E-ISSN: 1115 – 831X P-ISSN: 3027-2963
MPRI-JAVS | INTERNATIONAL JOURNAL OF AGRICULTURAL AND VETERINARY SCIENCE
VOL. 06 NO. 1 - OCTOBER, 2024

TREND OF CASSAVA YIELD/PRODCUTION IN IN KOGI EAST SENATORIAL DISTRICT, KOGI STATE, NIGERIA

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DOI Unique ID: 10.70382/mejavs.v6i1.003

Abstract

This study examined the trends in cassava yield and production in the Kogi East Senatorial District of Kogi State, Nigeria, focusing on the perceptions of local farmers regarding yield changes over the past five years and the factors influencing these trends. A total of 403 respondents were surveyed, revealing that 71.3% of the farmers perceived an increase in cassava yields, while 28.7% reported stable yields. The primary factors contributing to the perceived increase included the use of improved cassava varieties (58.1%) and climate variability (41.9%). Furthermore, the statistical analysis indicated a stationary R-squared value of 0.792, suggesting a robust model fit for predicting future production trends. Forecasts indicated a steady increase in cassava production per hectare from 2024 to 2033, with projected yields rising from 17.33 tons per hectare in 2024 to 18.54 tons per hectare by 2033. Despite these positive trends, the study identified significant challenges posed by climate variability, with 76.7% of respondents recognizing a high impact on production. The findings underscore the urgent need for targeted interventions, including the promotion of climate-resilient cassava varieties, improved access to quality

Keywords: Trends, Challenges, Agriculture, Productivity, Food

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planting materials, and the implementation of sustainable agricultural practices. Overall, this study provides critical insights into the cassava production landscape in Kogi East and highlights the importance of collaborative efforts among stakeholders to enhance productivity and ensure food security in the region.

Introduction

Cassava (Manihot esculenta) is a vital root crop in Nigeria, serving as a primary source of calories for millions of people. Its importance is particularly pronounced in Kogi State, where cassava production has been a cornerstone of agricultural practice. The Kogi East Senatorial District, with its favorable climate and soil conditions, has emerged as a significant contributor to cassava cultivation in the region. Over the years, various factors have influenced cassava yield and production in this district, including agricultural practices, government policies, and socio-economic conditions, making it essential to examine the current trends in this vital sector.

In recent years, the cassava yield in Kogi East has shown notable fluctuations, primarily due to climatic variations and the adoption of improved farming techniques. According to a study by Alabi et al. (2023), farmers in the region have increasingly embraced modern agricultural practices, such as the use of high-yielding varieties and integrated pest management strategies. This shift has been supported by various agricultural extension programs, aimed at improving productivity and ensuring food security. As a result, there has been a marked increase in the average yield per hectare, which has positive implications for local economies and food supply.

Government initiatives have also played a significant role in shaping the cassava production landscape in Kogi East. The Nigerian government has launched several programs aimed at promoting cassava cultivation, including the National Cassava Policy, which emphasizes the development of value chains and the establishment of processing facilities. Recent data from the Kogi State Agricultural Development Project (KSADP) indicates that these

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initiatives have led to increased investments in the sector, resulting in improved infrastructure and access to markets (KSADP, 2024). These efforts have not only enhanced the yield but also contributed to the sustainability of cassava farming in the region.

Despite the positive trends, challenges remain that could hinder further growth in cassava production in Kogi East. Issues such as land degradation, pest infestations, and inadequate access to financing for smallholder farmers pose significant threats to sustained yield increases. A recent report by the Food and Agriculture Organization (FAO, 2024) highlighted the need for targeted interventions to address these challenges, including improved access to credit and training on sustainable agricultural practices. Addressing these issues is crucial to ensure that the gains made in cassava production are not undermined by environmental and economic pressures.

The trend of cassava yield and production in Kogi East Senatorial District is characterized by both progress and challenges. The increasing adoption of improved agricultural practices and supportive government policies has positively impacted yield levels, contributing to enhanced food security in the region. However, persistent challenges must be addressed to sustain this growth. Continued research and development efforts, alongside targeted policies, are essential to secure the future of cassava farming in Kogi East and improve the livelihoods of those dependent on this crucial crop.

Materials and Methods

Kogi East Senatorial District is in the central region of Nigeria within Kogi State, covering a substantial area that spans a diverse range of landscapes. Geographically, Kogi East is situated roughly between latitudes 7° 30' N and 9° 30' N and longitudes 6° 30' E and 7° 45' E. It shares boundaries with several states, including Enugu, Benue, Anambra, Edo, and Delta, contributing to its strategic location within the larger Nigerian context.

In terms of size, Kogi East is one of the three senatorial districts in Kogi State, each representing a significant portion of the state's land area. While precise

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figures may vary, the senatorial district is characterized by its expansive and diverse terrain. The district encompasses various local government areas, each contributing to the overall size and geographical diversity of Kogi East. The district's size is a crucial factor in understanding its agricultural, environmental, and socio-economic dynamics, particularly in the context of the study on climate variability's impact on cassava production.

The size and location of Kogi East play a pivotal role in shaping its cultural, economic, and agricultural characteristics. With its strategic positioning and diverse landscapes, Kogi East contributes significantly to the overall socio-economic fabric of Kogi State. Understanding the geographical expanse of Kogi East is essential for contextualizing the study on climate variability and cassava production, as it acknowledges the district's unique environmental conditions and their implications for agricultural practices and community livelihoods.

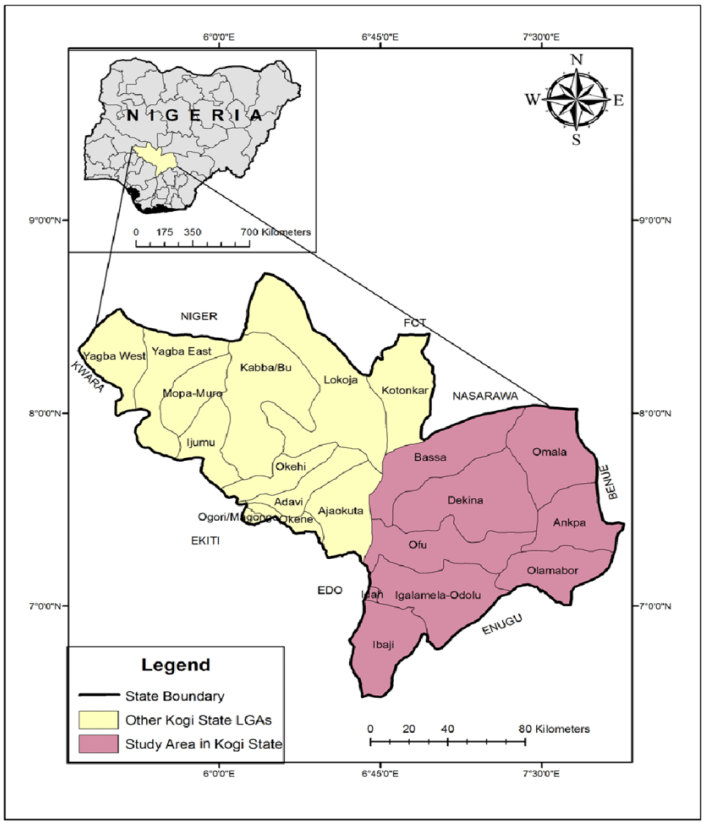


Fig 1: The Study Area
Source: Author 2023

The study employed a descriptive research design to assess the perceived trends in cassava yield and production in the Kogi East Senatorial District of Kogi State, Nigeria. The primary objective was to gather data on farmers' perceptions of cassava yield over the past five years and to identify the

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factors contributing to these perceived trends. A structured questionnaire was developed and administered to a sample of 403 respondents, primarily comprising cassava farmers within the district. The questionnaire was designed to elicit information on perceived yield trends, factors influencing those trends, and the impact of climate variability on cassava production.

Data collection took place through a field survey conducted in 2024. The respondents were selected using a stratified random sampling technique to ensure a representative sample from various communities within Kogi East. This approach allowed for the inclusion of diverse perspectives from farmers with varying levels of experience and farm sizes. The questionnaire contained both closed-ended and open-ended questions, facilitating the collection of quantitative data while also allowing for qualitative insights. The data was collected over a period of two months, ensuring adequate time for reaching a broad range of participants.

Once the data was collected, it was analyzed using descriptive statistical methods. Frequencies and percentages were computed to summarize the respondents' perceptions regarding cassava yield trends and the factors contributing to these trends. For instance, in assessing the perceived trends in cassava yield, respondents were asked to indicate whether they believed cassava yields had increased, remained stable, or decreased over the past five years. The results were then presented in tabular format, highlighting the frequency and percentage of each response category. Additionally, factors influencing yield changes were also tabulated to provide a clear overview of respondents' views on the primary drivers of yield variability.

To further understand the trends in cassava production, a model fit analysis was conducted. The statistical analysis included calculations of the R-squared value, Root Mean Square Error (RMSE), and Mean Absolute Percentage Error (MAPE) to assess the model's performance in predicting future production trends. The forecasts for cassava production per hectare were generated from 2024 to 2033, providing insights into expected future yields based on historical data and identified factors. The analysis also included visual representations of

observed and forecasted production trends, which helped to contextualize the data and illustrate the expected trajectory of cassava production in the district. The study incorporated community perceptions regarding the impact of climate variability on cassava production and explored ways local governments could support farmers in adapting to these changes. Respondents provided insights into specific challenges presented by climate variability, with a focus on the availability of cassava cuttings, which are critical for sustaining production.

Result

Trend of Cassava Yield/Production in the Study Area

Perceived trend in cassava yield in Kogi East Senatorial District in Past Five Years

Table 1: Perceived trend in cassava yield in Kogi East Senatorial District

Perceived trend in cassava yield	Frequency	Percent
Increasing	287	71.3
Stable	116	28.7
Total	**403**	**100.0**

Source: Field Survey, 2024

The data in Table 1 reveals that a significant majority of respondents (71.3%) believe that cassava yields in Kogi East Senatorial District have been increasing over the past five years. In contrast, 28.7% of the respondents perceive the yield as stable. This trend suggests that despite the challenges posed by climate variability, many farmers in the region have observed improvements in their cassava yields. The reasons behind this perceived increase could be multifaceted, involving factors such as improved farming practices, the adoption of more resilient cassava varieties, or possibly favorable climatic conditions during certain periods. However, it is also essential to consider that the perception of stability by a significant minority of respondents might reflect the varying impacts of climate variability across different areas within

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the district, where some regions might be more affected by adverse climatic changes than others.

Factors contributing to the observed trend in cassava yield

Table 2: Factors contributing to the observed trend in cassava yield

Factors contributing to the observed trend in cassava yield	Frequency	Percent
Climate variability	126	41.9
Use of improved variety	175	58.1
Total	**301**	**100.0**

Source: Field Survey, 2024

In table 2, the results indicate that the use of improved cassava varieties is perceived by most respondents (58.1%) as the primary factor contributing to the observed trend in cassava yield, while 41.9% attribute the changes in yield to climate variability. This finding highlights the critical role of agricultural innovations, particularly the adoption of improved cassava varieties, in mitigating the adverse effects of climate variability and enhancing crop production. The emphasis on improved varieties suggests that these cassava strains might offer better resistance to environmental stressors such as drought, pests, and diseases, which are exacerbated by climate variability. Nonetheless, the significant proportion of respondents who acknowledge the impact of climate variability underscores the ongoing challenges posed by changing weather patterns and the need for continued adaptation strategies in the region.

Model Fit

Fit Statistic	Mean	SE	Minimum	Maximum	Percentile						
					5	10	25	50	75	90	95
Stationary R-squared	.792	.	.792	.792	.792	.792	.792	.792	.792	.792	.792
R-squared	.312	.	.312	.312	.312	.312	.312	.312	.312	.312	.312
RMSE	1.676	.	1.676	1.676	1.676	1.676	1.676	1.676	1.676	1.676	1.676
MAPE	8.822	.	8.822	8.822	8.822	8.822	8.822	8.822	8.822	8.822	8.822

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MaxAPE	30.056	.	30.056	30.056	30.056	30.056	30.056	30.056	30.056	30.056	30.056
MAE	1.347	.	1.347	1.347	1.347	1.347	1.347	1.347	1.347	1.347	1.347
MaxAE	3.561	.	3.561	3.561	3.561	3.561	3.561	3.561	3.561	3.561	3.561
Normalized BIC	1.259	.	1.259	1.259	1.259	1.259	1.259	1.259	1.259	1.259	1.259

Model Statistics

Model	Number of Predictors	Model Fit statistics				Ljung-Box Q(18)			Number of Outliers	
		Stationary R-squared	R-squared	RMSE	MAPE	Statistics	DF	Sig.		
Production Per Ha-Model_1	0	.792	.312	1.676	8.822	19.960	16	.222	0	

Forecast

Model		2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Production Per Ha-Model_1	Forecast	17.33	17.47	17.60	17.74	17.87	18.01	18.14	18.28	18.41	18.54
	UCL	20.77	20.92	21.07	21.22	21.37	21.52	21.67	21.82	21.97	22.12
	LCL	13.90	14.02	14.14	14.26	14.38	14.50	14.61	14.73	14.85	14.97

For each model, forecasts start after the last non-missing in the range of the requested estimation period, and end at the last period for which non-missing values of all the predictors are available or at the end date of the requested forecast period, whichever is earlier.

The forecast model statistics table presents a detailed analysis of the model used to predict cassava production per hectare from 2024 to 2033. The stationary R-squared value of 0.792 indicates a good fit, suggesting that the model is well-calibrated to the historical data and is expected to provide reliable forecasts. The R-squared value of 0.312, although lower, still reflects a moderate level of explanatory power, meaning that the model accounts for about 31.2% of the variance in cassava production based on the predictors included. The RMSE (Root Mean Square Error) of 1.676 and MAPE (Mean Absolute Percentage Error) of 8.822 suggest that the model has a reasonable

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level of accuracy, although there is room for improvement. The forecasted trend suggests a steady increase in cassava production over the next decade, which is a positive sign for food security and economic stability in the region. However, the model's limitations, as indicated by the moderate R-squared and the presence of outliers, suggest that other unaccounted factors might influence cassava production, which could include extreme climatic events, socio-economic changes, or further technological advancements.

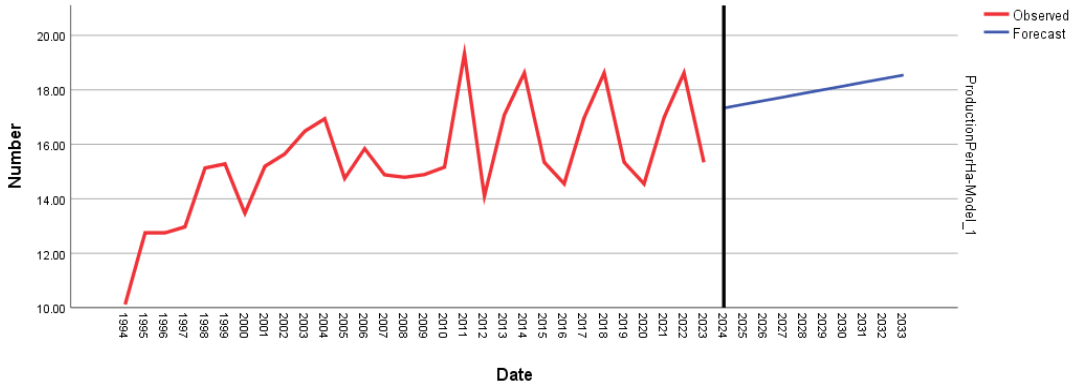


Figure 2: Observed and Forecast of cassava production from the year 1994 – 2033

Figure 2 provides a visual representation of the observed and forecasted cassava production in Kogi East Senatorial District from 1994 to 2033. The graph shows a historical trend of fluctuations in cassava production, with periods of both increase and decline, reflecting the variability in climate conditions and other factors influencing agriculture in the region. The forecast section of the graph indicates a gradual upward trend in cassava production over the next decade, with production levels expected to increase steadily. The upper and lower confidence limits (UCL and LCL) provide a range within which future production is likely to fall, acknowledging the inherent uncertainties in climate patterns and their impact on agricultural yields. This forecast aligns with the optimistic outlook expressed by many respondents in Table 2, suggesting that with the continued adoption of improved farming practices

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and cassava varieties, the region could see enhanced cassava production despite ongoing climate variability.

Conclusion

The findings of this study underscore the dynamic nature of cassava production in Kogi East Senatorial District, revealing both promising trends and significant challenges. The majority of respondents perceived an increase in cassava yields over the past five years, attributing this positive trend to the adoption of improved cassava varieties and enhanced agricultural practices. This suggests that ongoing efforts to promote agricultural innovations and support farmers in utilizing resilient crop varieties have the potential to significantly enhance cassava production in the region, contributing to food security and economic stability.

However, the study also highlighted the persistent challenges posed by climate variability, which a substantial portion of respondents acknowledged as impacting cassava production. While many farmers reported an increase in yields, the recognition of climate-related factors indicates that these fluctuations are not uniform across the district. The varying experiences of farmers point to the need for targeted adaptive strategies that can mitigate the adverse effects of climate change, particularly for those regions more vulnerable to environmental stressors. The study emphasizes the importance of continuous research and development to support farmers in implementing climate-smart agricultural practices.

While the perceived trend of increasing cassava yields presents an optimistic outlook for Kogi East Senatorial District, addressing the challenges related to climate variability remains paramount. Collaborative efforts among stakeholders, including farmers, local governments, and agricultural organizations, are essential for developing effective strategies to sustain and improve cassava production in the face of changing environmental conditions. The study highlights the necessity for ongoing support and adaptation initiatives to ensure that cassava remains a reliable source of food and income

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for the communities dependent on it, securing the future of agriculture in the region.

Recommendations

Based on the findings of this study, several recommendations can be made to enhance cassava production in Kogi East Senatorial District and address the challenges posed by climate variability. First and foremost, there is a critical need to promote the widespread adoption of improved cassava varieties that are resilient to climate change. Local agricultural extension services should prioritize training programs that educate farmers about the benefits of these varieties and the best practices for their cultivation. Additionally, partnerships with research institutions could facilitate the development and distribution of new, high-yielding, and disease-resistant cassava strains tailored to the specific climatic conditions of the region.

Another essential recommendation is to enhance access to quality planting materials and cuttings. The study indicated that inadequate supply of cuttings is a significant challenge for cassava production. To mitigate this issue, local governments and agricultural organizations should implement programs aimed at establishing community nurseries and propagation centers. These centers could serve as reliable sources of quality cassava cuttings, ensuring that farmers have access to viable planting materials. Furthermore, initiatives that encourage farmers to participate in the production and sharing of high-quality cuttings could foster community collaboration and improve overall yield.

Additionally, training and education on climate-smart agricultural practices should be prioritized. The findings suggest that farmers are keenly aware of the benefits of adapting to climate variability, yet many lack the necessary knowledge and skills. Local governments should collaborate with agricultural extension workers to organize workshops and field demonstrations focused on sustainable farming techniques, such as soil management, crop rotation, and integrated pest management.

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Moreover, it is vital for local governments to invest in infrastructure that supports irrigation and water management, particularly in areas prone to drought. Implementing irrigation systems can help stabilize cassava yields, especially during dry seasons or periods of inadequate rainfall. Funding for irrigation infrastructure projects should be prioritized, and training should be provided to farmers on efficient water use and management practices. This investment would not only bolster cassava production but also improve the overall agricultural landscape in Kogi East.

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