Knowledge, Attitudes and Practice (Kap) Analysis of Cassava Chain Optimization Among Medium-Scale Farmers in Rivers State

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Abstract

This study examined the knowledge, attitudes and practice (KAP) analysis of cassava chain optimization among medium-scale farmers in Rivers State. The theoretical framework adopted in the study was the diffusion of innovation theory. The research design for this study adopted a qualitative method, specifically utilizing email interviews to gather in-depth information from participants. The population for this study consists of medium-scale cassava farmers in Rivers State, Nigeria, who are involved in both cassava farming and processing activities, which stood at 257. A sample size of 10 medium-scale cassava farmers was selected to provide a manageable yet diverse pool of participants, offering insights into the varying degrees of knowledge and attitude toward modern farming techniques. The sampling technique employed was purposive sampling, where farmers who have been involved in cassava farming for at least five years and have a production capacity that qualifies them as medium-scale are chosen. Data collection was conducted through semi-structured email interviews. For data analysis, thematic analysis was employed to identify patterns and themes from the farmers' responses. The qualitative data were coded and categorized based on recurring themes, such as barriers to adoption, knowledge gaps, and current practices. The findings revealed that the medium-scale cassava farmers in Rivers State possess moderate knowledge of cassava chain optimization, with a strong understanding of traditional farming techniques but limited awareness of advanced processing, storage, and value addition practices, largely due to inadequate access to training and modern agricultural resources. Based on the findings of the study established that while medium-scale cassava farmers in Rivers State have a basic understanding of cassava chain optimization, there are significant gaps in their knowledge of advanced techniques that could improve their overall efficiency and profitability. The study recommended that targeted training programs and access to modern agricultural technologies should be made available to these farmers to enhance their knowledge and optimize the cassava value chain.

Keywords: *Knowledge, Attitudes, Practice, Cassava, Optimization, medium-Scale Farmers*

Introduction

Cassava (Manihot esculenta Crantz) is a vital food crop in many developing countries, especially in sub-Saharan Africa, where it serves as a staple food and a source of livelihood for millions of small and medium-scale farmers. Nigeria, being the largest producer of cassava in the world, plays a significant role in the global cassava value chain. The crop's adaptability to various agro-climatic conditions, tolerance to poor soils, and ability to provide stable yields even under harsh conditions make it a preferred choice for farmers in different regions (FAO, 2020). Despite the high production levels, the cassava industry in Nigeria remains underdeveloped, with inefficiencies in processing, storage, and marketing, particularly among medium-scale farmers (IITA, 2021).

Cassava chain optimization is crucial for enhancing productivity, reducing post-harvest losses, and ensuring sustainable livelihoods for farmers. The cassava value chain involves multiple processes, including production, harvesting, processing, storage, and marketing. Each of these stages presents opportunities and challenges for farmers, particularly those operating on a medium scale. In Rivers State, Nigeria, cassava farming contributes significantly to the local economy, with many farmers relying on the crop for income generation. However, several factors hinder the effective optimization of the cassava value chain, including limited access to modern agricultural practices, inadequate storage facilities, and poor market linkages (Onyeka et al., 2022).

A comprehensive understanding of farmers' knowledge, attitudes, and practices (KAP) regarding cassava production and value chain optimization is essential for identifying gaps and implementing interventions that can improve productivity and profitability. KAP analysis provides valuable insights into the behaviour and decision-making processes of farmers, which can be used to tailor extension services, policy frameworks, and capacity-building programs (WHO, 2021). By assessing farmers' knowledge of improved farming techniques, their attitudes toward innovation, and their current practices, stakeholders can design strategies that promote the adoption of sustainable agricultural practices.

In recent years, there has been growing recognition of the importance of optimizing the cassava value chain to meet the rising demand for cassava-based products both locally and internationally. As the demand for cassava products such as flour, starch, and bioethanol increases, farmers are under pressure to enhance their production capacities and improve the efficiency of their operations (Nweke, 2020). Medium-scale farmers, who often lack access to the resources and technical expertise available to larger commercial farms, face unique challenges in this regard. Understanding their KAP is a key to developing targeted interventions that address these challenges and support cassava chain optimization.

The role of extension services in disseminating knowledge and fostering positive attitudes toward cassava value chain optimization cannot be overemphasized. Research has shown that farmers who receive regular training and access to information about improved agricultural practices are more likely to adopt new technologies and optimize their production processes (Adeola & Adebiyi, 2021). In Rivers State, however, the coverage of extension services is often limited, particularly in rural areas where medium-scale farmers are concentrated. This gap in

service delivery exacerbates the challenges faced by farmers in optimizing their cassava value chain activities.

Moreover, socio-economic factors such as education, income level, and farm size significantly influence farmers' attitudes toward the adoption of innovations in cassava farming. Studies have indicated that farmers with higher levels of education and access to financial resources are more likely to invest in improved farming techniques and infrastructure, which can enhance productivity and reduce post-harvest losses (Eze et al., 2022). Conversely, farmers with limited resources may be hesitant to adopt new technologies due to perceived risks and financial constraints. Therefore, a thorough KAP analysis is essential for understanding the socio-economic dynamics that affect cassava chain optimization among medium-scale farmers.

In addition to socio-economic factors, environmental factors such as climate variability and land degradation pose significant challenges to cassava chain optimization. In Rivers State, frequent flooding and poor soil fertility have been identified as major constraints to cassava production (Nwankwo et al., 2021). These environmental challenges, combined with inadequate infrastructure for processing and storage, contribute to high levels of post-harvest losses and reduced profitability for farmers. Addressing these issues requires a multi-faceted approach that incorporates both technical and socio-economic interventions.

Optimizing the cassava value chain is critical for improving the livelihoods of medium-scale farmers in Rivers State. By conducting a KAP analysis, policymakers and stakeholders can identify key areas where interventions are needed to enhance farmers' knowledge, attitudes, and practices. This study aims to provide a comprehensive analysis of the current state of cassava chain optimization among medium-scale farmers in Rivers State, with a focus on identifying the factors that influence their adoption of improved farming techniques and value chain innovations.

Statement of the Problem

Cassava is a major staple crop in Nigeria, with Rivers State being one of the key regions contributing to its production. Despite its importance, the cassava value chain in the state faces significant inefficiencies, particularly among medium-scale farmers. These inefficiencies are manifested in poor yield per hectare, substantial post-harvest losses, limited processing capacity, and weak market linkages. As a result, many farmers are unable to fully benefit from their cassava farming activities, often grappling with low income and limited opportunities for growth. Optimizing the cassava value chain could significantly enhance productivity, reduce losses, and improve the economic outcomes for these farmers. However, there is limited understanding of the factors that drive or hinder cassava chain optimization at the medium scale.

One of the critical challenges is the knowledge gap among medium-scale farmers regarding modern farming techniques and value chain optimization practices. Many farmers lack access to up-to-date information on improved cassava varieties, efficient production techniques, and cost-effective methods for reducing post-harvest losses. This lack of knowledge often results in farmers relying on traditional farming methods that are less productive and sustainable. Additionally, the

absence of effective extension services to provide training and support further exacerbates this knowledge deficit, limiting farmers' ability to innovate and improve their practices.

Furthermore, the attitudes of medium-scale cassava farmers towards adopting new technologies and practices play a crucial role in determining the success of any optimization effort. Resistance to change, lack of trust in new interventions, and the perceived cost of adopting new technologies are significant barriers. Many farmers may be hesitant to invest in unfamiliar techniques without a clear understanding of their potential benefits. This cautious approach, combined with the uncertainty of returns on investments, hinders the widespread adoption of practices that could otherwise improve yields, reduce losses, and enhance marketability.

In practice, most medium-scale cassava farmers in Rivers State face logistical and infrastructural challenges that further complicate the optimization process. Limited access to modern processing equipment, inadequate storage facilities, and poor transportation networks contribute to significant inefficiencies along the cassava value chain. Farmers often lack the means to add value to their products through processing, which limits their ability to access more profitable markets. The result is a cycle of low productivity and income that keeps farmers in a state of subsistence rather than enabling them to scale up their operations and maximize the potential of cassava as an economic driver. Understanding the knowledge, attitudes, and practices (KAP) of these farmers is crucial in identifying areas for intervention and developing targeted strategies to optimize the cassava value chain in Rivers State.

Aim and Objectives of the Study

This study aims to assess the knowledge, attitudes, and practices of medium-scale cassava farmers in Rivers State regarding cassava chain optimization, identifying key challenges and opportunities to enhance productivity and economic outcomes in the sector. Specifically the objectives are to:

1. To evaluate the level of knowledge medium-scale cassava farmers have about modern farming techniques and cassava chain optimization.
2. To assess the attitudes of medium-scale farmers towards adopting new technologies and practices for optimizing the cassava value chain.
3. To examine the current farming and processing practices employed by medium-scale cassava farmers in Rivers State.

Research Questions

This study was guided by the following research questions.

1. What is the level of knowledge that medium-scale cassava farmers in Rivers State have about cassava chain optimization?
2. What are the attitudes of medium-scale farmers towards adopting new technologies and practices for cassava chain optimization?
3. What farming and processing practices do medium-scale cassava farmers currently use in Rivers State?

Literature Review

Conceptual Review

Knowledge of Cassava Chain Optimization among Medium-Scale Farmers
The level of knowledge among farmers significantly influences their ability to optimize agricultural processes. In the context of cassava farming, knowledge encompasses awareness of improved cassava varieties, farming techniques, post-harvest processing, and marketing strategies that can enhance the efficiency of the value chain. Studies have shown that farmers who are knowledgeable about modern agricultural practices tend to have higher productivity and reduced post-harvest losses (Abdul, 2019). However, in many rural areas, including Rivers State, there is often a gap in access to relevant agricultural information due to weak extension services and limited exposure to modern techniques.

Medium-scale cassava farmers in Rivers State, in particular, face challenges in accessing technical knowledge about optimized farming techniques. According to Nwankwo (2020), most farmers still rely on traditional farming methods that are less efficient, which affects their productivity. This is further complicated by the limited availability of training programs that could educate farmers on modern practices such as mechanized farming, improved stem varieties, and better fertilizer usage. As a result, the lack of knowledge becomes a critical barrier to optimizing the cassava chain.

Research suggests that bridging this knowledge gap is essential for improving the cassava value chain. Agricultural extension services, farmer-to-farmer training, and digital platforms can play pivotal roles in disseminating information (Olawale & Adeyemi, 2021). Enhancing farmers' knowledge of best practices can significantly improve their ability to optimize production, reduce post-harvest losses, and access better markets. Therefore, understanding the current level of knowledge among medium-scale cassava farmers is critical to identifying areas for improvement.

Attitudes of Farmers towards Adoption of New Technologies
The attitudes of farmers towards adopting new agricultural technologies are shaped by a variety of factors, including cultural beliefs, previous experiences, perceived benefits, and the costs associated with implementation (Ajayi, 2018). In the context of cassava chain optimization, the willingness of farmers to adopt modern technologies such as mechanized planting, improved storage techniques, and value-added processing plays a crucial role in determining the overall success of optimization efforts. However, many medium-scale farmers in Nigeria exhibit a cautious attitude towards new interventions, particularly when the benefits are not immediately apparent (Obi & Agwu, 2019).

Medium-scale farmers in Rivers State, like many others, may be reluctant to adopt new technologies due to a lack of trust in their effectiveness, fear of failure, or high initial investment costs (Eze & Ibe, 2020). For instance, farmers may be skeptical about investing in improved cassava varieties or new processing equipment without concrete evidence that these innovations will significantly increase their profits. Additionally, the absence of adequate financial support from government agencies or agricultural cooperatives further discourages farmers from adopting new practices (Eze & Ibe, 2020).

Addressing these attitudinal barriers is essential for promoting the adoption of technologies that can optimize the cassava value chain. According to Rogers' (2003) diffusion of innovation

theory, the perceived advantages of a new practice or technology, its compatibility with existing practices, and the ease of use are critical factors that influence adoption rates. By identifying and addressing the specific concerns and perceptions of medium-scale farmers, interventions can be tailored to encourage a more positive attitude towards technological innovations.

Farming and Processing Practices in Cassava Production

The farming and processing practices employed by medium-scale cassava farmers have a direct impact on the efficiency of the cassava value chain. Traditional farming methods, which often rely on manual labor, outdated planting techniques, and inefficient processing systems, limit the potential for optimizing cassava production. According to Akinbile and Omoniyi (2019), many farmers still use rudimentary tools and rely on rain-fed agriculture, which leads to lower yields and higher vulnerability to climate change impacts. Moreover, post-harvest practices such as inadequate storage facilities and inefficient processing techniques contribute to significant losses along the cassava value chain.

Processing cassava into various products such as gari, fufu, or starch adds value and opens up new market opportunities for farmers. However, the majority of medium-scale farmers in Rivers State do not have access to modern processing equipment or facilities, which restricts their ability to participate in value addition (Okoye, 2021). This limits their profitability and leaves them dependent on raw cassava sales, which often fetch lower market prices. Enhancing farmers' capacity to adopt improved processing techniques can significantly improve their earnings and reduce wastage in the cassava chain.

Improved practices in both farming and processing are key to optimizing the cassava value chain. According to Agwu and Anugwa (2022), the integration of modern techniques such as mechanized farming, proper storage facilities, and value-added processing can substantially improve the productivity and profitability of cassava farmers. Understanding the current practices of medium-scale farmers provides valuable insights into the areas that require intervention for the successful optimization of the cassava value chain.

Theoretical Framework

Diffusion of Innovations Theory

This theory was propounded by Everett M. Rogers in 1962. This theory explains how innovations, including new agricultural practices or technologies, spread within a social system over time. The tenet of the theory is that innovation diffusion occurs through a process of communication among individuals within a community. Rogers identifies five stages of adoption: knowledge, persuasion, decision, implementation, and confirmation. The assumption underlying the theory is that individuals adopt innovations at varying rates, categorized into innovators, early adopters, early majority, late majority, and laggards, depending on their willingness to embrace new ideas (Rogers, 2003). The focus on communication and social systems makes this theory suitable for analyzing how farmers in Obio Akpor might acquire and apply knowledge to optimize cassava production.

However, the Diffusion of Innovations Theory has been criticized for its linear and one-size-fits-all approach to innovation adoption, especially in diverse, rural, and low-resource settings. Critics argue that the theory tends to overemphasize individual decision-making and

underplay structural factors such as economic constraints, cultural differences, and institutional barriers that might affect the adoption of innovations, particularly among peasant farmers (Meijer et al., 2019). Additionally, the theory assumes that innovations are inherently beneficial and overlooks the fact that some innovations may not align with the needs or capacities of all segments of the population.

Despite these criticisms, the theory remains relevant to this study because it highlights the role of knowledge dissemination, communication networks, and farmer attitudes in the uptake of cassava chain optimization practices. By understanding the knowledge levels and attitudes of farmers, as well as how they practice or adopt new techniques, stakeholders can develop targeted interventions to enhance cassava productivity in Obio Akpor local government area. This theory offers a framework to examine the communication channels and peer-networks through which medium scale farmers might access new cassava optimization strategies, thus facilitating a more efficient agricultural value chain in the region.

2.3 Empirical Review

Okezie (2020) carried out a study on "Assessment of the Knowledge, Attitude, and Practice of Farmers in the Adoption of Improved Cassava Farming Techniques in Southeast Nigeria." This study aimed to evaluate the knowledge levels of medium- and large-scale farmers regarding improved cassava farming techniques, assess their attitudes toward adopting new technologies, and examine their current practices. The study employed a survey method using structured questionnaires administered to 150 cassava farmers. Data were analyzed using descriptive statistics and regression analysis. The findings revealed that a majority of farmers had limited knowledge of modern farming techniques. Although most farmers had a positive attitude toward new technologies, adoption was hindered by financial constraints and inadequate training. Both studies focus on assessing the knowledge and attitudes of medium-scale cassava farmers towards new farming techniques. While reviewed study focused on financial constraints as a barrier to adoption, the current study emphasizes the practice of cassava chain optimization as a key factor in improving the value chain.

Edeh (2021) conducted a research on "Evaluating the Impact of Agricultural Extension Services on Cassava Farmers' Adoption of Modern Farming Practices in South-South Nigeria." The objective was to evaluate the role of agricultural extension services in the adoption of modern farming techniques by cassava farmers and to examine the extent to which these services affect their farming practices. The study used a mixed-method approach combining qualitative interviews with extension workers and quantitative surveys of 120 cassava farmers. Data were analyzed using content analysis and multivariate statistical techniques. The study found that agricultural extension services significantly improved farmers' knowledge and adoption of modern farming techniques. However, gaps remained in the application of cassava processing techniques, reducing overall value chain efficiency. Both studies address the adoption of modern farming techniques by cassava farmers and the role of knowledge dissemination in that process. Edeh's study places more emphasis on the role of external agents (extension workers) in promoting

adoption, while the current study focuses more on farmer-led initiatives and their personal attitudes and practices.

Nweke 2019) did a study on "The Adoption of Cassava Processing Technologies and its Effect on Smallholder Farmer Productivity in Niger Delta, Nigeria." The study aimed to investigate the level of adoption of cassava processing technologies and its effect on the productivity and income of smallholder farmers. The study used case study research, surveying 100 smallholder cassava farmers and conducting in-depth interviews. The data were analyzed using both qualitative thematic analysis and quantitative productivity metrics. The results indicated a moderate adoption of processing technologies, with a corresponding increase in productivity. However, farmers still faced challenges in optimizing the entire cassava value chain due to a lack of knowledge on advanced farming and processing techniques. Both studies focus on the adoption of techniques aimed at optimizing the cassava value chain, particularly in processing. Nweke's study targets smallholder farmers and their processing techniques, whereas the current study focuses on medium-scale farmers and covers both farming and processing practices.

Methodology

The research design for this study adopted a qualitative method, specifically utilizing email interviews to gather in-depth information from participants. This approach allows for flexibility in the interview process and provides respondents the convenience to answer questions at their own pace. Email interviews are particularly useful for reaching medium-scale cassava farmers across diverse locations within Rivers State, enabling the collection of rich, descriptive data on their knowledge, attitudes, and practices regarding cassava chain optimization. The design is suitable for capturing the complexities of individual experiences and perceptions, which aligns with the objectives of understanding how these farmers adopt modern farming techniques and their current practices.

The population for this study consists of medium-scale cassava farmers in Rivers State, Nigeria, who are involved in both cassava farming and processing activities, which stood at 257. These farmers have a significant role in the cassava value chain, making their input crucial for assessing knowledge and practice related to optimization. A sample size of 10 medium-scale cassava farmers was selected to provide a manageable yet diverse pool of participants, offering insights into the varying degrees of knowledge and attitude toward modern farming techniques. The sampling technique employed was purposive sampling, where farmers who have been involved in cassava farming for at least five years and have a production capacity that qualifies them as medium-scale are chosen. This technique ensures that participants are knowledgeable enough to provide meaningful responses about cassava chain optimization.

Data collection was conducted through semi-structured email interviews. This method allows for open-ended questions that prompt detailed responses while also providing flexibility for follow-up questions based on initial replies. The questions were designed to explore farmers' knowledge of modern farming techniques, their attitudes toward adopting new technologies, and their current farming and processing practices. For data analysis, thematic analysis was employed to identify patterns and themes from the farmers' responses. The qualitative data were coded and

categorized based on recurring themes, such as barriers to adoption, knowledge gaps, and current practices. This method allows for a detailed interpretation of the farmers' perspectives, providing insights into their experiences and attitudes toward cassava chain optimization.

Presentation of Data and Analysis

The study adopted thematic method of data analysis to analyse the data gathered from the discussion. Themes were deduced deductively following the research objectives. The following were deduced: The level of knowledge medium-scale cassava farmers have about modern farming techniques and cassava chain optimization; the attitudes of medium-scale farmers towards adopting new technologies and practices for optimizing the cassava value chain; and the current farming and processing practices employed by medium-scale cassava farmers in Rivers State. These are presented and discussed below:

The level of knowledge medium-scale cassava farmers have about modern farming techniques and cassava chain optimization; when asked, the interviewees stated that the knowledge of cassava chain optimization is still developing. They were aware of some of the basic practices, such as improved planting techniques and the use of fertilizers to enhance crop yield. However, when it comes to optimizing the entire value chain, especially, processing and marketing the knowledge is somewhat limited. They understood that cassava chain optimization involves not just the farming part, but also ensuring that processing, storage, and distribution are more efficient to reduce waste and improve profitability. But honestly, they had not received enough formal training or exposure to modern practices that could help me fully optimize these areas.

However, the interviewees added that from the medium scale experiences, there was a good grasp of traditional farming methods, but the technical aspects of optimization, like mechanized processing and advanced storage solutions, are not very familiar to many of us. The farmer often relied on manual methods for harvesting and processing, which are time-consuming and lead to losses. We are also not fully informed about value addition techniques that can make cassava products more marketable. Some farmers who use modern equipment and practices to improve the efficiency of their operations, but the farmers have not had the opportunity to learn from them or access the tools they use.

Moreover, some of the interviewees illustrated that with better access to training and information on cassava chain optimization, many of them would be more capable of improving our production and profitability. There are extension services, but the medium scale farmers do not always reach us regularly, and when farmers do, the focus is usually on basic agricultural practices rather than the entire value chain. More structured programs that teach us about efficient processing methods, better marketing strategies, and ways to reduce post-harvest losses would be very beneficial. As it stands, their knowledge is moderate at best, and they knew there would be a lot more that can be done to optimize cassava farming and processing in Rivers State.

The attitudes of medium-scale farmers towards adopting new technologies and practices for optimizing the cassava value chain; when asked all the interviewees agreed that attitudes toward adopting new technologies and practices for cassava chain optimization were generally positive, but cautious. Most of the farmers were open to trying out new methods if they are convinced that

they will significantly improve our yields and reduce losses. However, there is a level of hesitation because adopting new technologies often requires a financial investment, and many farmers are unsure whether the returns will justify the costs. They need proof that these innovations work in our local conditions before we fully commit to them. Also, the farmers are more likely to adopt technologies if we see our peers successfully using them.

Furthermore, majority of the interviewees said that despite their willingness, there were some barriers that affect the farmers' attitude toward adopting new practices. One major issue is the lack of access to proper training and support. Without adequate guidance on how to effectively use new technologies, many of the famers feel uncertain about making changes to our farming methods. There is also the challenge of affordability; most of the modern equipment and inputs needed for cassava chain optimization are expensive, and many farmers do not have the financial resources to invest in them. This makes the farmers more hesitant to adopt new technologies, even when the famers see the potential benefits. Additionally, the limited availability of these technologies in rural areas further discourages the farmers.

Additionally, some of the interviewees narrated that when the opportunity arises and resources are available, the famers are generally receptive to adopting new technologies for cassava optimization. For instance, when agricultural extension officers or cooperatives introduce new practices, farmers tend to listen and give it a try, especially if there is some form of support or subsidy. The farmers also value technologies that can save time and labor, as these directly impact our productivity. However, for adoption to be more widespread, there needs to be more hands-on demonstrations and financial assistance, as these would give us more confidence to fully embrace modern practices in cassava farming and processing.

The current farming and processing practices employed by medium-scale cassava farmers in Rivers State; when asked, majority of the interviewees said that farming practices primarily revolve around traditional methods, although some modern techniques are beginning to be integrated. The farmers generally start by selecting high-yielding cassava varieties that are well-suited to our local conditions, which helps ensure good harvests. Land preparation typically involves manual labor, where farmers clear the fields and till the soil using simple tools like hoes and cutlasses. While some farmers are beginning to adopt mechanized planting and weeding, many of the farmers still rely on manual methods for planting cassava stems, which is labor-intensive but familiar.

During the growing season, the interviewees posited that the crops closely for pests and diseases, although our approach tends to be reactive rather than preventive. Farmers often use local knowledge and traditional methods for pest control, such as planting companion crops or applying organic treatments, but chemical fertilizers and pesticides are also used when available. Water management practices vary widely; most of the farmers depend on rainfall, and irrigation systems are not common due to costs. Harvesting is typically done by hand when the tubers reach maturity, and this can be quite laborious, especially when dealing with large fields.

Furthermore, the interviewees stated that when it comes to processing practices, many farmers still employ traditional techniques for turning cassava into products like garri, fufu, and

cassava flour. The processing usually involves peeling, washing, fermenting, and then either drying or frying the cassava to produce the final products. While some farmers have started using more modern processing equipment to improve efficiency and reduce labor, a significant number still rely on manual processes, which can be time-consuming and may affect the quality of the final product. Additionally, storage practices for both raw cassava and processed products are often inadequate, leading to significant post-harvest losses. Overall, while there is some adoption of modern methods, many practices remain traditional, indicating a need for improved access to technology and training to enhance both farming and processing efficiency.

Discussion of Findings

Research Question One: What is the level of knowledge that medium-scale cassava farmers in Rivers State have about cassava chain optimization?

The findings revealed that the medium-scale cassava farmers in Rivers State possess moderate knowledge of cassava chain optimization, with a strong understanding of traditional farming techniques but limited awareness of advanced processing, storage, and value addition practices, largely due to inadequate access to training and modern agricultural resources. The finding aligns with Okezie (2020) that posited that a majority of farmers had limited knowledge of modern farming techniques. Although most farmers had a positive attitude toward new technologies, adoption was hindered by financial constraints and inadequate training.

The relevance of the Innovation Diffusion Theory to this study lies in its ability to explain how medium-scale cassava farmers in Rivers State can gradually adopt modern farming techniques and cassava chain optimization practices, as the theory highlights the importance of communication, knowledge dissemination, and social networks in influencing farmers' attitudes and decisions to embrace new innovations that enhance productivity and efficiency. The implications of the finding suggest that without improved access to training and modern resources, medium-scale cassava farmers in Rivers State may continue to experience inefficiencies in processing, storage, and value addition, limiting their ability to fully optimize the cassava value chain, increase profitability, and contribute to the agricultural economy at their full potential.

Research Question Two: What are the attitudes of medium-scale farmers towards adopting new technologies and practices for cassava chain optimization?

The finding revealed that medium-scale cassava farmers in Rivers State generally have a positive attitude towards adopting new technologies and practices for cassava chain optimization, but are held back by financial constraints, lack of access to proper training, and limited availability of modern farming tools, making them cautious in fully embracing innovations without adequate support and demonstrations. The finding of this study is also evident in similar study by Edeh (2021) which found out that agricultural extension services significantly improved farmers' knowledge and adoption of modern farming techniques. However, gaps remained in the application of cassava processing techniques, reducing overall value chain efficiency. The relevance of Innovation Diffusion Theory in this study lies in its framework for understanding how medium-scale cassava farmers can progressively adopt new technologies and practices for cassava

chain optimization, emphasizing the significance of communication, social networks, and the perceived benefits of innovations in shaping farmers' attitudes and willingness to change their agricultural methods. The implications of the findings suggest that to enhance the adoption of new technologies and practices for cassava chain optimization among medium-scale farmers in Rivers State, it is essential to address financial barriers, provide targeted training, and improve access to modern agricultural tools, as these factors significantly influence farmers' attitudes and willingness to embrace innovations that could improve their productivity and profitability.

Research Question Three: What farming and processing practices do medium-scale cassava farmers currently use in Rivers State?

The results showed that that medium-scale cassava farmers in Rivers State predominantly employ traditional farming and processing practices, including manual land preparation, planting, and harvesting methods, while some have started to incorporate modern techniques; however, their processing of cassava into products like garri and fufu remains largely manual, leading to inefficiencies and post-harvest losses due to inadequate storage and out-dated practices. The finding of this study is in line with the study conducted by Nweke 2019) which indicated a moderate adoption of processing technologies, with a corresponding increase in productivity. However, farmers still faced challenges in optimizing the entire cassava value chain due to a lack of knowledge on advanced farming and processing techniques.

The relevance of the Innovation Diffusion Theory in this study lies in its ability to elucidate how medium-scale cassava farmers in Rivers State can be encouraged to adopt modern farming and processing practices, as the theory emphasizes the critical role of perceived benefits, communication channels, and social influence in shaping farmers' willingness to embrace innovations that can enhance their productivity and the efficiency of the cassava value chain. The implications of the findings suggest that the reliance on traditional farming and processing practices among medium-scale cassava farmers in Rivers State may hinder productivity and quality, highlighting the urgent need for interventions that promote modern agricultural technologies, effective training programs, and improved storage solutions to reduce post-harvest losses and enhance the overall efficiency of the cassava value chain.

Conclusion

The study highlighted that while medium-scale cassava farmers in Rivers State have a basic understanding of cassava chain optimization, there are significant gaps in their knowledge of advanced techniques that could improve their overall efficiency and profitability. The study indicated that while medium-scale cassava farmers in Rivers State are generally open to adopting new technologies and practices for optimizing the cassava value chain, their willingness is significantly influenced by financial constraints and a lack of access to training and resources. The study established that medium-scale cassava farmers in Rivers State primarily utilize traditional farming and processing practices, which, while familiar, limit their productivity and lead to significant post-harvest losses due to inadequate techniques and resources.

This study contributes to knowledge by providing valuable insights into the current farming and processing practices of medium-scale cassava farmers in Rivers State, revealing the extent of their awareness and adoption of modern technologies and techniques for cassava chain

optimization. By highlighting the gaps in knowledge, attitudes, and practices, the research underscores the need for targeted interventions to improve agricultural efficiency and productivity. Furthermore, it demonstrates the applicability of the Innovation Diffusion Theory in understanding the dynamics of technology adoption in agriculture, offering a framework for future studies on agricultural innovations and their impact on rural economies. This work not only enhances the academic discourse on cassava farming but also serves as a practical guide for policymakers, agricultural extension services, and stakeholders seeking to promote sustainable agricultural practices in the region.

Recommendations

In view of the findings from this work, the following recommendations have been made

1. Targeted training programs and access to modern agricultural technologies should be made available to these farmers to enhance their knowledge and optimize the cassava value chain.
2. Stakeholders develop accessible training programs and financial support mechanisms to facilitate the adoption of modern agricultural technologies among these farmers.
3. Targeted initiatives should be implemented to provide farmers with access to modern technologies, training, and improved storage solutions to enhance their farming and processing efficiency.

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