respondents had a high overall extent of adoption of high-yielding cassava

production technologies, with an adoption index of 80%. The high overall adoption index suggests that the farmers have generally embraced improved cassava production technologies, but greater attention is required for mechanization, soil fertility management and appropriate harvesting practices. Consequently, the major constraints are not isolated problems but interconnected barriers such as the high input prices increase the need for credit; inadequate credit reduces farmers' ability to purchase improved inputs; inadequate extension reduces farmers' knowledge of improved technologies; while poor roads and limited machinery increase production and marketing costs.

5.2 Recommendations

Based on the findings above, the following recommendations were made:

1. Financial institutions, government and relevant development agencies should provide accessible and affordable agricultural credit to large-scale cassava farmers. This will enable farmers to purchase inputs required for the adoption of high-yielding cassava technologies.
2. The government and agricultural input suppliers should develop measures to reduce the cost of improved cassava stems and other essential inputs. Input subsidies should be made available to genuine large-scale cassava farmers to encourage sustained adoption.
3. Certified, disease-free and high-yielding cassava stem cuttings should be made readily available to farmers at the appropriate planting period. Government research institutes, extension agencies and private seed/stem producers should strengthen the multiplication and distribution of improved cassava varieties across farming communities in Anambra State.

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