DETERMINANTS OF INNOVATIVE CAPABILITIES AMONG OIL PALM PRODUCERS IN EDO STATE, NIGERIA

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A DISSERTATION SUBMITTED TO THE DEPARTMENT OF AGRICULTURAL ECONOMICS & EXTENSION SERVICE IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE MASTER OF SCIENCE (AGRICULTURAL EXTENSION SERVICE) IN THE SCHOOL OF POSTGRADUATE STUDIES, BENSON IDAHOSA UNIVERSITY, BENIN CITY, EDO STATE, NIGERIA

SEPTEMBER, 2025

DECLARATION

I, IKUOBASE, Imafidon Edwin declare that this thesis titled "Determinants of Innovative Capabilities among Oil Palm Producers in Edo State, Nigeria" has been written by me and it is a record of my own research work. All borrowed ideas have been duly acknowledged in the text and a list of references provided.

…… **…….**

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CERTIFICATION

We, certify that this research work was carried out by IKUOBASE, Imafidon Edwin in the Department of Agricultural Economics and Extension Services, Faculty of Agriculture and Agricultural Technology, Benson Idahosa University, Benin City, Edo State, Nigeria.

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PLAGIARISM ATTESTATION

I certify that this report is my own work, based on my personal research and that I have acknowledged all material and sources used in its preparation, whether they be books, articles, reports, lecture notes, or any document, electronic or personal communication. I also certify that the report has not previously been submitted for assessment elsewhere, and I have not copied in part or whole, otherwise plagiarized the work of other students and/or persons.

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DEDICATION

This thesis is dedicated to God Almighty for his faithfulness, to my parents of blessed memory; Mr and Mrs Ikuobase Asemota and my lovely wife and children.

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I am most grateful to God Almighty, who in his special mercies and kindness has helped me to complete this research work successfully. In a special way, I express my unalloyed appreciation to my supervisor Prof. S.O.E. Alakpa for his scholarly guidance and sacrifice in making this thesis a reality. Also, my thanks go to the Dean, Prof. S.O.E. Alakpa, Head of Department; Dr. R.A. Egware, and other lecturers, Dr. E. Akintoye, Mr. J.O. Ejuetuenyin, Dr. (Mrs) J.E. Oboh and Miss. G.A. Aigba. I also extend my sincere thanks to the non-academic staff of the Faculty of Agriculture and Agricultural Technology, Benson Idahosa University, God bless you all.

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ABSTRACT

The oil palm industry in Nigeria, especially in Edo State, holds significant economic, cultural, and ecological importance. Despite its historical relevance and contributions to the country's GDP and rural livelihoods, the sector faces persistent challenges. Therefore, this study assessed the determinants of innovative capabilities of oil palm producers in Edo State, Nigeria. It described the socio-economic characteristics, sources of information, adoption of innovation practices, innovativeness, and constraints to innovativeness among oil palm producers. The study was conducted in five Local Government Areas (LGAs) with a high concentration of oil palm producers, and a multi-stage sampling technique was used to select 289 respondents. Data were collected through structured questionnaire. Descriptive statistics, grand mean score, multiple regression and binary logistic regression were employed for data analysis. Results indicate that the majority of respondents had a mean age of 51 years, predominantly male (84.8%), and married (83.7%), with relatively high educational levels (43.6% attaining tertiary education). Key drivers of innovation include economic stability, poverty alleviation, and financial security, while significant barriers encompass high input costs, insufficient funding, labor shortages, and fluctuating market prices. Farmers rely heavily on hired labor (82.7%) and information from cooperatives, extension agents, and digital platforms like WhatsApp, emphasizing the role of structured frameworks in promoting innovation. Regression analyses reveal that age, educated farmers and those with access to credit and larger household sizes are more likely to adopt innovative practices. However, inadequate technical knowledge, limited access to resources, and market instability remain persistent challenges. These findings point to the need for financial interventions, capacity-building initiatives, and policy support to promote sustainable innovation in oil palm production and processing in Edo State, Nigeria

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background of the Study

The oil palm industry is a major driver of agricultural and economic activities in tropical regions which is undergoing profound transformations due to sustainability demands, technological advancements, and evolving market needs. In Nigeria, innovations in oil palm production and processing aim to boost productivity and tackle sector challenges, aligning with the country's ambition to reclaim its former status as a global leader in palm oil production (Murphy, *et al*., 2021).

Globally, sustainability concerns in the oil palm sector, as asserted by Murphy *et al.* (2021), mirror local issues in Edo State, Nigeria, where sustainable agricultural practices are becoming increasingly critical. Major challenges in Nigeria's palm oil production include price fluctuations, long maturity periods for palm trees, transportation difficulties, inadequate financial support, poor storage facilities, and dependence on outdated equipment (Shehu, *et al*., 2021; Ikuenobe, *et al*., 2021). To mitigate these issues, innovative technologies have been introduced, enhancing processing efficiency and enabling farmers to produce palm oil more effectively. Advancements in harvesting techniques have also emerged, with the introduction of mechanical adjustable harvesters and Malaysian knives revolutionizing fresh fruit bunch (FFB) harvesting. These tools make harvesting faster, safer, and more productive, reducing the risks traditionally associated with climbing (Ikuenobe *et al.,* 2021). The importance of technology adoption and efficiency in revitalizing the oil palm sub-sector is underscored by studies such as those by Ariyanto *et al.* (2020) and Abdulsalam *et al*. (2014). Government efforts, particularly in Edo State, further support the industry through legal frameworks and land allocations for oil palm

cultivation. These initiatives aim to stimulate investment, expand large-scale plantations, and enhance production capacity with a focus on sustainability (Shehu *et al*., 2021).

Despite these efforts, Nigeria continues to face a domestic production gap, leading to palm oil imports. Addressing this shortfall requires further expansion of production while simultaneously tackling environmental and labour challenges (Murphy *et al.*, 2021). Overall, modernizing and revitalizing Nigeria's oil palm sector depends on a blend of innovation, investment, and supportive policies. While significant hurdles persist, the sector holds considerable potential for economic development and environmental stewardship (Shehu *et al.*, 2021). A critical component of this transformation is the role of agricultural extension services as highlighted by Aina and Odebode (2021), extension services are vital for promoting the adoption of sustainable practices and equipping smallholder farmers with the necessary knowledge and skills to innovate. Building a robust extension system in Edo State would be crucial for empowering farmers to adapt to new technologies and changing environmental conditions. Furthermore, research by Krishna *et al.* (2017) and Kubitza *et al.* (2018) emphasizes the importance of understanding the socio-economic impacts of oil palm expansion, highlighting the need to balance economic growth with social equity. Keong (2019) further stresses the necessity of addressing pest management and market access challenges through innovative strategies, such as integrated pest management and improved market networks, to strengthen farmers' market positions and resilience.

Technological innovation remains a cornerstone for modern agricultural advancement. According to Ariyanto *et al*. (2020), adopting new technologies is essential for achieving more efficient, environmentally sustainable, and profitable oil palm cultivation practices. Thus, assessing the innovative capabilities of oil palm farmers in Edo State involves examining their

adoption of sustainable practices, technological advancements, market strategies, and understanding the socio-economic dimensions of innovation. These insights form the foundation for the proposed study, aimed at fostering a resilient and thriving oil palm industry in Edo State.

1.2 Statement of the Research Problem

The oil palm industry is a cornerstone of Nigeria's economy and a vital source of livelihood for millions, particularly in rural areas. Historically and culturally significant, the sector has evolved with global agricultural trends. The International Fund for Agricultural Development (IFAD, 2024) emphasizes that innovation, especially local technological solutions, can enhance the productivity and sustainability of small-scale farms. Despite current challenges, Nigeria's oil palm industry holds great potential for growth, export earnings, and industrial diversification, given its versatility across food, cosmetics, and biofuel industries (Olatunji *et al.,* 2015).

Oil palm cultivation is deeply integrated into the socio-economic and cultural fabric of many Nigerian communities (Ikuenobe *et al.,* 2021), where its products are used in traditional ceremonies and daily life. Adopting improved technologies can foster skills and innovation among farmers (Olatunji, *et al*., 2015). However, the industry also faces environmental concerns such as biodiversity loss and deforestation (Ekenta and Ajala, 2017). Sustainable practices, like those promoted through the BEFTA Programme, can mitigate these impacts by enhancing plantation structural complexity (Fayle *et al.,* 2015).

Historically, oil palm (*Elaeis guineensis*) has been central to Nigeria's economic and cultural life (Shehu *et al.,* 2021). Initially grown for subsistence, it later became a major export during the colonial period, fundamentally shifting its economic role. Post-independence, oil palm remained

crucial to Nigeria's agricultural economy despite market fluctuations, underpinning food security and economic stability (Food Business Africa, 2024; Ekine and Onu, 2008).

Today, the industry continues to drive GDP growth, employment, and rural development, while promoting economic diversification away from crude oil (Ekenta and Ajala, 2017). Oil palm exports significantly bolster Nigeria's foreign exchange reserves (Okolo *et al.,* 2019), while the industry's expansion supports infrastructure development and improves rural livelihoods (Shehu *et al.,* 2021). Government policies are increasingly geared toward investment stimulation, sustainable practices, and global competitiveness. Given its economic importance, farmers especially in Edo State must adopt technological innovations to enhance production and remain competitive. Despite extensive research on innovations (Agwu, 2021; Ikuenobe *et al.,* 2021; Ariyanto *et al*., 2020), there is still a lack of empirical studies assessing how innovative Nigerian oil palm producers, particularly in Edo State, truly are. This study, therefore, seeks to address that gap through the following questions;

1. What are the socio-economic characteristics of oil palm producers in Edo State?
2. What are the sources of information available and accessible to producers and the frequency in accessing them?
3. What are the key drivers motivating oil palm farmers in Edo State to adopt innovative practices?
4. What are the innovative capabilities of oil palm farmers in Edo State?
5. What barriers do oil palm farmers in Edo State encounter in adopting innovative practices?

1.3 Objectives of the Study

The main objective of this study was to assess the determinants of innovative capabilities of oil palm producers in Edo State, Nigeria, with a view to unravelling the innovativeness of oil palm producers for economic prosperity in cash crop production in Nigeria. Specifically; the study is designed to:

1. describe the socio-economic characteristics of oil palm producers in the study area;
2. identify information sources accessed by farmers and the frequency of accessing them;
3. describe the factors that influence farmers' decisions to adopt new innovative practices;
4. determine the farmers' innovative capabilities in oil palm production and processing;
5. Identify the constraints to innovativeness in oil palm production and processing.

These questions and objectives are designed to provide a comprehensive understanding of the current state of innovation among oil palm farmers in Edo State, identify factors influencing innovation, and suggest ways to bolster innovation for sustainable development and economic growth of oil palm farmers.

1.4 Hypotheses of the Study

$H0_1$: There is no significant relationship between socio-economic characteristics of oil palm producers and their level of innovativeness in the adoption of new technologies.

$H0_2$: There is no significant influence between income and their level of innovativeness in oil palm producers.

1.5 Justification of the Study

This study highlights the economic significance of innovation in Nigeria's vital oil palm sector. By assessing farmers' innovative capabilities, it identifies strategies to boost productivity, efficiency, and competitiveness, enhancing both state and national economies. Insights from this research can inform policies and interventions aimed at value addition, export promotion, and income improvement among producers.

Innovation is also crucial for environmental sustainability. The study explores how innovative agricultural practices can promote sustainable land use, biodiversity, and a reduced environmental footprint, aligning with global and local sustainability goals. By encouraging eco-friendly practices, it offers solutions to challenges like deforestation and soil degradation.

Furthermore, understanding farmers' innovative capabilities reveals pathways for rural livelihood improvement. Enhanced innovation can drive income stability, better living standards, poverty reduction, and community development. The study thus supports initiatives for farmer empowerment, entrepreneurship, and resilience building. The findings will provide empirical evidence to guide resource allocation, design support programs, and shape regulations that foster agricultural innovation. Engaging various stakeholder, farmers, policymakers, researchers, and

industry players the study aims to create a collaborative environment conducive to sectoral development. Additionally, the research contributes to academic knowledge by addressing gaps in agricultural innovation literature and setting a foundation for future studies.

Ultimately, the study holds significant potential for advancing economic development, environmental sustainability, social welfare, policy formulation, and academic progress, offering crucial insights for driving positive change in Edo State's oil palm industry.

CHAPTER TWO

2.0 LITERATURE REVIEW

This chapter reviews literature that are relevant to this research. There are four sections such as; Conceptual and Theoretical Framework, Methodological Reviews and Empirical Reviews

2.1 Definition of terms

Assessment: In the context of this study, "assessment" refers to the systematic evaluation and measurement of the extent, nature, and impact of innovative capabilities among oil palm farmers in Edo State. This involves collecting and analyzing quantitative and qualitative data to gauge the levels of innovation adoption and its determinants within the target population.

Innovative Capabilities: "Innovative capabilities" denote the ability of oil palm farmers in Edo State to adopt new and improved methods, technologies, processes, or practices that enhance the efficiency, productivity, sustainability, or profitability of their farming activities. This includes the adoption of modern agricultural techniques, utilization of improved seed varieties, implementation of sustainable farming practices, engagement with digital technology for agricultural purposes, and the adoption of new market or business strategies.

Oil Palm Farmers: In this study, "oil palm farmers" are defined as individuals or entities engaged in the cultivation, harvesting and processing of oil palm crops in Edo State, Nigeria. This includes smallholder farmers, medium-scale producers, and large-scale enterprises that are actively involved in oil palm farming and processing within the geographical confines of Edo State.

2.2 Conceptual and Theoretical Framework

A conceptual model for this research was structured with the innovative capability of oil palm producers as the dependent variable, influenced by a set of explanatory variables grouped under: individual factors (education, age, gender, oil palm farming experience), institutional factors (extension contact, cooperative membership) and economic factors (farm income, access to credit) etc.

2.2.1 Innovation in Oil Palm Production

Innovations in oil palm production are multifaceted, encompassing agricultural techniques, technology adoption, and sustainable practices to meet growing demand while addressing environmental concerns. Among the recent innovations are the use of biomass. Research has highlighted innovative ways to leverage oil palm biomass, like the production of biochar and activated carbon, which are significant for their energy potential and environmental benefits. Biochar production from oil palm biomass is noted for its high fixed carbon content, indicating its high energy potential, and can serve as an alternative renewable energy source. The production processes are designed to optimize combustion and ensure the high energy content of the biochar, with potential applications in various industries, including wastewater treatment and energy storage (Owutuamor, *et al*., 2021)).

In addition, irrigation technology adoption is another innovation that has been used extensively in oil palm farming in Colombia, a study has categorized oil palm farmers based on demographic and socioeconomic characteristics to understand their willingness to adopt irrigation technologies better (Ikuenobe, *et al*., 2021). The findings suggest that specific groups, such as those led by women or diversified populations, are more inclined to adopt such technologies. This insight is

crucial for tailoring agricultural extension services and enhancing technology adoption to improve productivity and sustainability in oil palm production.

Furthermore, the application of machine learning and artificial intelligence in oil palm agriculture is emerging as a transformative force. These technologies can improve yield predictions, disease detection, and plantation management. They offer a roadmap for integrating smart systems that can significantly enhance the efficiency and sustainability of oil palm agribusiness, addressing both the environmental and economic aspects of sustainability (Ekenta, & Ajala. 2017).

The palm oil industry is transitioning towards net-zero emissions and sustainable practices. This includes adopting standards that ensure traceability and transparency in supply chains, enhancing sustainable certification schemes, and developing climate-smart agricultural methods to increase yields without expanding plantation areas, which is crucial for maintaining biodiversity and reducing environmental impacts (Ekenta, & Ajala, 2017).

Remote sensing technologies, using satellite and aerial data, offer new opportunities for monitoring oil palm plantations, enhancing yield forecasting, and ensuring sustainable land use. These technologies can identify suitable lands for plantations, detect illegal logging, and provide vital data for effective plantation management, thereby supporting both the environmental and economic sustainability of palm oil production (Shehu *et al*., 2021). Innovations in small-scale palm oil processing, such as different types of manual and hydraulic presses, have evolved to improve efficiency and reduce labor intensity. These innovations cater to the needs of small-scale processors, aiming to increase oil extraction efficiency while addressing ergonomic and operational challenges (Murphy, *et al.*, 2021).

2.2.2 Concept of Agricultural Technology

Agricultural technology encompasses a range of innovations, from basic tools and machinery to advanced biotechnologies and information systems. These technologies aim to increase efficiency, reduce labour and resource requirements, and improve crop yields and quality and reduce the laborious nature of farming among farmers (Mailena, *et al*., 2021). At global level, these technologies are found in various forms such as:

2.2.2.1. Biotechnology

Biotechnology plays a critical role in developing drought-resistant, pest-resistant, and high-yield crop varieties. Genetically modified organisms (GMOs) are a significant outcome of biotechnology, increasing food production and reducing dependency on chemical pesticides (James, 2014).

2.2.2.2 Nanotechnology

Nanotechnology offers innovative solutions in crop protection, nutrient delivery systems, and water purification. It enables precise delivery of nutrients and pesticides, enhancing plant growth and reducing environmental impacts (Scott, & Chen, 2013).

2.2.2.3 Information Technology (IT) and Precision Agriculture

The use of IT in agriculture, including geographic information systems (GIS), sensors, and drones, facilitates precision agriculture. This approach allows farmers to optimize inputs like water, fertilizers, and pesticides, thereby enhancing productivity and sustainability (Pierpaoli, *et al.*, 2013).

2.2.2.4 Farm Mechanization and Robotics

Farm mechanization, including tractors, harvesters, and planting machinery, has long been central to increasing agricultural productivity. Robotics and automation are extending these benefits, enabling precision tasks, reducing labor needs, and improving safety (Blackmore, *et al.*, 2005).

2.2.2.5 Renewable Energy in Agriculture

Renewable energy technologies, such as solar and wind power, offer sustainable alternatives for powering agricultural operations, reducing reliance on fossil fuels, and mitigating greenhouse gas emissions (Smith, & Gregory, 2013).

While technology offers numerous benefits, its adoption faces challenges, including high costs, lack of infrastructure, and the need for farmer education and training. However, the potential rewards, such as increased efficiency, reduced environmental impact, and enhanced food security, present compelling opportunities for stakeholders across the agricultural spectrum. Technological innovations in agriculture are pivotal for addressing global challenges such as food security, resource scarcity, and climate change. Continued research, investment, and collaboration are essential to harness these technologies' full potential, ensuring a sustainable and prosperous future for the agricultural sector.

2.2.3 Technological Interventions in Oil Palm Production

The theoretical foundation for understanding technology utilization in oil palm production is built on models that elucidate the role of information in agricultural contexts. These models typically represent the flow and impact of information within agricultural systems, emphasizing the relationships between information access, technology adoption, and production outcomes. In

technology utilization, information is required and this is formed in form of information behaviour in oil palm require. This involves the processes through which oil palm producers and stakeholders obtain relevant technological and agronomic information. The analysis and interpretation of acquired information to make it actionable within the context of oil palm production. The practical application of processed information in the form of technology adoption and implementation, directly influencing oil palm cultivation practices.

The use of GPS, drones, and sensors to monitor and optimize oil palm plantation management, including planting, fertilization, and harvesting. Application of genetic engineering and tissue culture techniques to develop high-yielding and disease-resistant oil palm varieties. Utilization of information technology to implement sustainable cultivation practices, such as integrated pest management and efficient water usage. Leveraging big data analytics and IoT devices to gather and analyze data for informed decision-making in oil palm production (Pierpaoli *et al.*, 2013).

2.2.4 Outcomes of Technology Utilization

Enhanced Productivity: Improved yield and quality of oil palm production through targeted technology applications.

Environmental Sustainability: Reduced environmental impact of oil palm cultivation by adopting eco-friendly technologies and practices.

Economic Viability: Increased profitability and market competitiveness for oil palm producers through cost-effective technology solutions.

2.2.5 Model Representation

The model can be visualized through diagrams illustrating the interconnections between information flow, technology adoption, and their impacts on oil palm production. These diagrams can serve as a tool for understanding and communicating the dynamic nature of technology utilization in the sector (Pierpaoli *et al.*, 2013). By conceptualizing a model for technology utilization in oil palm production, stakeholders can gain insights into the mechanisms through which information and technology drive improvements in the sector. This understanding is critical for developing strategies that enhance the productivity, sustainability, and economic viability of oil palm cultivation.

2.2.6 Diffusion Model Theory

A Rural Sociologist from the United States, developed the Diffusion of Innovations theory. This theory seeks to explain why significant differences in productivity and marketing exist among farmers within the same economic and geographical areas. The theory suggests that adopting modern techniques is crucial for enhancing agricultural productivity, thereby contributing to food security. The Diffusion theory views the adoption of innovations as a process that typically unfolds in five main stages. This theory is applicable to understanding the behaviour of information seeking and the adoption of best practices among farmers. The stages of adoption and their relevance to farming are as follows:

Knowledge: Adoption begins with awareness. Farmers can only adopt practices they know about, which comes from accessing relevant information through suitable channels. Thus, awareness of innovations via appropriate sources is key to adopting technology in oil palm production practices.

Persuasion: In this stage, farmers evaluate the innovation, weighing its pros and cons. Their attitude towards the innovation influences whether they adopt the practices fully, partially, or not at all. Friends and neighbours are crucial sources of information during this phase.

Decision: Here, farmers seek more detailed information before adopting the proposed practices. Again, friends and neighbours play a significant role, influencing the farmers' decisions positively or negatively through their ability to persuade.

Implementation: Farmers may initially try the practices on a small scale as a test. This trial allows them to gain personal experience with the innovation before fully adopting it.

Confirmation: After the trial, the farmers are likely to fully adopt the innovation and seek further reinforcement for their decision. Effective communication and support services are necessary for diffusing innovations to farmers, especially in rural areas. Explaining the benefits of modern techniques is crucial for their understanding and application in improving productivity.

This theory has been widely applied in many developing countries, significantly contributing to the success of agricultural extension services, demonstration farms, and local innovations. It has helped expose rural farmers to new concepts, applications, and benefits. In Nigeria, the Diffusion model theory is recognized as a solution to low productivity and marketing challenges faced by rural farmers, ultimately addressing national food insecurity issues.

2.2.7 Theory of Reasoned Action

The Theory of Reasoned Action (TRA), has been widely employed by various researchers to analyze sociological phenomena. This theory operates on the premise that individuals make logical decisions based on their understanding of a given situation and their intent to engage in or refrain from a particular action, which is the key determinant of their actual behaviour. TRA is

noted for its robust ability to predict the relationship between knowledge, behaviour, and an individual's intention to undertake a specific task.

TRA posits that two primary factors influence an individual's behavioural intention: their attitude towards the behaviour (A) and the subjective norm (SN) surrounding it. These factors, in turn, influence the actual behaviour.

The Theory of Planned Behaviour (TPB), an extension of TRA introduced by Ajzen in 1985, differs by including perceived behavioral control (PBC) as an additional factor affecting behavioral intention. Ajzen later clarified in 1991 that PBC, alongside behavioral intention, can directly predict actual behaviour.

In the context of new technology adoption, TRA suggests that a user's attitude towards the technology significantly influences their behavioral intention to use it. Applying this to the innovativeness of oil palm farmers in Edo State could be explained by the fact that when farmers develop a positive attitude towards these innovations, their intention to adopt them strengthens, increasing the likelihood of their actual use.

Furthermore, TRA implies that the search behaviour of farmers for technology in oil palm production is closely linked to their interest and intention. This means that their efforts to gather information and their decision-making processes are guided by their intentions and attitudes towards the adoption of technology for producing oil palm.

2.3 Methodological Review

Among oil palm producers, the assessment of innovative capabilities is increasingly essential for policy development, investment targeting, and capacity building. However, despite the growing body of literature, methodological frameworks employed in these assessments reveal significant

gaps that undermine the reliability, comparability, and applicability of findings. This paper critically examines these methodological framework gaps;

One significant gap in the assessment of innovative capabilities among oil palm producers is the lack of a standardized, agricultural-sector-specific conceptual framework. Researchers frequently adopt models such as the Oslo Manual (OECD & Eurostat, 2018), originally designed for firms in industrial settings, and apply them to small-scale farmers without sufficient adaptation (Wiggins & Keats, 2013). Though useful in some aspects, such frameworks often fail to capture context-specific innovations like indigenous knowledge integration, informal knowledge networks, and non-technological innovation. Additionally, frameworks like the Agricultural Innovation Systems (AIS) approach have been proposed (World Bank, 2006), but their adoption remains fragmented and inconsistent. AIS emphasizes the dynamic interactions between different actors (e.g., farmers, researchers, extension agents, market players) in the innovation process, yet few studies integrate these interactions systematically (Klerkx, *et al*., 2012).

Innovation is a multidimensional phenomenon, there is limited integration of mixed-methods approaches in current research. Mixed methods, which combine qualitative and quantitative data, can offer a more holistic assessment of innovative capabilities (Creswell & Plano Clark, 2011).

Furthermore, a recurring methodological challenge is the development of robust and context-specific measurement indices for innovative capability. While some studies employ innovation indices derived from Likert-scale survey questions (e.g., rating knowledge or use of certain practices), the validity and reliability of these indices are often questionable (Ekong, 2003). Moreover, indices frequently fail to differentiate between adoption (which is passive) and adaptation (which involves active problem-solving), both of which are essential components of

innovative capability. In addition, many studies do not test the psychometric properties of their scales, such as internal consistency (e.g., Cronbach's alpha) or construct validity. As a result, their findings may be statistically sound but theoretically weak (Hair *et al*., 2010).

In an era of rapid digital transformation, many methodological frameworks fail to incorporate metrics related to the use of Information and Communication Technologies (ICTs) in innovation processes. Digital tools such as mobile apps, online extension platforms, and drone-assisted farming are emerging as important drivers of innovation among progressive oil palm producers (Aker, 2011). The omission of such variables results in outdated assessments.

The assessment of innovative capabilities among oil palm producers remains a critical area for agricultural research, policy formulation, and development interventions. However, these methodological gaps that persist, undermining the validity, depth, and applicability of findings are what this research addressed holistically that reflect the realities of oil palm producers in Nigeria.

2.4 Empirical Review

Several studies have emphasized the importance of innovative capabilities in agricultural production. Oyelaran-Oyeyinka and Adebowale (2012) noted that innovation in agriculture encompasses not only the adoption of new technologies but also changes in organizational practices, business models, and institutional arrangements. Innovative capability is thus a multidimensional construct, involving human capital, institutional support, information flow, and socio-economic conditions. These components collectively determine the extent to which farmers can respond to opportunities and challenges in their production environment.

Empirical Evidence from Nigeria: In Nigeria, numerous empirical studies have attempted to measure and assess the innovative capabilities of farmers, including oil palm producers. Ayinde, *et al*., (2017), in their study on innovation adoption among oil palm farmers in Ondo and Edo States, identified that access to extension services, education level, and availability of credit significantly influenced farmers' willingness to adopt innovations such as improved seedlings and mechanized processing techniques. The study utilized a structured questionnaire and logistic regression analysis to identify the major determinants of innovation adoption.

Bassey and Enete (2018) conducted a similar study in Cross River State, where they observed that farmers with larger farm sizes and those who were members of innovation platforms were more likely to adopt improved production practices. The researchers highlighted the importance of social networks and collective action in fostering innovation diffusion among smallholder farmers. They used a probit model to analyze factors influencing the adoption of new technologies such as hybrid seedlings, fertilizer application, and mechanized tools.

Edeh, Onwuka, and Ugwuja (2019) explored the socio-economic determinants of the adoption of improved oil palm processing technologies in Imo State. The study found that age, level of education, cooperative membership, and access to extension services significantly affected adoption rates. The authors recommended strengthening cooperative societies and improving extension delivery systems to enhance innovation uptake.

Innovation Systems and Institutional Support: The innovation systems framework has been widely used to understand the dynamics of agricultural innovation. Innovation is not merely a linear process but a complex interaction among various actors, including farmers, researchers,

extension agents, input suppliers, and policymakers. The effectiveness of these interactions determines the capacity of the system to generate and disseminate useful innovations.

In Nigeria, institutional support for innovation in the oil palm sector has been uneven. A study by Okunlola, *et al*., (2020) revealed that many oil palm farmers in Osun and Ogun States lacked access to institutional support such as training programs, innovation grants, and extension services. Their findings suggested that farmers' perception of risk and their level of trust in public institutions influenced their willingness to adopt new technologies. The study emphasized the need for inclusive and participatory innovation platforms that bring together stakeholders from various segments of the oil palm value chain.

Furthermore, Oladeji & Oyesola (2013) assessed the effectiveness of extension services in facilitating innovation among rural farmers in Southwestern Nigeria. Their results indicated that extension agents were more successful in promoting innovation when they adopted participatory and farmer-centered approaches. The authors advocated for the restructuring of extension systems to focus more on capacity building and knowledge co-creation.

Human Capital and Innovation Adoption: The role of human capital in innovation adoption has been extensively documented in the literature. Farmers with higher levels of education are generally more likely to experiment with and adopt new technologies (Asenso-Okyere & Davis, 2009). This is because education enhances cognitive skills, improves access to information, and increases the ability to evaluate the benefits and risks of innovations.

Oluwatayo & Adedeji (2019), in their study on agricultural innovation in Nigeria, found a positive correlation between farmers' educational attainment and their adoption of improved

agricultural practices. The study also found that participation in training programs significantly enhanced farmers' knowledge and willingness to innovate. In the context of oil palm production, formal and informal training in best practices, pest management, and processing technologies is essential to building innovative capabilities.

Similarly, the study by Adesina & Baidu-Forson (1995) highlighted that perception of technology characteristics such as compatibility, complexity, and relative advantage also influences adoption. These perceptions are shaped by farmers' prior knowledge, experience, and exposure to training.

Role of Cooperatives and Social Networks: Cooperative societies and farmer groups play a crucial role in fostering innovation. They serve as platforms for knowledge exchange, collective learning, and access to resources such as credit and inputs. Empirical evidence from multiple studies supports the view that group membership enhances farmers' capacity to innovate.

Umeh & Asogwa (2012) found that oil palm producers who belonged to cooperatives were more likely to adopt improved processing technologies and participate in value addition activities. The study, conducted in Enugu and Anambra States, employed a multi-stage sampling technique and descriptive statistics to evaluate the impact of cooperatives on innovation behavior.

Afolami *et al.* (2015) also emphasized the role of social capital in innovation diffusion. They noted that information flows more efficiently within trusted networks, and farmers are more likely to adopt innovations recommended by peers. These findings underscore the importance of strengthening farmer organizations and creating enabling environments for peer learning.

Technological and Digital Innovations: In recent years, digital technologies have emerged as critical enablers of innovation in agriculture. Mobile phones, internet platforms, and digital extension tools facilitate access to market information, weather forecasts, and best agronomic practices.

Asante, *et al*., (2016) examined the role of ICTs in innovation adoption among oil palm and cocoa farmers in Ghana. They found that access to mobile phones and radio programs significantly improved farmers' knowledge and uptake of innovations. The study recommended the integration of ICTs into agricultural extension systems to broaden outreach and reduce information asymmetry.

In Nigeria, the Federal Ministry of Agriculture has initiated several e-extension platforms, but their effectiveness remains limited by infrastructural and logistical challenges. Okello *et al.* (2014) noted that digital inclusion requires not only infrastructure but also digital literacy and affordability.

Gender and Innovation: Gender dynamics also influence innovative capabilities. Women often face structural constraints such as limited land access, lower education levels, and reduced mobility, which inhibit their participation in innovation processes.

Ogunlela & Mukhtar (2009) argued that addressing gender disparities in access to resources and information is essential for inclusive innovation. They advocated for gender-sensitive policies and programs that recognize women's roles and contributions in agricultural innovation.

A study by Fakoya *et al.* (2016) in Ogun State observed that female oil palm processors were less likely to adopt mechanized tools due to limited access to credit and labor. The authors called

for targeted interventions such as microcredit schemes and labor-saving technologies designed for women.

Regional and International Perspectives: Beyond Nigeria, studies from Southeast Asia offer valuable lessons. In Malaysia, Wahid, *et al*., (2015) demonstrated that public-private partnerships, research-extension linkages, and farmer training centers were instrumental in enhancing the innovative capabilities of smallholder oil palm producers. The Malaysian Palm Oil Board (MPOB) played a pivotal role in coordinating innovation activities and supporting farmers through subsidies, training, and research dissemination.

In Indonesia, Purnomo *et al*. (2017) found that certification schemes such as the Roundtable on Sustainable Palm Oil (RSPO) encouraged innovation by promoting sustainable practices and providing market incentives. These schemes pushed producers to adopt environmental and socially responsible practices, thereby stimulating innovation.

The empirical literature on innovative capabilities among oil palm producers reveals a complex interplay of factors influencing innovation behavior. From all the researches carried out, it was observed that there was paucity of information in innovation capacibilities among oil palm producers in Edo State using information variables such as WhatsApp, facebook, Instagram, twitter etc.

2.5 Factors Influencing Farmers' Adoption of Innovative Practices

1. **Socio-Economic Characteristics**: Farmers' age, education level, household size, farm size, and income level significantly affect adoption. Younger and more educated farmers

are generally more willing to take risks and try innovations compared to older farmers who may be conservative (Adeola, *et al*., 2025).

2. **Access to Information and Extension Services**: Regular contact with extension agents and access to training, demonstrations, and agricultural information positively influence adoption because they improve farmers' understanding of the technology and its benefits (Okoh & Ikeoji, 2025).
3. **Technology Attributes (Perceived Benefits & Compatibility)**: The perceived relative advantage, compatibility, and ease of use of an innovation strongly shape adoption decisions (Rogers, 2003). If a new practice is seen as profitable, reduces labour/time, or fits within existing farming systems, adoption is higher (Adesina & Zinnah, 1993).
4. **Economic and Financial Access**: Adoption is influenced by the cost of the technology, availability of credit, and farmers' liquidity. Farmers are more likely to adopt when they have access to affordable credit or subsidies to offset initial investment costs (Okoh & Ikeoji, 2025).
5. **Infrastructure and Market Access**: Secure land tenure, good infrastructure (roads, storage), and market access motivate adoption because farmers are confident they can sell increased production (Okoh & Ikeoji, 2025; Oyekunle, 2025). Lack of market opportunities can limit uptake even when innovations are technically sound.
6. **Social Influence and Peer Learning:** Farmer-to-farmer diffusion, social networks, and cooperative membership influence decisions. Adoption tends to spread faster when opinion leaders or early adopters in a community use and endorse the practice (Bandiera & Rasul, 2006).

7. **Policy and Government Support**: Enabling policies, subsidies, and government programmes (e.g., input support schemes) encourage adoption by reducing barriers and signaling official support for the innovation (Okoh & Ikeoji, 2025).

2.6 Some Innovations from Nigerian Institute for Oil Palm Research

The Nigerian Institute for Oil Palm Research (NIFOR) has developed several technologies but not limited to the ones listed below;

1. Soil App development for the Oil palm sector growth and precision nutrient management: Generation, rescue and assemblage of legacy data which consist of soil and climatic data across the selected locations in different agro-ecological zone. The rescued data consist of the rainfall distribution, temperature distribution, soil temperature distribution, depth to aquifer water table and soil reaction (pH).

   The application Interface overview has the following features;

   - Oil palm soil info app interactive platform
   - NIFOR logo, search bar, profile access
   - Dashboard, soil profiles, data analysis, mapping
   - Project summary, feature cards (NIFOR In-House Research Review, 2025).
2. NIFOR CPO Adulteration Analysis Kit (NIFOR CAAK)": In 2025, NIFOR developed a test kit to detect adulterated palm oil, especially detecting harmful Sudan dyes in palm oil sold in markets. It will help to;

   - assure quality & safety of palm oil,
   - can protect consumers from health risks
   - may increase trust in formal markets;

- supports regulatory enforcement (Standard Gazette, 2025).

3. Development of special fertilizer blends for oil palm in Nigeria (regional blends for South- west, South- south and national) in collaboration with IAR& T and OCP Africa to address nutrient deficiencies and boost yields. Trials have been done over many farms.
4. Studies on crop geometry (spacing), land clearing techniques, nursery techniques (single-stage vs double stage), intercropping systems (oil palm with food crops, with cocoa) to increase productivity and optimize land use.
5. Development of the dura × pisifera (D × P) cross to produce the tenera hybrid. The tenera has a thinner shell (mesocarp shell) and gives much higher oil yield than unimproved palms.
6. Progeny trials and a recurrent selection scheme (modified reciprocal recurrent selection) that have led to improved parents (both dura & tenera) for seed gardens, giving increased yields.
7. Research into seed dormancy in oil palm, with techniques to break dormancy; this has helped improve germination rates. NIFOR is now able to produce seeds/seedlings with high and uniform germination.
8. Identifying key nutrient elements like potassium, nitrogen, phosphorus, magnesium; developing fertilizer regimes. Critical nutrient levels have been determined via foliar diagnosis etc.
9. Research on Fusarium wilt: its aetiology, screening for tolerant or resistant progenies, breeding toward resistant hybrids.

10. Identification and management of major insect pests (e.g. leaf-mining hispid *Coelanomenodera elaeidis*; *Oryctes spp.*, etc.). Seasonal abundance, distribution etc. studied; integrated control strategies developed.
11. Development of Small Scale Processing Equipment (SSPE). NIFOR designed/fabricated mini, medium, large SSPEs with capacities appropriate to smallholder farmers. These units include sterilizer/cooker, stripper, digester, press (e.g. screw press), clarifier etc.
12. Palm kernel recovery units: Nut fibre separator, nut cracker, kernel/shell separator, to make better use of kernels.

CHAPTER THREE

3.0 METHODOLOGY

3.1 The Study Area

The study was conducted in Edo State, Nigeria. This was because the State is prominently known for oil palm production and farmers are known for their involvement in oil palm production and processing in State of the Southern part of Nigeria.

Historically and geographically, Edo State was created on 27th August 1991 out of the former Bendel State, and it is located in South-South Geopolitical zone of Nigeria with a total area of about approximately 19383.93km^2, stretching from latitude 5^0.67'N to 7^0.34' north of the equator and longitude 6.20^0'E to 7.53^0'W of the equator and Greenwich meridian, respectively. The State has 18 Local Government Areas with the capital in Benin City and the Agricultural Development Programme (ADP) delineated it into three zones to align with the political senatorial districts. The State has a population of approximately 3,218,332 people with males being 1.64 million and females at a total of 1.58 million (National Population Commission, 2006).

Edo State is low lying except towards the northern axis which range from 183 metres in the Kuruku hills to 672 metres in the Somorika hills. It is bounded to the south and southeast by Delta State, to the north and north east by Kogi State and to the west by Ondo State and east by River Niger. The State is blessed with two major vegetation belts, namely: the rain forest belt in the south and central parts, while the guinea savannah is predominant in the northern part. The major agricultural activities of the State include cultivation of crops such as yam, cassava, maize, rice, cocoa, oil palm, rubber, pineapple, cashew, mango, kola and avocado pear. There is extensive rearing of livestock like goat and sheep and intensive poultry, fish, and pig production. The principal minerals found in the state are gypsum, limestone, marble, kaoline, granite,

industrial sand and bentonite. The major industries in the state are breweries, wood processing, soft drink bottling and cement manufacturing. Locally made wood and metal sculptures are also of commercial and cultural importance. The States houses the Nigerian Institute for Oil Palm Research (NIFOR), a Federal Government Agricultural Institute with the mandates of improving the production of oil palm.

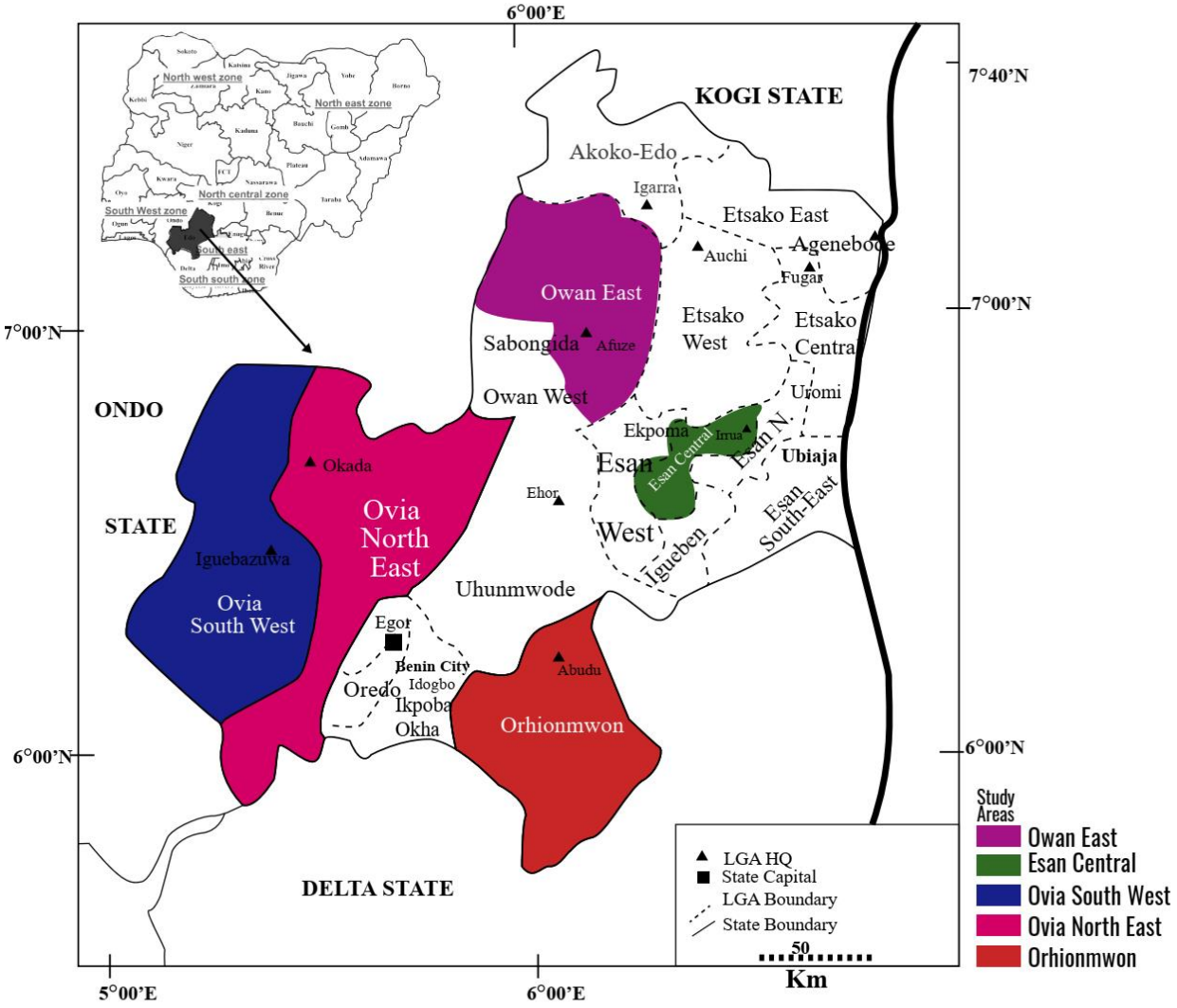


Figure 3.1: Map of Edo State of Nigeria

Source: Adapted from Research gate (2021).https://www.researchgate.net/figure/Map-of-edo-state-showing-the-local-government-areas-of-study-Source-Ministry-of-lands_fig1_302065471

3.2 Scope of the Research

The study was conducted among oil palm producers having processing mills in Edo State, Nigeria. Data were collected from oil palm producers in the State. Preliminary investigations showed that Ovia North-east, Orhionmwon, Owan East, Esan Central and Ovia South West are the Local Government Areas in Edo State with the highest population of oil palm farmers based on the list of the farmers obtained. The study focused on the five (5) LGAs where oil palm farming and processing was predominant and have a high population of those cultivating oil palm as major crop as mean of livelihood in the study area.

3.3 Research Design

Survey research design was used for this study. This type of research design is usually used to find facts by collecting primary data directly from the sample population drawn from the entire population in a study. Surveys are useful in describing the characteristics of a large population by making use of a representative sample of population to be selected. It has the advantage of having accurate assessment of the characteristics of the population under study through random samples drawn from the population. This type of research design allows for a variety of several methods to select respondents to collect quantitative data.

3.4 Data sources

The data for the study was obtained from primary and secondary sources. The primary source were the oil palm farmers under the umbrella body of Oil Palm Growers Association of Nigeria (OPGAN). The secondary data sources were journals, internet, thesis, textbooks and annual reports from Nigerian Institute for Oil Palm Research (NIFOR), Agricultural Development Programme (ADP) etc.

3.5 Population of the study

All oil palm farmers in the state having a processing mill who cultivate oil palm formed the population of the study. The registered oil palm farmers in the State under the umbrella body of Oil Palm Growers Association of Nigeria (OPGAN) were selected using random sampling technique.

3.6 Sampling Procedure and Sample Size

Multi- stage sampling procedures was used to select respondents for the study.

First Stage: At this stage**,** a purposive sampling technique was used to select five (5) Local Government Areas (LGAs) with the preponderance of oil palm production. This is because, the likelihood of having high population of farmers in areas with high oil palm production is guaranteed. Based on the preliminary investigation and information obtained from NIFOR, Ovia North East, Orhionmwon, Owan East, Esan Central and Ovia South West have the highest population of oil palm farmers and were therefore selected.

Second Stage: This stage involved a purposive selection of four (4) communities from each of the chosen LGAs where oil palm production is intensively cultivated and practiced. Thus, 20 communities were sampled from the five (5) LGAs.

Third Stage: This final stage involved random sampling of 61% of the oil palm producers from each community making a total of two hundred and eighty-nine (289) respondents from the list of oil palm producers obtained from Oil Palm Growers Association of Nigeria (OPGAN) which served as the sampling frame. From the sample size of 483 oil palm producers, only 289

respondents were used for the analysis of the study. The sample size was determined using the formula provided by Taro Yamane formula (1967) because the population size was known. The mathematical representation of the Taro Yamane formula, which was used to determine the sample size is shown below;

$$n = \frac{N}{1 + N(e^2)}$$

Where:

n = sample size

N = population size

e = is the level of precision or margin of error, expressed as a proportion (0.05 for a 5% margin of error).

Table 3.1: Sampling Frame for the Oil Palm Producers.

State	Agricultural Zone	Local Government Areas	Communities	Planned Sample	Real Sample (61% of planned sample)
Edo	Edo South	Ovia North-East	Okada	19	11
			Abumere	24	14
			Okokhuwo	33	20
			Obarenren	29	17
		Ovia South-West	Usen	34	20
			Udo	42	24
			Urhezen	27	16
			Iguerhahon	19	12
		Orhionmwon	Ugo neyeko-orhionmwon	48	29
			Obazagbon-nugu Abudu	33	20
			Evboesi	22	13
				17	10
	Edo North	Owan-East	Afuze	31	19
			Uhokha	11	7
			Ake	23	14
			Otuo	27	16
	Edo Central	Esan-Central	Idumebo	8	5
			Opogi	14	9
			Ewu	12	7
			Ugbegun	10	6
Total				**483**	**289**

3.7 Data Collection Instrument

Instrument for data collection for this study was a well-designed questionnaire and interview schedule for both the literate and non-literate respondents. The research instrument was explained to the non-literate oil palm farmers. The instrument was validated and tested for its reliability and validity by experts in the field of Agricultural Economics and Extension, Benson Idahosa University, Benin City, Edo State, Nigeria before use.

3.8 Validity and Reliability of Research Instrument

a. Validity of data instrument

Both the content and construct validity techniques were employed to validate the research instrument.

Content Validity: Experts in Department of Agricultural Economics and Extension, Benson Idahosa University as well as technical staff from NIFOR were asked to critically examine and review the research instrument in relation to the objectives of the study. Their suggestions and recommendations were incorporated in the drafting of the final instrument prior to field survey.

Construct Validity: The instrument was compared with the variables in the conceptual framework on which the study is based to ensure that it does not deviate from its conceptual background.

b. Test of Reliability

Cronbach-Alpha reliability test was carried out on the research instrument to determine the degree of consistency in the measurement of variables it was designed to measure. The method has the advantage of providing a unique estimate of the internal consistency or reliability of a scale, rather than there being a range of possible reliabilities. The test scores were analyzed using Cronbach Alpha Coefficient to determine the level of consistency. A correlation value of ≥ 0.70 was considered an acceptable indication of the instrument reliability. A correlation score of 0.70-0.95 was usually taken to be a good measure of consistency/ reliability of an instrument. Cronbach-Alpha is the most common form of internal consistency reliability coefficient, because of the advantage of being administered once to a target sample thus, saving cost and time.

3.9 Measurement of variables

The variables for this study, consisting of dependent and independent variables, were measured as follows:

The independent variables consist of the following variables as measured below:

i. Age (actual age in years)**:** The respondents were asked to indicate their actual age. This was measured in years (continuous variable).

ii. Sex: Male was coded as 1 while female was coded as 2 generally as nominal variables.

iii. Marital Status: This was measured as a nominal variable with codes such as 1 assigned to single, 2 to married, 3 to widow and 4 to separated/divorced.

iv. Religion: Respondents were asked to indicate their religious affiliation among the 3 religion bodies we have in Nigeria, and this was normally measured as 1 for Christianity, 2 for Islam and 3 for those that practice Traditional Religion.

v. Farming experience: Respondents were asked to indicate their number of years they have been farming oil palm. This was measured in years (continuous level).

vi. Educational Qualification: This was categorized as follows: Respondents with no formal education were rated 1, those with primary education were given 2, and those with secondary education were scored 3 while those with post-secondary education were scored 4. It is nominal and categorical.

vii. Farm size: The size of the farm was measured in hectares (Ha).

viii. Membership of Association: Respondents were asked to indicate whether they belong to any social group or not on a yes/no basis. ‘Yes’ response was coded 1 while ‘no’ was coded zero.

ix. Association membership: Respondents were asked to indicate which of the association they belong. This was coded as 1 for cooperative society, 2 for farmers' association, 3 for trade union association, 4 for community-based association, 5 for the respondents to indicate which of the association belong. Multiple responses were considered for this variable in which multiple responses will exceed 100%.

x. Contact with extension organization: Respondents were asked to indicate whether they had contact with extension organization within the last 1 year on a yes/no basis. Yes was coded 2 while no was coded 1.

xi. Frequency of contact: Respondents were asked to indicate in numerical value, the number of times they have had contact with extension agent within the last one processing year.

xii. Attendance in training related to oil palm production: This was measured on a yes/no basis as nominal variable.

xiii. Frequency of training attendance: Respondents were asked to indicate the number of times such training has occurred within the last one year. It was recorded as given.

xiv. Income from oil palm cultivation: Respondents were asked to indicate their income derived from oil palm production in naira in the last year. This was measured as given.

xv. Income from other economic activities: Respondents were asked to indicate their income derived from other economic activities in naira in the last one year. This was measured as given.

The dependent variable is the innovative capabilities, measured as follows:

A. Skill Assessment: Evaluate the individual's relevant skills that contribute to innovation. This can include:

i. Creative problem-solving,

ii. Technical skills, or specialized knowledge that aids in generating or implementing new ideas

iii. Communication skills.

iv. Human relation skills etc.

Each of these items in the skill assessment was rated on a 5-point rating scale where oil palm producers are expected to rate their ability to perform each of the tasks based on a rating of 1 - 5, where 1 is ‘no ability’ and 5 is ‘very high ability’. A decision was made using a benchmark of 3.0. Any oil palm producers that scores above 3.0 was rated as one with high innovative capacity in skill assessment.

B. Learning and Knowledge Acquisition: Assess the individual's commitment to learning and acquiring new knowledge, which is crucial for innovation. This can be measured by participation in training programs, conferences, or self-directed learning activities. Any oil palm producer who indicated that he/she had participated in a training of oil palm production practices scored a high mark say 1, then those who have never participated say 0 mark

C. Collaboration and Networking: Evaluate the individual's ability to collaborate with others and network across different teams or disciplines. Innovation often requires cross-functional teamwork and the integration of diverse perspectives. A farmer who has a network of farmers

within and outside his/her location was be scored 1 point while those who never had were scored '0' point.

D. Project Outcomes: Looked at the tangible results of projects or initiatives the individual has contributed to, particularly those that involve innovation. Success in bringing new products, services, or processes to fruition can be a strong indicator of innovative capability. Here, any farmer who had improvised any idea to solve his/her immediate problems and got positive results was scored 1 point while those who had never done this were scored 0 point.

E. Adaptability and Resilience: Assess how well the individual adapts to new situations, overcomes challenges, and perseveres through setbacks, all of which are critical for sustained innovation. Farmers were asked their level of adaptability on a yes/no basis. Here, 'yes' was scored 1 point while 'no' attracted 0 point.

F. Feedback and Recognition: Consider the feedback and recognition the individual receives from peers, supervisors, or external parties regarding their contributions to innovation. Here, farmers were asked if they had received any recognition in their locality before with respect oil palm production. 'Yes' attracted 1 point while 'no' attracted 0 point.

G. Self-Assessment: Include self-assessment tools that allow individuals to reflect on their own innovative behaviours and attitudes. This can provide insights into their self-perception of creativity and innovation. A set of perception statements was drawn for farmers to respond to on a 5-point likert scale. This was used to estimate their perception of innovations in oil palm production and their positions about innovations. Their responses were scored appropriately.

All the above stated indicators were scored appropriately and their composite scores calculated. This served as the dependent variable score that were used for the analysis.

3.10 Methods of Data Analysis

The study's data were gathered and analyzed using descriptive statistics such as frequency counts, percentages and mean, grand mean score, while, multiple regression, and binary logistic regression was used to test the stated hypotheses.

Table 3.2. Different Analytical Tools to address the specific objectives

S/N	Objectives	Model to use
1	describe the socio-economic characteristics of oil palm producers;	Descriptive Statistics such as frequency, percentages, means and charts
2	identify sources of information available and access by farmers and regularity in accessing them;	Descriptive Statistics
3	describe the perceived factors that influence farmers' decisions to adopt innovative practices;	Grand mean score
4	Determine innovative capabilities in oil palm production (level);	Grand mean score
5	identify and rank constraints to the innovativeness in oil palm production.	Descriptive Statistics such as frequency, percentages and means

3.10.1 Hypotheses Testing

In statistics, the multiple regression model was used to model the relationship between a set of independent variables and a dependent variable. Multiple regression was used to analyze hypothesis one. The regression model is specified below:

$$Y_i = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + b_9X_9 + b_{10}X_{10} + U \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where:

Y_i = Innovativeness scores (composite score)

X_1 = Age (years)

X_2 = Marital status (Married = 1, Otherwise = 0)

X_3 = Household size

X_4 = Sex: Male = 1 while female = 2.

X_5 = Educational Qualification: no formal education = 1, primary education = 2, secondary education = 3, post-secondary education = 4.

X_6 = Oil Palm Farming Experience (years)

X_7 = Source of labour (man-day)

X_8 = Income (naira)

X_9 = Income from other sources (naira)

X_{10} = Credit access (credit volume in naira)

U = Error term

Hypothesis Two

For the hypothesis two, Binary Logistic response model, if there are N categories, the probability that a farmer is in a particular category j

$$pij = \frac{\exp(ijxi)}{\sum_{j=1}^{3}(\exp(ijxi)} \text{ ---------- (2)}$$

Where *j=0* if the innovativeness is low, and 1 if the level of innovativeness is high based on the categories derived from the innovativeness composite scores from the Equal Interval Approach model.

The explicit function is given as;

$$P_i\ (Y = 1/X_i)\ \frac{p_i}{1-p_i} = e^{(\beta_0 + \beta_1 X_1 + \beta_2 X_2 + + u)} \text{.....(3)}$$

Where:

α= Constant/intercept

β= Slope (Regression coefficient)

Y = Dependent variable for the study (Level of innovativeness categorized into low (0), and high (1); and

X_1= Income from oil palm in naira

X_2= Other sources of income.

Level of Innovativeness was categorized based on the following classification rule Sahal & Baha (2010).

The formula is given as:

$$SDI = 1 - \Sigma(n/N)^2 \quad or$$

Where:

SDI= Simpson Diversity Index

P_i = the proportionate number in the sample);

n = the total number of scores per respondent/household (*ith = 1, 2, . . . n*)

N = gross scores of the sample.

The index ranges between 0 and 1. If there is no response or 'no' response, the index moves tends to Zero. If P_i^2 =1, which is Yes, then it implies the farmers are completely innovative. Based on the scores, respondents' innovative status will be categorized based on the following classification rule.

- Low (0 - 0.63)
- High (Above 0.63)

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

The chapter presents the results of data analysis, interpretation and discussion of findings in line with the study objectives and hypotheses. From a sample of 300 oil palm farmers and processors, 289 copies of the questionnaire used were found properly filled and analyzable. This forms a response rate of 96.3%.

4.1 Socio-Economic Characteristic of the Oil Palm Producers.

4.1.1 Age in years

The age demographics of the respondents show a mean age of 51 years, with a standard deviation of 10.46. This indicates that the population is relatively older, with over half (51.9%) being 50 years and above. The next significant group is aged 40-49 years (34.6%), while only 13.4% are less than 40 years. This older demographic shows a likely focus on mature, experienced individuals in the sampled population. This age group brings experience but may also face physical challenges associated with the labour-intensive nature of palm oil production (Okoroafor *et al.,* 2023).

4.1.2 Marital Status

A vast majority (83.7%) of respondents were married, with singles, widows, and separated individuals constituting smaller proportions (6.9%, 5.2%, and 4.2%, respectively). This high percentage of married individuals may reflect a cultural or societal norm emphasizing marriage, potentially influencing socio-economic dynamics especially among farmers. The higher married status of the oil palm farmers and processors may be due to higher family responsibilities. This is

in line with the study of Okoroafor *et al.,* (2023) that stated that married individuals may have greater family responsibilities, potentially affecting their capacity to adopt new technologies or expand their production.

4.1.3 Household Size

The mean household size is 8, with a standard deviation of 4.24. The majority of households (60.9%) have between 5 and 9 members, while 24.9% have 10 or more members. Only 14.2% have fewer than 5 members. This indicates that larger households predominate among oil palm farmers in the study area. Although, the larger household size might suggest extended family living arrangements or economic dependencies within households. Larger households may provide more labour, reducing the need for hired workers. However, smaller household sizes might limit labour availability, potentially impacting production capacity (Okoroafor *et al*., 2023).

4.1.4 Gender Distribution

The sampled respondents are overwhelmingly male (84.8%) compared to females (15.2%). This gender imbalance raises questions about the permanent nature of oil palm production as in most cases, in African settings, women are not entitled to land. In case of the demise of the husbands, such women can only access land through their sons. This is one of the reasons why desire of women to have male children is very high among many African women. The male dominance in this study may not be unconnected to the permanent cropping system of oil palm while the few women found in this study may dominate the processing aspect of the study, which empirically conforms with the study of Olagunju *et al.* (2023), which stated that about 61.1% of women in

Ife-South Local Government Area of Osun State involved in oil palm processing and they were over 50 years old. This shows the substantial role of older women in the industry.

4.1.5 Educational Qualification

The respondents exhibit a varied educational background, with 43.6% attaining tertiary education and 38.8% completing secondary education. Primary education and no formal education account for 13.8% and 3.8%, respectively. This indicates a relatively educated population, with a strong proportion having access to higher education. The higher educational level attained among respondents positively affected the adoption of improved oil palm fruit processing technologies (Adekunle *et al.*, 2022).

4.1.6 Years of Experience

The result shows that a significant portion of respondents (44.3%) have 10 –19 years of experience, with a mean of 18.51 years. This indicates that the industry is predominantly managed by individuals with substantial experience. Experience is a critical factor in optimizing oil palm production, as it fosters better decision-making, risk management, and adoption of innovative practices. Long-term involvement also reflects stability and commitment to the sector. This was corroborated by studies carried out by Adekunle *et al.,* (2022) that farmers with extensive experience are more likely to implement improved production and processing techniques, resulting in higher productivity. However, limited participation by less experienced individuals (18.3% with ≤10 years) suggests potential barriers to entry, such as high capital requirements or a lack of knowledge transfer mechanisms which can be proxy by higher level of experience.

4.1.7 Farm Size

Farm size is a key determinant of production capacity, with 41.5% of respondents managing farms larger than 10 hectares and a mean size of 10.49 hectares. This could imply that larger farm sizes support economies of scale, enabling mechanization, bulk production, and better access to markets. However, 58.4% of respondents operate on ≤9 hectares, reflecting the dominance of smallholder farmers who may face resource constraints and limited productivity. Olagunju *et al.*, (2023) emphasize that smallholders often operate under subsistence conditions, unable to leverage economies of scale. Supporting smallholders with subsidies, access to improved seedlings, and mechanization could bridge productivity gaps and enhance profitability.

4.1.8 Sources of Labour

The result shows that hired labour accounts for 82.7% of the workforce used in oil palm production and processing in the study area, with mixed labour (17.3%) supplementing household efforts. This implies that the heavy reliance on hired labour highlights the labour-intensive nature of oil palm production. Mixed labour strategies suggest cost-saving measures, especially among smallholders. Adetunji *et al.*, (2021) found that labour costs had significant influence on the profitability of oil palm enterprises. It could Promote mechanization or provides labour subsidies that could mitigate these costs, especially during peak harvesting periods.

Table 4.1: Demographic Characteristics of Respondents

Variables	Categories	Freq.	%	Mean
Age in years	< 30	1	0.3	
	30 – 39	38	13.1	51
	40 – 49	100	34.6	
	50 and above	150	51.9	
Marital status	Single	20	6.9	
	Married	242	83.7	
	Widowed	15	5.2	
	Separated	12	4.2	
Household size	< 5	41	14.2	
	5 – 9	176	60.9	8
	10 and above	72	24.9	
Gender	Male	245	84.8	
	Female	44	15.2	
	Educational qualification			
	No Formal Education	11	3.8	
	Primary education	40	13.8	
	Secondary education	112	38.8	
	Tertiary education	126	43.6	
Years of experience	< 10	53	18.3	
	11 – 19	128	44.3	18.51
	20 – 29	63	21.8	
	30 years and above	45	15.6	
Farm size (hectares)	< 5	92	31.8	
	6 – 9	77	26.6	10.49
	10 and above	120	41.5	
Sources of Labour	Hired labour	239	82.7	
	Mixed labour (family & hired)	50	17.3	
Income per annum from oil palm in (₦)	< 500,000	45	15.6	
	500,001 – 999,000	45	15.6	
	1,000,000 and above	121	41.9	2,813,649.29
	No response	78	27	
Income from other sources (₦)	< 500,000	68	23.5	
	500,001 – 999,000	61	21.1	1,150,169.12
	1,000,000 and above	88	30.4	
	No response	72	24.9	

Source: Field Survey, 2024.

Table 4.1 continues: **Demographic Characteristics of Respondents**

Variables	Categories	Freq.	%	Mean
Access to credit	Yes	236	81.7	
	No	53	18.3	
Credit Sources	Family/Relatives	140	48.4	
	Friends	139	48.1	
	Microfinance Bank	98	33.9	
	Co-operatives	93	32.2	
	Thrift	165	57.1	
	Personal savings	151	52.2	
Membership of Associations	Yes	235	81.3	
	No	53	18.7	
Types of Association belonged	Oil palm processing association	225	77.9	
	Palm growers' association	235	81.3	
	Multi-purpose association	178	61.6	
	Farmers' association	150	51.9	
	Others.	264	91.3	

Source: Field Survey, 2024

4.1.9 Income from Oil Palm

Approximately 41.9% of respondents earn over ₦1,000,000 annually from oil palm production, with a mean income of ₦2,813,649.29. This implies that the high-income earners likely benefit from larger farm sizes, mechanization, and better market access. However, the 15.6% earning ≤₦500,000 reflect disparities in access to resources and markets. This agrees with the study carried out by Okoroafor *et al.*, (2023) that income from oil palm production correlates with factors such as credit access, association membership, and farm size. Enhancing these enablers could elevate earnings for underperforming groups.

4.1.10 Access to Credit

A majority (81.7%) have access to credit, primarily from informal sources like thrift groups (57.1%), Personal savings (52.2%) and family/relatives (48.4%). Credit availability is crucial for scaling operations, purchasing inputs, and adopting new technologies. However, the reliance on informal credit sources shows gaps in institutional financial services, which may offer more significant amounts with structured repayment terms. Adekunle *et al.,* (2022) argue that limited access to institutional credit restricts investment in capital-intensive technologies, perpetuating low productivity among smallholder farmers. This could also apply to the oil palm farmers.

4.1.11 Membership in Associations

The result shows that about 81.3% of respondents belong to associations, with 77.9% in oil palm processing groups and 81.3% in oil palm growers' associations. It is a known fact that associations serve as platforms for resource pooling, knowledge exchange, and advocacy. Membership enhances farmers' bargaining power, access to markets, and exposure to training opportunities. Based on the findings of Olagunju *et al.*, (2023), it was found that associations play a pivotal role in technology dissemination and collective bargaining. Promoting cooperative structures can thus address systemic challenges like access to credit and market linkages.

4.1.12 Income from Other Sources

The findings found that a significant portion (30.4%) earns over ₦1,000,000 from non-oil palm sources, with a mean income of ₦1,150,169.12. It was found that diversification of income streams provides financial stability and reduces vulnerability to market fluctuations in the oil palm sector. It reflects strategic economic behaviour, especially in volatile market conditions. This is in consonant with the findings of Adetunji *et al.,* (2021), which emphasizes that

supplementary income is essential for smallholder farmers, enabling them to invest in oil palm production without risking household sustenance.

4.1.13 Type of Associations

Findings in Table 4.1 show that oil palm farmers participate in a variety of associations, including multi-purpose (61.6%) and farmers' associations (51.9%). Diverse association memberships indicate efforts to maximize benefits across different agricultural and economic activities. These associations provide farmers with broader networks and access to specialized resources. This is in line with the findings of Okoroafor *et al.,* (2023) that noted active participation in multiple associations enhances access to credit, training, and group marketing opportunities, improving overall efficiency and profitability.

4.2 Extension Contacts

4.2.1 Contact with Extension Agent Last Year

Results in Table 4.2 show that a significant majority (91.3%) of respondents indicated that they had contact with an extension agent in the previous year. This high level of contact with extension agents may be due to the fact that the study areas are the catchment areas of NIFOR as a prominent institute for the investigation into the improvement of oil palm production and processing in Nigeria. This finding points to the critical role of extension services in disseminating agricultural information and improving farming practices. Studies suggest that frequent engagement with extension agents enhances farmers' adoption of modern practices, leading to increased productivity and sustainability (Zeweld *et al.,* 2020).

Table 4.2: Extension Contact

Extension Contacts	Freq.	%	Mean
Contact with extension agent last year	264	91.3	
Frequency of contact			
Once	37	12.8	
Bi-annual (Twice a year)	16	5.5	3.07
Quarterly (Four times a year)	146	50.5	
6 times (yearly)	90	31.1	
Type of farming methods used			
Local method	50	17.3	
Modern/Improved method (small scale equipment)	239	82.7	
Any training on modern oil palm production	265	91.7	
Yes	265	91.7	
No	24	8.3	
Source/organiser of the training (multiple responses)			
NIFOR	190	65.7	
ADP	240	83	
FADAMA	58	20.1	
NGO	118	40.8	
Cooperatives	152	52.6	

Source: Field Survey, 2024.

4.2.2 Frequency of Contact

Further analysis was conducted to know the frequency of contacts, results show that the mean frequency of contact with extension agents was 3.07 (approximately quarterly). Specifically, it was found that 12.8% of the sampled respondents had contact once within the last one year. This shows that a smaller proportion of farmers had only occasional contact, suggesting barriers such as distance or limited extension resources. Also, only 5.5% had contact Bi-Annually. It implies that they had rare contact reflecting minimal access or need, possibly due to reliance on traditional knowledge, while 50.5% had contact quarterly. This shows that majority of farmers benefited from regular quarterly engagement, emphasizing its importance in fostering

progressive practices. Similarly, only 31.1% of the sampled respondents had contact six times yearly. The findings show that a significant number of farmers interacted with agents every other month, showing a commitment to continuous learning and feedback. This distribution of oil palm farmers and processors contact with extension agents pointed to the important and necessity of organizing a deliberate and frequent extension services to meet farmers' needs effectively as Sulaiman *et al.*, (2022) report that higher interaction levels between farmers and extension organization correlate with better technology adoption rates, which gives rise to improved productivity.

4.2.3 Type of Farming Methods Used

It was observed that only 17.3% of the sampled respondents indicated that they used local methods, while 82.7% used improved methods of production and processing. The findings show that a small subset still relies on traditional methods, which may limit productivity and efficiency due to outdated techniques, while the majority use modern methods with small-scale equipment, reflecting progress in technology adoption. This shift is pivotal for achieving sustainable agricultural development, as modern practices often reduce labour intensity and improve yield (Melesse, 2022).

4.2.4 Training on Modern Oil Palm Production

On the training attendance, it was found that 91.7% indicated that they had attended trainings in oil palm production and processing in the study area. This implies that most farmers and processors received training and this pointed to a well-structured framework for capacity building in the sector. Training is essential for equipping farmers with the skills to optimize

modern techniques. This aligns with findings by Asfaw *et al.,* (2021), which indicated that structured training programs significantly enhance the efficacy of agricultural innovations.

4.2.5 Source/Organizer of the Training

It was found that multiple organizers contributed to training programs. This is an evidence of a multi-stakeholder approach to agricultural production which has been found very effective in improving productivity of farmers. Specifically, ADP was indicated by the 83% of the respondents as the organizer. Agricultural Development Programs are pivotal in bridging the gap between research institutions and farmers, offering localized solutions. It was also found that 65.7% of the sampled respondents indicated that NIFOR was the organizer of the training they attended. This organization, the Nigerian Institute for Oil Palm Research is a major training provider, emphasizing its role in driving research-based agricultural improvements. Fortunately, it is located within the study area and it can therefore be seen as the catchment area in the state. Furthermore,

cooperative societies and NGOs were indicated that 52.6%, and 40.8% respectively. Cooperative societies play a vital role in community-based knowledge sharing, which fosters peer learning and trust. While the involvement of NGOs aligns with their roles of non-governmental organizations in supporting sustainable agricultural practices and capacity building.

4.3 Information Sources to Innovations among Oil Palm Farmers and Processors

Results in Table 4.3 show that WhatsApp was accessed by 95.2% of respondents with a high level of accessibility based on a high mean of 2.83. It was also recorded that extension agents in the ADP were accessed by 90.3% of respondents as a viable source of information on innovation with a high level of accessibility as the mean score was 3.32. Fellow Processors, Local

Leaders/Community Heads, and Friends and Family were accessed by all the sampled respondents

Table 4.3: Information sources

Variables	Accessed		Frequency of Access	
Information sources	**Freq**	**%**	**Mean**	**Std. Dev.**
Television	159	55.0	2.91**	1.19
Radio	201	69.6	2.83**	1.20
WhatsApp	275	95.2	2.83**	1.23
Facebook	188	65.1	2.42	1.23
Instagram	39	13.5	1.68	1.04
Twitter	13	4.5	1.82	1.17
Extension agents (ADP)	261	90.3	3.32**	1.00
Fellow processors	289	100.0	3.53**	0.89
Local leaders or community heads	289	100.0	2.87**	1.20
Newspapers	104	36.0	1.56	1.34
Workshops	51	17.6	1.34	0.91
Seminars	44	15.2	1.45	0.84
Telephone	209	72.3	3.78**	0.53
Friends and family	289	100.0	3.68**	0.59
Cooperatives	201	69.6	3.23**	1.12

Source: Field Survey, 2024.
**Mean = ≥2.5 = Highly accessed

and the level of accessibility were high with mean scores of 3.53, 2.87, and 3.68, respectively. In addition, Telephone and Cooperatives were accessed by 72.3% and 69.6% of respondents and the level of accessibility for each of these was equally high with mean values of 3.78 and 3.23, respectively. Television was accessed by 55% of respondents and it was highly accessed for information with a mean of 2.91, out of a total of 4 points. Radio was accessed by 69.6% of respondents and the level of accessibility was high with a mean of 2.83. The above information sources were categorized as those that were highly accessed by the respondents in getting information on oil palm production and processing.

For the moderately to least accessed information sources, Facebook, Instagram, Twitter, Newspapers, Workshops and Seminars were identified with 65.1%, 13.5%, 4.5%, 36%, 17.6%,

and 15.2% indicated that they accessed them and the level of accessibility for each of the information sources recorded 2.42, 1.68, 1.82, 1.56, 1.34, and 1.45.

The findings show that friends and family, telephone and fellow processors and farmers are the most frequently and highly accessed information sources. This high access rate points to the critical role of interpersonal communication in disseminating information. Close-knit networks provide reliable, accessible, and trusted information, aligning with studies emphasizing social capital in rural and semi-rural contexts (Putnam, 2000). The telephone emerges as a primary tool for communication, reflecting its affordability, ease of use, and penetration, even in less urbanized.

Table 4.4: Perceived Factors influencing farmers and processors' decision to adopt innovations

Factors	Mean	Std. Dev.
It encourages meeting up with family responsibilities	4.63	0.65
It is necessary for large family	3.58	1.28
It will help in building savings	4.70	0.59
One may not be able to pay children school fees with oil palm production without being innovative	3.22	1.30
With the adoption of modern practices, I am financially stable	4.62	0.61
Adoption of innovative practices is not easy in Nigeria due to finance	4.49	0.75
It is good for the young people	3.76	1.42
It makes income to come in multiple outlets	4.69	0.53
It does not guarantee stability	2.27	1.46
I always encourage my fellow producers to adopt innovations	4.59	0.61
It had positive benefits	4.73	0.55
I adopt innovation because it is necessary for me to survive	4.38	0.94
Innovativeness makes me live above poverty	4.60	0.80

Source: Field Survey, 2024.
**Mean = ≥3.0 = Significant factor

regions (Asfaw *et al.,* 2021). Peer-to-peer knowledge exchange is particularly effective in specialized contexts such as processing industries. This aligns with research emphasizing the value of shared experiences in professional and technical problem-solving (Sulaiman *et al.,*

2022). Based on the high access to the extension agents and community leaders, these findings bring out the relevance of structured institutional frameworks in fostering knowledge dissemination. Extension agents, in particular, bridge the gap between governmental initiatives and local communities, supporting agricultural and processing advancements.

4.4 Perceived Factors influencing Farmers and Processors' Decision to adopt Innovations

Based on the results in Table 4.4, the variables used to measure perceived factors that influence respondents' decision to adopt innovations in oil palm production and processing were categorized in economic stability, survival and poverty alleviation, financial challenges, social and family responsibilities, and youthfulness.

For the economic stability, it was revealed that building savings (Mean = 4.70; SD = 0.59), and multiple income streams (Mean = 4.69; SD = 0.53) recorded the highest means and these reflects the critical role of innovations in enhancing financial security. Adopting modern practices among oil palm farmers and processors provides opportunities to accumulate wealth, a crucial motivator in agricultural livelihoods. This is in-line with the innovations linked to increased productivity and profitability, as seen in studies emphasizing the impact of technology on sustainable farming systems (Ariyanto *et al.,* 2020). Also, multiple income stream means that oil palm farmers and processors recognize innovation as a pathway to diversifying income sources. This aligns with the research carried by Ikuenobe *et al.,* (2021) on the role of technology in creating alternative revenue streams, particularly in low-resource settings.

In a similar development, the survival and poverty alleviation had variables like living above poverty (Mean = 4.60; SD = 0.80) with a high mean score. The perception of innovation as a poverty-alleviating tool shows its transformative potential. Farmers identify modernization as a

pathway to improved living standards. This finding therefore aligns with the findings of Adebayo *et al.,* (2021), who noted that agricultural innovation adoption directly correlates with poverty reduction, particularly in rural Sub-Saharan Africa. Another variable that contributes to this is the necessity for survival (Mean = 4.38; SD = 0.94). this means that innovation is viewed as a non-negotiable tool for sustaining livelihoods amidst economic challenges, reinforcing its indispensability.

For the financial challenges, variables such as difficulty of adoption due to finance (Mean = 4.49; SD = 0.75), and School Fees Payment Challenges (Mean = 3.22; SD = 1.30) recorded the highest mean scores. This means that financial constraints significantly hinder adoption. High costs of inputs and limited credit access are barriers well-documented in the literature (Olatunji *et al.,* 2015 and Aina & Odebode, 2021). The findings points to the need for policy interventions to support affordability and financial difficulty may serve as a hindrance to the adoption of innovation in farming.

For the social and family responsibilities encourages meeting family responsibilities (Mean = 4.63; SD = 0.65) was strong enough in terms of the mean score. The strong mean score reflects how innovations align with cultural and family's obligations, underscoring their relevance beyond economic considerations. The social and cultural acceptability often determines the success of agricultural technologies. Lastly, youthfulness related factor with a variable that innovations are good for young people (Mean = 3.76; SD = 1.42) highlights the importance of tailoring innovative approaches to attract younger demographics, ensuring long-term agricultural sector sustainability.

4.5 Oil Palm Producers Level of Innovative capabilities

Innovative capabilities of oil palm farmers and processors were analyzed and results in Table 4.5 shows that creative problem-solving had a mean of 4.44, std. dev: 0.74, which is higher than the benchmark of 3.0. This means that creative problem solving among farmers and processors is pivotal in addressing critical challenges in oil palm production, such as environmental

Table 4.5: Level of Innovative capabilities

Skills	Mean	Std. Dev.
Creative problem-solving	4.44*	0.74
Technical skills, or specialized knowledge that aids in generating or implementing new ideas	2.19	0.91
Communication skills	4.31*	0.89
Human relation skills	4.27*	0.85
Idea Generation	1.34	0.86
Learning and Knowledge Acquisition	4.44*	0.82
Collaboration and Networking	4.14*	1.02
Self-Assessment	4.29*	0.88
Outcomes	1.06	0.81
Feedback and Recognition	2.20	1.00
Adaptability and Resilience	2.61	0.65

Source: Field Survey, 2024.
**Mean = ≥3.0 = High innovativeness

sustainability, pest management, and yield optimization. This type of innovative idea promotes development of sustainable practices, such as waste-to-energy systems using palm oil mill effluent (POME) (Hansen *et al*., 2015). Also, learning and knowledge acquisition had a mean of 4.44, std. dev: 0.82. It means that continuous learning is essential for adopting innovative technologies in the industry. This promotes knowledge sharing platforms such as the Roundtable

on Sustainable Palm Oil (RSPO) to disseminate best practices globally, and this has been found to enhance productivity as pined by Khatun *et al.,* 2020).

The communication skills were high as the recorded mean was 4.31, and a std. dev of 0.89. This means that effective communication fosters collaboration across stakeholders, from farmers to policymakers. Transparent communication is also critical for addressing public concerns about deforestation and human rights issues associated with palm oil production. therefore, effective communication can promote sustainability certifications to global markets through clear communication strategies. Also, it can facilitate knowledge transfer between researchers and plantation workers based on the assertion of Schleifer & Sun (2020) who asserted that communication promotes transfer of knowledge and enhances sustainability of farming enterprises.

It was found that the human relation skills were equally high among the respondents with a mean of 4.27, and a std. dev of 0.85. This implies that oil palm production requires managing diverse teams, including farmers, supply chain managers, and quality assurance personnel in terms of agro-inputs and agrochemicals. This means that human relation skills are essential for fostering collaboration and resolving conflicts among the various stakeholders that are involved in oil palm production and processing. The study of Byerlee, *et al.,* (2016) pointed that fact that a sound human relation is a prerequisite for an improved agricultural production and food supply chain as it enhances leadership training for plantation managers to improve workforce productivity and it builds cooperative frameworks for smallholder farmers to access financial and technical resources.

Also, results further shows that farmers and processors had high mean scores in self-assessment with a mean of 4.29, and std. dev. of 0.88. This implies that oil palm producers and processors

had the ability to assess themselves in terms of performance. This may be done through sales and production capacities. Self-assessment helps an individual to evaluate the efficiency of his/her processes, such as oil extraction rates, and identify areas for improvement in sustainability practices. This agrees with Khatun *et al.,* (2020) assertion that conducting life cycle assessments (LCA) to measure environmental impacts and improve resource efficiency and regular audits of plantation operations is to ensure compliance with international standards like ISPO (Indonesian Sustainable Palm Oil). Lastly, among the variables with high innovative capabilities collaboration and networking (Mean: 4.14, Std. Dev: 1.02) was included. This is because collaboration between researchers, farmers, and industry stakeholders has driven advancements in processing innovations such as enzymatic oil extraction and zero-waste processing systems among others. Effective collaboration promotes diffusion of information, which enhances productivity (Rahman *et al.,* 2020).

The findings show that the significant variables with high mean scores recorded above among the variables used to measured innovative capabilities of oil palm farmers and processors emphasize the human-centric aspects of innovation, aligning well with the oil palm industry's evolution. Therefore, the key innovations like high-yielding oil palm breeds, sustainable plantation practices, and advanced extraction technologies are driven by the ability to solve problems, acquire knowledge, communicate effectively, and collaborate.

4.6 Constraints to Innovativeness in Oil Palm Production and Processing

Results in Table 4.6 show that cost of inputs (Mean = 3.90, Std. Dev. = 0.38) was rated as one of the serious constraints to the innovativeness of farmers and processors in the oil palm production

and processing in the study area. The high cost of essential farming inputs, such as fertilizers, machinery, and improved seedlings, limits the ability of farmers to adopt modern practices. This financial burden stifles innovation, leaving farmers dependent on less efficient traditional methods. This also agrees with the research carried out by Ariyanto *et al.*, (2020) that financial constraints are a critical barrier to the adoption of advanced technologies among smallholder farmers, which affects technical efficiency and productivity. To mitigate this, subsidized input costs and

Table 4.6: Constraints to Innovativeness in Oil Palm Production and Processing

Constraints	**Mean**	**Std. Dev.**
Insufficient fund	3.88**	0.40
Fluctuation in market prices	3.80**	0.46
Lack of storage facilities	3.64**	0.64
High cost of inputs	3.90**	0.38
Inaccessibility of inputs	3.61**	0.57
Inadequate technical knowledge	3.47**	0.79
High cost of labour	3.89**	0.42
Inadequate labour	3.85**	0.45
Bad road network	3.69**	0.62
Poor government policy	3.71**	0.64
Insecurity	3.77**	0.56
Low contact with extension agents	2.01	0.84
Theft	1.94	1.10
Unpredictable climate change	3.29**	1.15
Lack of market	1.88	0.93
Bureaucracy in the processing of accessing loan	3.59**	0.82

Source: Field Survey, 2024.
**Mean = ≥3.0 = Serious and significant constraints

Cooperative purchasing schemes could be implemented, enabling greater access to essential resources.

Also, high cost of labour (Mean = 3.89, Std. Dev. = 0.42) was found to be serious and significant to the respondents' ability to innovate in oil palm production and processing. Labour-intensive practices remain the norm for many oil palm farmers, and rising labour costs further reduce profitability and sustainability. This challenge is particularly pressing for small-scale farmers who struggle to afford skilled labour for modern practices. This was in consonant with the study done by Ekine & Onu (2008) that high labour costs constrain small-scale processors, limiting their ability to engage in value-adding activities. The adoption of mechanized tools and farmer training programs can help optimize labour use and reduce costs over time.

It was also found that insufficient fund (Mean = 3.88, Std. Dev. = 0.40) was indicated as significant. This implies that access to affordable credit is crucial for farmers and processors to invest in innovative technologies and infrastructure. However, insufficient funding remains a persistent issue as asserted by Aina & Odebode (2021) underscored the role of financial accessibility in enabling smallholder farmers to adopt sustainable practices. Without adequate funding, farmers remain trapped in a cycle of low productivity. Policies that streamline access to credit and provide low-interest loans are essential to bridge this gap.

In addition, inadequate labour (Mean = 3.85, Std. Dev. = 0.45) was rated as a significant constraint to oil palm production and processing. This means that labour shortages, especially in oil palm production and processing, exacerbate inefficiencies in oil palm production. Rural-to-urban migration has significantly reduced the availability of skilled labour for agricultural activities. This was buttressed in the studies carried out by Biodun *et al.,* (2021) that there is need for localized training programs to equip rural labourers with the necessary skills for modern farming. Retaining talent through incentives and vocational programs can help address this issue.

It was also recorded that fluctuation in market prices of palm oil (Mean = 3.80, Std. Dev. = 0.46) was significantly serious. This means that one of the major constraints the respondents face in oil palm business is instability in market prices. Volatile market prices for palm oil and its derivatives discourage investments in innovation. Farmers face uncertainty about returns, which affects their willingness to adopt cost-intensive modern practices. This agree with the work carried out by Krishna *et al.*, (2017) that market instability created economic disincentives for farmers. The establishment of price stabilization mechanisms and cooperative marketing strategies can shield farmers from market fluctuations and encourage innovation.

Insecurity (Mean = 3.77, Std. Dev. = 0.56) were identified as serious constraints. This means that excessive red tape in accessing loans discourages farmers from seeking financial assistance, further perpetuating funding issues. Also, insecurity, including theft and conflict, poses significant risks to investments in innovative practices. Farmers operating in regions with weak security infrastructure are less likely to take on high-risk investments. Okolo *et al.,* (2019) pointed out the economic vulnerabilities of oil palm farmers in such environments. Strengthening security measures and community-based interventions can create a conducive environment for innovation.

Moreso, poor government policy (Mean = 3.71, Std. Dev. = 0.64) was found to be high. This may be a discouraging factor to the oil palm farmers and processors in the study area. Inconsistent and inadequate government policies, such as unclear land tenure laws or insufficient funding for agricultural programs, stifle innovation. This corroborate the studies carried out by Ikuenobe *et al*., (2021) which pointed out that unsupportive policies hinder sustainable oil palm production in Nigeria. To overcome this, governments need to create clear, farmer-friendly policies and ensure proper allocation of resources to incentivize innovation.

Furthermore, bureaucracy in loan processing (Mean = 3.59, Std. Dev. = 0.82). This means that excessive red tape in accessing loans discourages farmers from seeking financial assistance, further perpetuating funding issues. This agrees with the studies done by Ekine & Onu (2008) that challenges in small-scale processing are the complex loan procedures which hinders financial accessibility. Streamlining loan application processes through digital platforms and reducing bureaucratic barriers can empower farmers to secure funding for innovative projects.

Another significant constraint identified as serious is inadequate technical knowledge (Mean = 3.47, Std. Dev. = 0.79). Farmers' lack of technical expertise in adopting and maximizing advanced technologies, especially in Africa is a significant limitation. This knowledge gap often stems from poor knowledge of technologies among the stakeholders that are involved in agricultural information handling and dissemination coupled with the poor technical know-how of the so-called experts in the field of agriculture. This may not be far from the priorities the Nigerian government placed on agriculture in terms of budget allocation compared to other sector of the economy. Aina & Odebode (2021) stressed that extension services play a critical role in bridging this gap by providing training and technical support. Expanding the reach and capacity of these services is essential for driving innovation.

4.7 Relationship between Socio-Economic Characteristics and Innovativeness in Oil Palm Production and Processing.

Results in Table 4.7 show the regression analysis, which identifies socio-economic factors significantly influencing the innovativeness of oil palm farmers and processors. These variables are expected to model the adoption of innovative practices, impacting productivity and sustainability. The model summary shows that the R-Squared value of 0.719 was obtained with a

F-Value of 50.731, p = 0.000 and a Durbin-Watson value of 1.487 indicating that the model explains 71.9% of the variation in innovativeness, showcasing a strong relationship between socio-economic characteristics and innovation. The significance of the model reflects the collective influence of the included variables and the absence of severe autocorrelation ensures the reliability of the regression estimates.

Table 4.7: Regression Analysis Modelling the Relationship between Socio-Economic Characteristics and Innovativeness of Respondents

Variables	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	T	Sig
(Constant)	60.41***	3.603		16.767	0.000
Age	-0.592***	0.046	-0.897	-13.00	0.000
Marital status	2.883***	0.677	0.2	4.26	0.000
Household size	1.01***	0.103	0.713	9.8	0.000
Gender	0.771	0.794	0.045	0.971	0.333
Education	1.178**	0.466	0.132	2.527	0.012
Experience	0.111*	0.063	0.151	1.774	0.078
Source of labour	0.619	0.415	0.074	1.491	0.137
Income in naira (Annually)	3.03	0.043	0.022	0.497	0.620
Income from other sources	-6.06	0.158	-0.009	-0.22	0.826
Access to credit	-4.546***	0.903	-0.202	-5.034	0.000

Source: Field survey, 2024.
F-value = 50.731 (p= 0.000); R = 0.848; R-squared = 0.719; Durbin-Watson = 1.487.
* significant at 0.1 level of significance; **Significant at 0.05 level of significance;
***Significant at 0.01 level of significance

Specifically, the findings found that age (coefficient = -0.592), marital status (coefficient = 2.883), household size (coefficient = 1.01); education (coefficient = 1.178), access to credit (coefficient = -4.546) were the significant variables that influenced respondents' innovativeness in oil palm production and processing. This means that younger respondents exhibit higher levels of innovativeness, as the negative coefficient indicates an inverse relationship between age and innovation. This aligns with the studies done by Ariyanto *et al.*, (2020), who observed that

younger farmers are more open to adopting advanced technologies, while older individuals often rely on traditional methods due to resistance to change or limited exposure. To bridge this gap, tailored training programs can target older farmers, equipping them with the skills and knowledge to adopt modern practices. Also, married farmers demonstrate higher innovativeness, driven by family responsibilities that incentivize adopting practices to enhance productivity and income. Aina & Odebode (2021) noted that family obligations often motivate individuals to explore sustainable and profitable techniques. Supporting married farmers with community-based programs or incentives can enhance their access to resources and bolster innovation in oil palm production.

In addition, larger households positively correlate with innovativeness, likely due to the availability of internal labour. Farmers with larger households can implement labour-intensive innovations such as mechanized tools without incurring additional costs. This aligns with the studies carried out by Biodun *et al.*, (2021) which emphasizes family labour as a critical driver for adopting innovative practices. Policies that support large households through access to resources and training can maximize their potential for innovation and sustainability. Moreso, education plays a crucial role in driving innovativeness, as better-educated farmers are more likely to adopt and utilize advanced farming techniques. This was highlighted by Aina & Odebode (2021) that educated farmers have greater awareness of opportunities such as subsidies, training, and market trends, enabling them to improve productivity. Simplifying technical information and offering hands-on workshops for less-educated farmers can address knowledge gaps and promote widespread adoption of innovative practices. Lastly, limited access to credit is a significant barrier to innovation, as it prevents farmers from investing in essential resources like fertilizers, machinery, and improved seedlings. This was amplified in the studies carried out

by Ekine & Onu (2008) that financial constraints inhibit the adoption of modern processing technologies. Also, Aina & Odebode (2021) similarly observed that credit access fosters sustainable agricultural practices. By implication simplifying loan application procedures and reducing bureaucratic barriers can empower farmers to secure financing and embrace innovative tools.

4.8 Relationship between Respondents' Income and Level of Innovativeness

Table 4.8 presents the results of a binary logistic regression model accessing the relationship between income sources and the level of innovativeness among oil palm farmers and processors. The coefficient for income is positive and significant statistically (B=2.166; P=0.007), which implies that higher income is connected with a better probability of exhibiting a higher level of innovativeness as the significance of the variable was further supported by the Wald statistic (9.439). The odd ratio (Exp (B) being positive further implies that an increase in income substantially improve the likelihood of adopting innovation. These results show that higher income provides farmers and processors with the financial capacity to invest in advanced technologies, modern tools, and improved processing techniques. This aligns with the findings of Ekine & Onu (2008), who emphasized the role of financial resources in enabling small-scale processors to adopt value-adding practices. Also, Aina & Odebode (2021) also highlighted that income stability allows farmers to access inputs like fertilizers, mechanized tools, and improved seeds, which are critical for enhancing productivity.

Table 4.8: Results of Binary Logistic Regression between Income and Level of Innovativeness

Variables	**B**	**S.E.**	**Wald**	**Sig.**	**Exp(B)**
Income	2.166	0.705	9.439	0.007	1.000
Other income	1.692.	0.509	6.53	0.919	1.000
Constant	1.687	0.264	40.99	0.000	5.404

Source: Field Survey, 2024; -2 Log likelihood = 200.478; Nagelkerke R Square = 0.068; Overall Percentage = 82.3

Furthermore, other income sources had a positive coefficient (B = 1.692), although not significant statistically (p = 0.919). This suggest that other sources of income do not significantly drive innovation among farmers and processors. This implies that farmers relying on non-farming income may allocate less attention and fewer resources to oil palm-related innovations, focusing instead on other income-generating activities. This result contradicts the findings of Krishna *et al.,* (2017), who observed in Indonesia that diverse income sources could sometimes fund innovative agricultural practices.

CHAPTER FIVE

5.0 SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

The study was designed to assess innovative capabilities among oil palm producers in Edo State, Nigeria. The study specifically describes the socio-economic characteristics; identify information sources accessed by farmers and the frequency of accessing them; describe the perceived factors that influence farmers' decisions to adopt new innovative practices; determine farmers' innovative capabilities in oil palm production and processing and identify the constraints to innovativeness in oil palm production and processing. A multi-stage sampling procedure was employed to select 300 respondents; however, 289 respondents was valid for the analysis. Primary data were collected through the use of a well-designed questionnaire administered to the oil palm farmers and processors. Descriptive statistics and inferential statistics were used to analyzed the data.

Results from the findings revealed that oil palm farmers and processors in Edo State had a mean age of 51 years and predominantly married (83.7%), with large households (mean size = 8), reflecting reliance on family labour. Majority of the respondents were male (84.8%), indicating a gender imbalance, though women play significant roles in processing. Education levels were high, with 43.6% attaining tertiary education, enhancing their capacity to adopt innovative practices. However, the reliance on hired labour (82.7%) and challenges with access to credit (81.7%) were noted as critical socio-economic factors influencing innovation. These findings highlight the need for targeted interventions to address gender disparities and labour-related constraints while leveraging education to foster innovation. The study found that farmers

primarily rely on interpersonal communication and modern digital platforms for information dissemination. High-access sources included extension agents (90.3%), cooperatives (69.6%), WhatsApp (95.2%), and fellow processors and farmers (100%). These findings emphasize the importance of leveraging structured institutional frameworks, such as extension services and cooperatives, alongside accessible digital tools, to enhance information flow and adoption of innovative practices.

Economic stability and financial security emerged as the strongest motivators for adopting innovative practices. Variables like savings (mean = 4.70) and income diversification (mean = 4.69) were significant drivers. Innovations were also linked to poverty alleviation (mean = 4.60) and survival (mean = 4.38). Barriers included high input costs (mean = 3.90), insufficient funding (mean = 3.88), and market price fluctuations (mean = 3.80). These findings support the need for financial interventions, including subsidies, credit access, and market stabilization mechanisms, to encourage widespread innovation adoption.

Farmers demonstrated strong innovative capabilities, particularly in creative problem, learning and knowledge acquisition, training programs significantly enhanced skills, highlighting the importance of continuous learning, collaboration and networking. Significant constraints included high cost of inputs, labour challenges, insufficient funding, market instability, and inadequate technical knowledge, posed significant barriers. Regression analysis indicated that socio-economic factors significantly influenced innovation adoption, younger, educated farmers were more innovative, married farmers with larger households demonstrated higher innovativeness due to labour availability and family responsibilities, limited credit access negatively impacted innovation, underscoring the need for financial interventions. Binary logistic regression showed that income from primary sources significantly correlated with innovation

adoption (B = 2.166, $p < 0.05$). However, supplementary income sources exhibited a weaker relationship, suggesting that primary income drives innovation investments.

5.2 Conclusion

Based on the findings of the study, it can be concluded that most of the respondents had a mean age of 51years, predominantly male (84.8%), married (83.7%) with relatively high educational levels (43.6% attaining tertiary education). The study further revealed that WhatsApp was accessed by 95.2% of respondents and extension agents in the ADP accessed by 90.3% of respondents were the most viable sources of information on innovation with a high level of accessibility. It was also revealed that building savings (Mean = 4.70; SD = 0.59), and multiple income streams (Mean = 4.69; SD = 0.53) recorded the highest means and these reflects the critical role of innovations in enhancing financial security.

It was observed that while oil palm production in Edo State plays a vital role in Nigeria's agricultural economy, its growth and innovation are constrained by systemic challenges, including high input costs, insufficient funding, labour shortages, and fluctuating market prices. Despite these barriers, the findings point to the significant potential of innovation driven by factors such as education, age, access to stable income, and organized dissemination of information through cooperatives, and digital platforms. However, reliance on hired labour, inadequate technical knowledge, and limited financial resources remain significant obstacles.

5.3 Recommendations

Based on the findings of the study, the following recommendations were put forward:

1. Agricultural Development Project (ADP) of the state should work towards addressing the identified constraints through targeted financial interventions, capacity-building

initiatives, and improved access to resources through local and international donor agencies. This will improve the ability of the respondents to adopt innovations thereby improving their innovativeness in oil palm production and processing.

2. State government through the Ministry of Agriculture should provide incentives for the adoption of mechanized tools to address labour shortages and improve productivity.
3. Stakeholders in the oil palm industry should implement policies to stabilize market prices of palm oil and its derivatives to encourage long-term investments in innovation.
4. Stakeholder should encourage collaboration between farmers, researchers, and private-sector stakeholders to drive innovation through joint initiatives

5.4 Contributions to Knowledge

1. The study found that oil palm farmers in Edo State are predominantly male (84.8%) with a mean age of 51years and have large households (mean size 8).
2. Gender imbalance was noted, with men reflecting reliance on family labour. However, women play significant roles in processing.
3. The study identifies key socio-economic factors that influence innovation adoption among farmers, including economic stability and financial security.
4. Barriers to adopting innovative practices include costs, insufficient funding and market price fluctuation.
5. Farmers primarily rely on leveraging education to foster innovation with access to extension agents, cooperatives and digital platforms like whatsapp.

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APPENDIX
DEPARTMENT OF AGRICULTURAL ECONOMICS AND EXTENSION
FACULTY OF AGRICULTURE & AGRICULTURAL TECHNOLOGY
BENSON IDAHOSA UNIVERSITY,
BENIN CITY

Dear Respondent,

I am a postgraduate student of the above named department and University. I am carrying out a research on **ASSESSMENT OF INNOVATIVE CAPABILITIES AMONG OIL PALM PRODUCERS IN EDO STATE, NIGERIA**. I seek your cooperation to kindly answer the questions below as correctly as possible so as to ensure reliable data collection for the study. The research is purely for academic purpose and your responses will be treated as such.
Thank you for your anticipated cooperation.

MR. IKUOBASE IMAFIDON EDWIN

SECTION A: SOCIO-ECONOMIC CHARACTERISTICS
Please tick (√) where appropriate or fill the spaces provided

(A) DEMOGRAPHIC PROFILE

(1) Age in years…….
(2) Marital status: (a) Single [1] (b) Married [2] (c) Widow (3) (d) Separated [4]
(3) Household size: ……
(4) Gender: (a) Male [1] (b) Female [2]
(5) Educational qualification: (a) No Education [1] (b) Primary education [2] (c) Secondary [3] (d) Tertiary education [4].

(B) ECONOMIC PROFILE

(6) How many years have you been farming oil palm?**.....**
(7) Farm size in hectares: …….
(8) Sources of Labour (a) Family members [1] (b) Hired labour [2] (c) Self [3] (d) mixed labour (family & hired) [4]
(9) Kindly indicate your average income per annum from oil palm in naira: ……
(10) Income from other sources: …….
(11) Do you access credit? Yes [1], No [2]?
(12) If yes, indicate your sources of credit (you can tick more than one)

	Sources	**Yes**	**No**
1	Family/Relatives		
2	Friends		
3	Microfinance Bank		
4	Co-operatives		

5	Thrift		
6	Others		

(13) Membership of Association/Co-operatives (a) Yes [1] (b) No [2]

(14) If yes to question [13], indicate in the table below. (You can tick more than one association.)

		YES	NO
1	Oil palm processing ass.		
2	Palm growers' ass.		
3	Multi-purpose ass.		
4	Farmers' ass.		
5	Others.		

(C) EXTENSION MATTERS

(15) Were you contacted by extension agent last year? Yes [1] No [2]

(16) If yes, how frequently was the contact between you and extension agent (a) Once [1] (b) Bi-annual (Twice a year) [2] (c) Quarterly (Four times a year) [3] (d) 6 times (yearly) [4]

(17) What kind of farming method do you use? (a) Local method [1] (b) Modern/Improved method (small scale equipment) [2]

(18) Have you attended any training on modern oil palm production? Yes [1] No [2]

(19) If yes, indicate source/organiser of the training

	Source	**Yes**	**No**
1	NIFOR		
2	ADP		
3	FADAMA		
4	NGO		
5	COOPERATIVES		
6	Others		

SECTION B: Sources of information and accessibility

Indicate information sources: indicate which of the following where you get your information relating to oil palm production and how accessible they are in oil palm production on a 4-point rating scale of High accessible (4), Accessible (3), sometimes accessible (2) and not accessible (1).

S/N	**Indicator**	**4**	**3**	**2**	**1**
1	Television				
2	Radio				
3	WhatsApp				
4	Facebook				
5	Instagram				
6	Twitter				

7	Extension agents (ADP)				
8	Fellow processors				
9	Local leaders or community heads				
10	Newspapers				
11	Workshops				
12	Seminars				
14	Telephone				
15	Friends and family				
16	Cooperatives				

SECTION C: Perceived Factors that influence farmers' decisions to adopt innovative practices
Indicate your level of agreement or otherwise to the following variables as they influence your decisions to adopt innovative practices on a 5 point Likert scale of **Strongly agree (5); Agree (4), Undecided (3); Disagree (2) and Strongly Disagree (1)**

S/N	**Statements**	**Strongly agree**	**Agree**	**Undecided**	**Disagree**	**Strongly disagree**
1	It encourages meeting up with family responsibilities					
2	It is necessary for large family					
3	It will help in building savings					
4	One may not be able to pay children school fees with oil palm production without being innovative					
5	With the adoption of modern practices, I am financially stable					
6	Adoption of innovative practices is not easy in Nigeria due to finance					
7	It is good for the young people					
8	It makes income to come in multiple outlets					
9	It does not guarantee stability					
10	I always encourage my fellow producers to adopt innovations					
11	It had positive benefits					
12	I adopt innovation because it is necessary for me to survive					
13	Innovativeness makes me live above poverty					

SECTION D: Innovativeness capabilities

How often do you engage in the following oil palm production on a 5-point rating scale of 1- 5, with 5 as the highest level while 1 as the least level

Variable	**1**	**2**	**3**	**4**	**5**
Skills					
Creative problem-solving					
Technical skills, or specialized knowledge that aids in generating or implementing new ideas					
Communication skills					
Human relation skills					
Idea Generation					
Learning and Knowledge Acquisition					
Collaboration and Networking					
Self-Assessment					
Outcomes					
Feedback and Recognition					
Adaptability and Resilience					

SECTION E: Constraints faced in oil palm production

Indicate challenges you face in the process of oil palm

		Level of seriousness			
	Constraint	**Very serious**	**Moderately serious**	**Serious**	**Not serious**
1.	Insufficient fund				
2.	Fluctuation in market prices				
3.	Lack of storage facilities				
4.	High cost of inputs				
5.	Inaccessibility of inputs				
6.	Inadequate technical knowledge				
7.	High cost of labour				
8.	Inadequate labour				
9.	Bad road network				
10	Poor government policy				
11	Insecurity				
12	Low contact with extension agents				
13	Theft				
14	Unpredictable climate change				

15.	Lack of market				
16.	Bureaucracy in the processing of accessing loan				