EFFECT OF FARMER COOPERATIVES ON SMALLHOLDER RICE PRODUCTION IN EDO STATE, NIGERIA

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B. Agric. (Agricultural Economics and Farm Management), Abeokuta, 2019
HND (Agricultural Extension and Management), Akure, 2013

DEPARTMENT OF AGRICULTURAL ECONOMICS
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FACULTY OF AGRICULTURE,
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A THESIS SUBMITTED TO THE SCHOOL OF POSTGRADUATE STUDIES IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER (M.Sc.) IN AGRICULTURE IN THE DEPARTMENT OF AGRICULTURAL ECONOMICS AND RESOURCE MANAGEMENT, FACULTY OF AGRICULTURE, UNIVERSITY OF BENIN, BENIN CITY, NIGERIA

NOVEMBER, 2025

CERTIFICATION

This is to certify that the work on Effect of Farmers' Cooperatives on Smallholder Rice Production in Edo State, Nigeria was carried out by Solomon Oshoke OSESEAMHE in the Department of Agricultural Economics and Resource Management, Faculty of Agriculture, University of Benin, Benin City, Nigeria.

_____ _____

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Supervisor

_____ _____

Prof. J. Egbodion Date
Head of Department

DEDICATION

This work is dedicated firstly to the Almighty God, for His mercies, grace, divine guidance, wisdom and strength that have enabled me to complete this project. May his name be praised both now and forever!

Secondly, in loving memory of late Prof. C. I. Ada-Okungbowa, whose words of encouragement continues to inspire and motivate me. You were like a father to me. May this project be a testament to the impact you have had on my life and the lives of others. May your kind soul continue to rest in peace, Amen!

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ABSTRACT

This study was carried out to examine the effect of farmers' cooperatives on smallholder rice production in Edo State, Nigeria. Specifically, the study sought to: describe the socio-economic characteristics of rice farmers in the study area; profile the rice farmers' cooperatives; examine the roles performed and services rendered by the cooperatives; compare the costs and returns of cooperative and non-cooperative rice farmers production; determine the effect of cooperative membership on rice yield; and examine the constraints facing cooperatives in promoting rice production.

A multi-stage sampling procedure was used to select 260 rice farmers comprising 130 cooperative and 130 non-cooperative rice farmers. Data were analyzed using descriptive statistics, Relative Importance Index, cost and return analysis, t-test, and regression analysis.

The findings revealed that the average age of cooperators was 45 years, while the average age of non-cooperators was 47 years. Additionally, the study revealed that majority of the cooperators (68.5%) and non-cooperators (75.4%) were males. Most rice farmers, cooperators (92.3%) and non-cooperators (80.0%) were married, with an average household size of seven persons for both cooperators and non-cooperators. Additionally, cooperators agreed to a high extent that cooperatives assisted members with farm implements (RII = 0.908), facilitated access to land (RII = 0.898), provided access to farm inputs (RII = 0.878), and supplied market information (RII = 0.863), among other services. Profitability analysis revealed that cooperative farmers recorded higher gross margins and net incomes of ₦519.68 and ₦499.23 per kg rice, respectively compared to ₦415.48 and ₦376.10 per kg rice for non-cooperative farmers, with a statistically significant difference (t = 4.8672) between both groups. Furthermore, regression analysis showed that cooperative membership, educational status, and farm size were positive and statistically significant at the 1% level, while age was negative and farming experience positive and were significant at the 10% level, indicating these variables as major determinants of rice yield. The major constraints affecting cooperatives included unfavourable government policies, inadequate support, and poor funding. The study concluded that cooperatives positively influenced rice farmers' production and income. And recommended that Non-member farmers should be encouraged to voluntarily join or form cooperatives to access shared resources, economies of scale, and collective bargaining, thereby improving productivity and income and also strengthening institutional support to enhance the effectiveness of farmers' cooperatives.

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background of the study

Much of Africa is economically dependent on agriculture, which represents 32 percent of the Continent's GDP and employs over 60 percent of the total labour force (Agu, 2018). The sector is an important source of livelihood for the very poorest members of society, many of which are smallholder farmers. Smallholder farmers remain the bedrock of agricultural production especially in the developing countries including Nigeria. Smallholder farmers are the suppliers of food to the tables of Nigerians (Agu, 2018). In fact, a report has it that more than 80% of the total farmers, including medium and large ones, are smallholder farmers (Sabo *et al,* 2017). They are the backbone of the Nigerian agriculture sector and deserve every support to produce more food, grow more raw materials for the agro-industrial sector and contribute in ending a food supply deficit that costs the country US$ 10 million in food import annually (Sabo *et al,* 2017).

Meanwhile, there is no universally accepted definition of a small farm. 'Small' may refer to the number of workers; capital invested, or amount of land worked. Land size is the criterion most commonly employed, but given the differing potential of land in soil quality and rainfall, a single measurement hardly captures the sense of limited resources or relative powerlessness characteristic of smallholders. Overall, smallholder farmers are characterized by marginalization, in terms of accessibility, resources, information, technology, capital and assets, but there is great variation in the degree to which each of these applies (Sabo *et al*, 2017). With these qualifications, the Food and Agriculture Organization of the United Nations (FAO) adopted a 2-hectare (ha) threshold as a broad measure of a small farm (which is not inclusive of fishers and other small-scale food producers). The vast majority of smallholders live in rural areas, although urban and peri-urban smallholdings are an

increasingly important source of supply for developing urban areas (IFAD, 2020). Smallholder Rice Production (SHRP) is basically an enterprise with farm size below 3hectares of land and limited manpower and financial turnover.

Small holder rice farmers play a significant role in Nigeria's social and economic growth (IFAD, 2020). The ban by the Nigerian Federal Government on importation of rice in 2018 boasted the quantity and quality on rice output in Nigeria with domestic production estimated at (₦685 billion) ($1.9 billion) making the country now second largest producer of rice in Africa (Oladiebo and Fajuyigbe, 2019). This has also offered Nigeria the opportunity to export rice to earn sufficient revenue. Nigeria possesses diverse ecological zones with significant potential for rice cultivation. According to (Familusi and Oranu, 2020), the country has between 4.6million and 4.9 million hectares of land suitable for rice production, theoretically capable of meeting the domestic demand. This vast agricultural resource underscores Nigeria's capacity to achieve self-sufficiency in rice production, given appropriate cultivation practices and supportive policies (FMARD, 2019). Small holder rice farmers in the region struggle to achieve optimal production despite favourable ecological conditions. This underperformance can be attributed to a combination of factors including limited access to modern inputs, inadequate infrastructure, and knowledge gaps (FMARD, 2019).

Rice is a monocot that is typically cultivated as an annual plant. According to Smith (2018), rice can be produced almost everywhere in the world which come in various form, colour and dimension. There are about 100,000 species of rice today, Oryza sativa (Asian rice) and Oryza glaberrima are regarded as staple food across Asian-pacific and it has become very important food in several continents including Africa, Latin America (United Nation Food and Agriculture Organization (FAO) 2019). Rice can grow on Mangrove Swamp, rainfed upland, irrigated lowland, rain fed lowlands ecosystems. In Nigeria we have Fadama rice,

Ofada rice, Foro rice, upland rice, Low land rice, Osomegbe rice, Ekpoma rice, Abakaliki rice, Benue rice, Kano rice, Nasarawa rice, Sokoto rice and other varieties grown in different parts of the country (Yurkushi, 2018).

The three rice production environments and their coverage are: rain-fed lowland (having a percentage of 69.0%), irrigated lowland (2.7%) and rain fed upland (28.3%) (Ibanga. S.,2018). More than 90% of rice production in Nigeria is done by resource poor, small holder farmers while the remaining 10% is produced by commercial farmers. In 2016, the quantity of local rice production in Nigeria was estimated at 4.8 million tonnes (Food and Agriculture Organization-FAO, 2016), about 95% of rice processed in Nigeria is by small holder farmers and they operate in low capacity with obsolete mills (FAO, 2016).

It was based on the several problems faced by the smallholder farmers that the co-operative option comes into focus as a viable way to effectively mobilize rice farmers to form groups and pool resources so as to become more effective in rice production (Agenyour, 2014). Despite the growing interest from policy makers on the important roles of farmers' cooperatives in improving the efficiency and yield of smallholder rice farmers' especially in developing countries Nigeria inclusive, majority of the smallholder rice farmers still operate in isolation and lack the necessary/basic agricultural inputs (good quality seeds/seedlings, pesticides and output markets, extension services, credit facilities, access to information; and improved agricultural technologies needed to improve the country's agricultural sector.

1.2 Statement of the Problem

Rice remains one of the most widely consumed staple foods in Nigeria, contributing significantly to the caloric intake of the population (FAO, 2022). However, the country's consumption pattern is highly skewed toward imported rice, with domestic production only able to meet a fraction of national demand (FAO, 2022). This dependency has left the

Nigerian economy vulnerable to fluctuations in global rice supply and prices. The situation became even more pronounced following the closure of Nigeria's land borders, a government policy aimed at boosting local production (FAO,2022). The policy led to a steep rise in the price of rice, with the cost of a 50kg bag of imported rice soaring from about ₦14,500 to nearly ₦100,000 (FAO, 2022). Even locally produced rice experienced similar price hikes, underscoring the inadequacy of supply to meet growing demand.

In response, the Federal Government has invested heavily in initiatives to expand rice production. For example, Edo State received ₦5 billion in 2019 through the Central Bank of Nigeria's Commercial Agriculture Credit Scheme to boost rice and maize cultivation, with a target of producing 17,000 tons of rice across 4,400 hectares in selected areas of the state (FAO, 2022). However, the output from such initiatives has consistently fallen short of expectations, raising concerns about inefficiencies, bureaucratic bottlenecks, and weak policy implementation. This is particularly worrisome considering Nigeria's vast arable land and the large number of farmers engaged in rice cultivation estimated at over 12.2 million as of 2018 yet production still lags behind demand. As a result, Nigeria continues to spend trillions of naira annually on food imports, including rice, despite its agricultural potential (Odogwu, 2018).

At the smallholder level, farmers' cooperative societies have emerged as a mechanism for addressing some of the challenges associated with rice production. Cooperatives are designed to provide collective support in areas such as production, processing, marketing, storage, and distribution (Agenyour, 2014). In theory, they serve as vehicles for strengthening farmers' capacity, enhancing bargaining power, and improving access to resources and markets. However, in practice, many cooperative societies in Nigeria struggle to deliver these benefits effectively. Their limitations are partly due to the voluntary nature of membership, which

sometimes undermines cohesion, as well as weak organizational structures and inadequate capacity to compete within the broader agricultural economy (Luka *et al*., 2023).

Moreover, farmer cooperatives face mounting pressures from both domestic and global forces. Shifts in the global agricultural economy, overproduction in some markets, rising imports, and persistent low farm-gate prices have eroded their financial sustainability. Many cooperatives end their fiscal year with reduced revenues and poor earnings, making it difficult to provide tangible benefits to their members. This situation has, in some cases, led farmers to abandon cooperative membership altogether, either due to financial stress, retirement, urban migration, or health-related issues. Given the aforementioned challenges, this study sought to provide answers to the following research questions:

1. What are the socio-economic characteristics of smallholder rice farmers in the study area?
2. What is the profile of the farmer cooperatives in the study area?
3. What are the services render by rice farmer cooperatives in rice production in the area?
4. What are the costs and returns to rice production in the area**?**
5. What are the effects of farmers' cooperatives on the rice yield of the farmers**?**
6. What are the constraints of farmer cooperatives in promoting rice production in the area**?**

1.3 Objectives of the Study

The main objective of the study is to examine the effect of farmers' cooperatives on smallholder rice production in Edo State. The specific objectives are to:

i. describe the socio-economic characteristics of smallholder rice farmers in the study area,
ii. profile rice farmers' cooperatives in the study area.
iii. examine the services rendered by rice farmers cooperatives in the area.

iv. estimate and compare the costs and returns to rice production of members and non-members of cooperatives in the study area.

v. determine the effect of farmers' cooperatives on the yield and returns to scale of rice production in the study area,

vi. examine the constraints of farmers' cooperatives in promoting rice production in the study area.

1.4 Justification for the study

Nigeria is an agrarian country, and agriculture remains a major source of livelihood for majority of the country's population. Rice production is paramount for the attainment of sustainable food security and agricultural development, and its consumption has continued to increase without a commensurate increased output in recent times. Rice has become a crucial staple in Nigeria, with consumption steadily outpacing domestic production. Recent data indicate an annual production of around 5.0-5.4 million metric tons (MMT), while consumption has reached 6.8-7.2 MMT, resulting in a deficit of approximately 1.8 MMT per year (USDA, 2021). This growing gap underscores the urgent need for Nigeria to boost its rice production to meet increasing demand and achieve food security goals.

This study, therefore sought to give information about the characteristics/features of farmer's cooperatives and their role in the production of rice in the study area. The study provides extension workers, development institutions, rice industries and policy makers with valuable information that will assists in improving mass production of rice in Nigeria.

Additionally, there is limited contemporary empirical evidence on how agricultural cooperatives contribute to improving the income levels, productivity, and overall economic well-being of smallholder rice farmers in Nigeria. While cooperatives are widely acknowledged as a means of enhancing access to inputs, markets, and credit, systematic

assessments of their actual impact on members' revenue generation and production efficiency remain scarce. This knowledge gap limits understanding of how effectively cooperatives are currently fulfilling their purpose of improving farmers' livelihoods and constrains the development of strategies and policies that could optimize their role in boosting rice production in the country.

Finally, this study contributes to improving the efficiency of agricultural research, input provision and policy formulation. Findings of this study would also add to the existing body of knowledge. It is expected that this study encourages further studies on the subject matters.

CHAPTER TWO

2.0. LITERATURE REVIEW

2.1 Conceptual Review

2.1.1 Concept of Cooperatives – Origin and Meaning

According to Birchall (1997, 1998) cited in Hussain (2014), the roots of the modern cooperative movement can be traced to Britain toward the close of the eighteenth century. At that time, groups known as friendly societies began to emerge among the working-class population. Their primary goal was to provide mutual protection against risks associated with daily life, especially through collective insurance schemes. By 1834, membership in these societies had expanded rapidly, surpassing one million individuals. These early associations were not merely financial arrangements but were regarded as a broader self-help initiative, created in response to the social and economic vulnerabilities that came with dependence on wage employment during the Industrial Revolution.

A major milestone in the evolution of cooperative movements was the establishment of the Rochdale Society of Equitable Pioneers (EPRS) in 1844. The society was founded by a group of twenty-eight unemployed artisans who, in response to the economic hardship of their time, decided to pool their scarce resources in order to improve their collective welfare. Although forms of cooperative activity had existed earlier, the Rochdale initiative is widely acknowledged as the first truly “modern” cooperative, primarily because it provided the foundation for what later became known as the cooperative principles (Gibson, 2005; Abell, 2004). The Rochdale experiment thus marked a transition from loosely organized self-help groups to a structured system of collective enterprise with clearly articulated rules and practices.

The institutionalization of cooperative ideals was further strengthened with the establishment of the International Cooperative Alliance (ICA) in 1895. As a non-governmental umbrella

body, the ICA was designed to promote collaboration and harmonious economic relations among cooperative societies across different countries. Through its activities, it helped to unify diverse cooperative practices under a common global framework.

Central to the operation of cooperatives are the values and principles that guide their members, leaders, and employees. According to Hoyt (1996), these values serve not only as general norms but also as a moral compass that influences the attitudes, decisions, and conduct of cooperative participants. In 1995, the ICA articulated a formal statement of cooperative values which emphasized key ideals such as self-help, self-responsibility, democracy, equality, equity, and solidarity. Beyond these collective values, cooperatives are also expected to uphold ethical standards of personal conduct. These include honesty, transparency, social responsibility, and genuine concern for the well-being of others. Together, these values and principles form the ethical and operational backbone of cooperatives worldwide, ensuring that they are not merely economic organizations but also vehicles for social and cultural development.

Complementary to these values, the cooperative principles provide practical guidelines on how the values are translated into action. First codified by the ICA in 1937 and revised in 1966, they were comprehensively reformulated in 1995 to align cooperative practice with modern realities. The updated framework outlined seven universally accepted principles, namely: voluntary and open membership, democratic control by members, economic participation of members, autonomy and independence, provision of education and training, inter-cooperative collaboration, and concern for the wider community (Baarda, 2006). Collectively, these principles continue to serve as the foundation for cooperative governance and sustainability, ensuring that cooperatives remain distinct from other organizational forms while promoting both economic viability and social responsibility.

A cooperative society, therefore, is a voluntary organization formed by individuals who share common responsibilities and aspirations, particularly to support the less privileged and promote collective development. Virendra Kumar *et al.* (2015) describe it as an independent association of people who come together to meet their shared economic, social, and cultural needs through a jointly owned and democratically managed enterprise. In practice, cooperatives operate across various sectors such as agriculture, forestry, credit and banking, agro-processing, storage, marketing, fisheries, dairy, and housing—reaching nearly 85 percent of rural households. Specifically in agriculture, they facilitate efficient use of resources and inputs, provide water resource management, improve marketing and storage channels, enhance distribution systems, add value to farm products, supply market information, and ensure regular monitoring. In addition, cooperatives engage in key economic activities such as credit provision and the distribution of essential agricultural inputs like seeds, fertilizers, and agrochemicals (Virendra Kumar *et al.,* 2015).

In the same vein, the International Cooperative Alliance in its statement on the Cooperate Identify in 1995, defines a cooperative as "an autonomous association of persons united voluntarily to meet their common economic, social, and cultural needs and aspirations through a jointly-owned and democratically-controlled enterprise" (United Nations, 2012).

2.1.2 Farmer Cooperative Societies

An agricultural cooperative, also known as a farmer cooperatives or farmer cooperative societies, is a business enterprise jointly formed, owned, capitalized, patronized, and democratically controlled by farmers, fishermen, or other agricultural operators to meet their pressing needs (Igben & Eyo, 2002, as cited in Nlerum & Ogu, 2014). Agricultural cooperative societies occupy a central position in the socio-economic structure of rural communities, serving as key institutions that empower farmers with the knowledge, technical skills, and organizational capacity needed to enhance their productivity and sustain their

livelihoods (Ezekiel, 2023). Beyond providing direct benefits to members, cooperatives also act as instruments for promoting rural development. This is particularly important because rural development is not a one-dimensional process but a holistic effort through which communities mobilize and utilize their human and material resources to bring about social and economic transformation in their environment (Obasi, 2010). By fostering collective participation in rural development initiatives, cooperatives align local agricultural practices with broader goals of economic sustainability.

According to Budi *et al.* (2021), agricultural cooperatives across the globe have increasingly taken on the role of promoting a renewed agenda for rural transformation, particularly by strengthening farmer-owned organizations and enterprises that improve bargaining power, resilience, and access to markets. Ezekiel (2023) noted that despite facing challenges such as inadequate government support, insufficient investment, and weak institutional backing, agricultural cooperatives remain highly relevant. They continue to play an indispensable role as grassroots organizations that drive agricultural progress in rural areas, bridging the gap between smallholder farmers and the larger economic system. This relevance is reflected in their ability to organize dispersed farmers into cohesive groups capable of addressing shared problems and pursuing common opportunities.

Ruphina *et al.* (2017) emphasize that agricultural cooperatives are fundamentally voluntary associations, established by farmers who share a common vision of pooling their resources, efforts, and expertise to achieve shared economic, social, and cultural objectives. By adopting a collective approach, rural dwellers not only strengthen their economic position but also gain a stronger voice in influencing agricultural policies and government decisions that directly affect their livelihoods. This participatory role enhances rural governance and ensures that smallholder farmers are not passive recipients of policy outcomes but active stakeholders in shaping agricultural development.

Furthermore, Nlebem and Raji (2019) observe that agricultural cooperatives are among the most important rural institutions driving socio-economic transformation. They go beyond providing knowledge and technical assistance by offering access to vital production inputs such as fertilizers, improved seed varieties, and agrochemicals. By reducing transaction costs and facilitating bulk procurement, cooperatives enable smallholder farmers to acquire modern farming inputs and technologies that would otherwise be inaccessible or unaffordable. In doing so, cooperatives significantly enhance farmers' productive capacity, improve food security, and strengthen rural households' resilience against poverty.

2.1.3 Agricultural Cooperatives in Nigeria

The origin of modern cooperatives in Nigeria dates back to the colonial period of the 1930s, following the acceptance of Mr. C. F. Strickland's report on their potential (Chukwu, 1996). The first cooperatives were formed among farmers producing key export crops—cocoa in the West, palm produce in the East, and groundnut in the North (Ijere, 1977). However, these early cooperatives were not primarily designed to benefit rural farmers but rather to serve the interests of the colonial administration by organizing the marketing and export of agricultural raw materials (Arua, 2004; Agbo, 2006). Strickland's report even suggested that while Nigeria was suitable for cooperative development, the local population was not capable of managing them independently. It therefore recommended strong government involvement in their establishment and operations.

After independence, Nigerian governments continued with this approach. Cooperative activities such as registration, supervision, auditing, and promotion were mostly handled by government officials, keeping the system under state control (Okonkwo, 1979). The oil boom of the 1970s and 1980s further encouraged government-led expansion of cooperatives, which were used as part of nationwide rural development initiatives (Alghraibi *et al.,* 2020; Bhuyan, 2007).

By the late 1980s and 1990s, however, economic reforms introduced deregulation policies. These reforms reduced government financial and organizational support but gave cooperatives greater autonomy in managing their affairs. As a result, by the 2000s, most agricultural cooperatives in Nigeria were operating within a more competitive and liberalized market environment compared to the heavily supported system of earlier decades (Umebali & Akujuobi, 2013).

Despite these transitions, agricultural cooperatives have remained important in Nigeria's rural economy. They have helped smallholder farmers improve access to production inputs, strengthen bargaining power, and increase income through collective action (Ortmann & King, 2007).

2.1.4 Roles of Farmer Cooperatives on Smallholder Farmers Well-being

Agricultural cooperatives have long been recognized as vital institutions that contribute to improving the socio-economic status of smallholder farmers globally. By bringing farmers together under a common framework, cooperatives enhance their capacity to overcome individual limitations, increase productivity, and improve overall quality of life. Their influence is most evident in areas such as income generation, asset accumulation, food security, and access to basic welfare services such as healthcare.

2.1.4.1 Income Generation

A major impact of agricultural cooperatives lies in their ability to boost the earnings of smallholder farmers. When farmers market their produce individually, they are often at the mercy of middlemen who dictate prices. However, by pooling resources and selling collectively, cooperatives strengthen farmers' bargaining power and enable them to negotiate better prices in both local and external markets (Duguma *et al.,* 2018). This collective approach reduces marketing costs, widens market opportunities, and often guarantees more

stable prices for members' produce. Consequently, cooperative members tend to enjoy higher and more reliable incomes than non-members, who lack similar advantages of scale and market access (FAO, 2019). The increased income not only meets immediate household needs but also provides surplus that can be reinvested in farming or other income-generating ventures.

2.1.4.2 Asset Accumulation

Beyond boosting incomes, agricultural cooperatives play a central role in facilitating asset accumulation among farming households. Many smallholder farmers face barriers in accessing credit from formal financial institutions due to lack of collateral and high lending risks. Cooperatives bridge this gap by providing financial support and credit facilities tailored to members' needs. Such access enables farmers to invest in critical productive assets—ranging from modern agricultural equipment and irrigation systems to improved seed varieties and farmland expansion (Gujba & Gwani, 2019). Over time, these investments enhance productivity, build long-term wealth, and strengthen farmers' resilience against economic shocks. In addition, the collective savings and loan schemes promoted by cooperatives create a culture of financial discipline and long-term planning, which further reinforces asset growth and sustainable rural development.

2.1.4.3 Food Security Enhancement

Agricultural cooperatives contribute significantly to improving food security among smallholder farmers by addressing both production and post-harvest challenges. Through the collective purchase and distribution of farm inputs such as fertilizers, improved seed varieties, and agrochemicals, cooperatives lower production costs and make essential inputs more accessible to members. This, in turn, enhances productivity, boosts yields, and strengthens household food self-sufficiency (Duguma *et al.,* 2018). Moreover, many cooperatives invest in storage facilities, processing centers, and value addition activities that minimize post-

harvest losses. Such infrastructure ensures that harvested crops are preserved for longer periods, enabling farmers to maintain a steady food supply throughout the year rather than facing periods of scarcity. By stabilizing both production and supply, cooperatives help reduce hunger and improve dietary diversity in rural households (FAO, 2019).

2.1.4.4 Healthcare Accessibility

The contributions of cooperatives extend beyond the purely economic domain into broader aspects of social welfare, particularly healthcare. Smallholder farmers often face significant financial constraints in accessing medical services, especially during emergencies. Cooperative membership helps mitigate this challenge by facilitating access to group-based health insurance schemes or welfare funds that reduce the financial burden of healthcare expenses (Bezu & Holden, 2014). In some cases, cooperatives also partner with health service providers to organize periodic medical outreaches, vaccinations, or health education for their members and communities. By reducing vulnerability to health shocks, cooperatives indirectly improve productivity, as healthier farmers are more capable of sustaining agricultural activities and supporting their households.

2.1.4.5 Gender Empowerment

Agricultural cooperatives also play a transformative role in advancing gender empowerment, which is an essential component of rural development. Women, who make up a large share of Nigeria's smallholder farming population, often face structural barriers such as limited access to land, credit, and decision-making platforms. Cooperative membership provides women with a pathway to overcome these barriers by granting them greater access to financial resources, extension services, and training opportunities (Duguma *et al.,* 2018). Participation in cooperatives also enhances women's bargaining power within households and communities, enabling them to play more active roles in economic and leadership decisions. This empowerment not only improves their individual livelihoods but also has a ripple effect

on family welfare, as women are more likely to reinvest earnings into nutrition, education, and healthcare for their households.

2.1.4.6 Provision of Credit

Cooperatives also have the capacity to offer credit services to their member farmers, alleviating constraints in production (Tefera *et al.,* 2016). This financial support becomes a catalyst for enhanced agricultural productivity. Enhancing agricultural productivity holds significant importance in improving farmers' livelihoods, reducing rural poverty, and bolstering food security (Shiferaw *et al*., 2014; Asfaw *et al*., 2012; Kassie *et al*., 2011). The availability of credit services within cooperatives allows farmers to invest in various aspects of their agricultural operations. This includes acquiring essential inputs such as seeds, fertilizers, and machinery, as well as implementing improved farming practices. The financial assistance not only addresses immediate production challenges but also opens avenues for adopting more sustainable and efficient methods.

2.1.5 Constraints Faced by Farmer Cooperatives in Nigeria

Agricultural cooperatives have long been recognized as vital institutions for smallholder farmers, contributing to improved productivity, enhanced income, and better overall livelihoods. Despite these benefits, their effectiveness is often constrained by a range of internal and external challenges. Understanding these limitations is essential for evaluating their performance and designing interventions that strengthen their role in rural development.

2.1.5.1 Governance and Management Challenges

Strong governance and sound management are critical determinants of cooperative success. However, many cooperatives struggle with weak leadership capacity, poor decision-making processes, and insufficient accountability mechanisms. A lack of transparency in the management of funds and resources often leads to misallocation, corruption, and erosion of

member trust (Birchall, 2018). Ineffective governance structures not only limit operational efficiency but also reduce members' willingness to participate actively in cooperative affairs, ultimately undermining their sustainability.

2.1.5.2 Financial Constraints

Limited access to finance remains one of the most persistent challenges faced by agricultural cooperatives. Insufficient capital restricts their ability to expand infrastructure, establish effective credit systems for members, or invest in modern production technologies (Gujba & Gwani, 2019). In many cases, cooperatives rely heavily on member contributions and external aid, which may be inconsistent or inadequate. Without sustainable financial resources, cooperatives struggle to scale up their services, thereby weakening their capacity to meet members' evolving needs.

2.1.5.3 Inadequate Market Access and Bargaining Power

Agricultural cooperatives are often expected to provide better market opportunities for smallholder farmers, yet many encounter difficulties in achieving this. Poor access to timely market information, inadequate transportation networks, and exploitative middlemen reduce cooperatives' bargaining power (Duguma *et al.,* 2018). As a result, members may be forced to sell their produce at unfavourable prices, negating one of the core benefits of collective action. Limited capacity for value addition and weak integration into value chains further reduce cooperatives' competitiveness in local and global markets.

2.1.5.4 External Market Dynamics

Beyond local structural challenges, cooperatives are highly exposed to broader market and economic fluctuations. Volatility in commodity prices, shifts in consumer demand, and unfavourable trade policies can significantly affect their profitability and resilience (Birchall, 2018). Since many smallholder cooperatives are dependent on one or two key crops, such

external shocks can destabilize their operations and make it difficult to provide consistent returns to members.

2.1.5.5 Social and Cultural Factors

Social and cultural dynamics also influence the effectiveness of agricultural cooperatives. Gender inequality, entrenched traditional norms, and community power imbalances can exclude women and marginalized groups from participating fully in cooperative activities (Gujba & Gwani, 2019). Such exclusion not only reduces inclusivity but also limits the pool of knowledge, skills, and resources that cooperatives can draw upon. Additionally, internal conflicts arising from community politics may further weaken cooperative unity and cohesion.

2.1.5.6 Limited Access to Technology and Information

The competitiveness of agricultural cooperatives depends heavily on their ability to adopt modern technologies and innovative farming practices. However, most smallholder cooperatives operate under significant constraints, including limited financial resources, poor technical expertise, and inadequate extension services (FAO, 2019). This hampers their productivity, restricts efficiency in post-harvest handling, and reduces their ability to compete with more technologically advanced actors in the agricultural sector.

2.1.5.7 Climate Change and Environmental Factors

Climate change presents an increasingly critical challenge for agricultural cooperatives. Unpredictable rainfall patterns, droughts, floods, and pest outbreaks significantly affect yields and threaten the livelihoods of smallholder farmers. Cooperatives reliant on specific crops or rain-fed agriculture face even greater risks (FAO, 2019). Furthermore, limited knowledge and resources for climate-smart practices hinder their ability to adapt to environmental shocks. Without deliberate strategies for resilience and sustainability, cooperatives may become increasingly vulnerable to climate-related risks.

2.2 Rice and its Origin

Rice has been widely studied by botanists and geneticists, yet its domestication history remains debated. Two major schools of thought dominate this discourse. The single-origin model suggests that rice was domesticated in China, whereas the multiple-origin model proposes that *Oryza sativa japonica* was domesticated in China and *O. sativa indica* later in India (Fuller *et al.,* 2010). Genetic studies lend weight to the multiple-origin perspective, showing that the two subspecies have distinct mitochondrial genomes: *indica* likely descended from an *O. nivara*-like ancestor, while *japonica* originated from *O. rufipogon*. Conversely, proponents of the single-origin theory argue that *indica* evolved from *japonica* with local introgression from wild populations (Molina *et al*., 2011). What remains clear, however, is that hybridization, regional diversification, and adaptation sometimes through intentional breeding have been central to the evolutionary history of rice (Fuller, 2011).

Globally, out of more than 20 known species in the genus *Oryza*, only two have been domesticated: *O. sativa* (Asian rice) and *O. glaberrima* (African rice). While Asian rice dominates worldwide production, African rice represents an independent domestication pathway and is particularly significant to the history of West African agriculture. Archaeological and historical accounts suggest that *O. glaberrima* has been cultivated in West Africa for at least 3,000 years. Strabo, for instance, recorded rice farming in the Fezzan (modern-day Libya) by the Garamantes, indicating its presence during wetter climatic periods in the Sahara (Fuller, 2011). Unlike *O. sativa*, African rice is a distinct species and does not naturally interbreed with its Asian counterpart.

Within Nigeria, African rice cultivation has deep historical roots. It was first grown in the central Niger Delta and Sokoto basins before spreading to bush-fallow upland farming systems in the western forest zones (Oka, 1988, cited in Maji *et al.*, 2017). Today, it remains an important crop in several regions: as a lowland variety in Kebbi and Sokoto States

particularly in the Rima River floodplains and as an upland crop in areas such as Zuru Local Government of Kebbi State. Farmers also cultivate it in shallow swamps, inland valleys, and the floodplains of the Niger and Benue rivers, often mixing it with Asian rice or allowing it to dominate in certain fields. In the southern parts of the country, it also appears in dry land rice systems, reflecting its adaptability across diverse ecological conditions (Fuller *et al.,* 2010). The earliest written reference to rice in Nigeria comes from Leo Africanus, who in the 1560s described the technique of sowing rice "on the waters" in the Sokoto area a practice that endures among local farmers to this day (Fuller *et al.,* 2010).

2.2.1 Global Rice Production

Record increases in rice production occurred during the last three decades of the twentieth century. The Green Revolution, which unfolded between the 1940s and the late 1960s, played a pivotal role in transforming agricultural output in developing countries through the transfer of new technologies and research-driven practices (FAO, 2006). During this period, the population of low-income countries grew by about 90% between 1966 and 2000, yet paddy rice production rose by 130%. This growth was largely made possible by the adoption of modern farming technologies that introduced semi-dwarf, early-maturing rice varieties capable of being cultivated up to three times per year and highly responsive to nitrogen fertilizers. These improved rice varieties, grown primarily on irrigated land that covers nearly half of the world's harvested rice area, now account for almost three-quarters of global rice output. As a result, yield levels in many Asian countries have doubled or even tripled compared to pre-Green Revolution averages. Looking ahead, demand for rice in Asia alone is projected to rise by about 70% over the next 30 years, driven primarily by population growth (Khush, 2011).

Global rice production has continued to show remarkable growth in the twenty-first century. According to the Food and Agriculture Organization (FAO, 2025), production increased

steadily from 496.9 million tonnes in 2016/17 to 555.6 million tonnes in 2025/26, as shown in Figure 2.1. These figures are expressed in *milled terms*, meaning they represent the weight of rice after undergoing the milling process, during which the husk, bran, and germ are removed, leaving polished white rice ready for consumption. Although annual fluctuations occurred, such as the dip in 2019/20 to 503.4 million tonnes, the overall trajectory remained upward, reflecting technological advances, improved seed varieties, and enhanced farming practices. The trend highlights not only the resilience of the rice sector but also its capacity to sustain growing global demand.

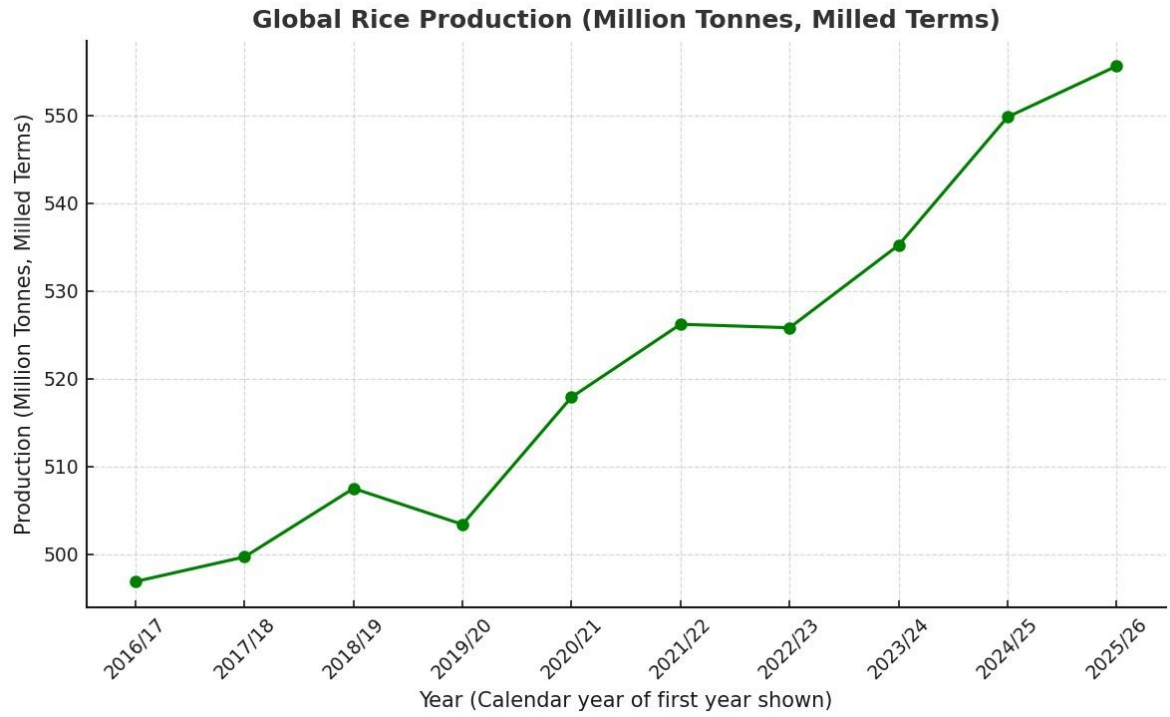
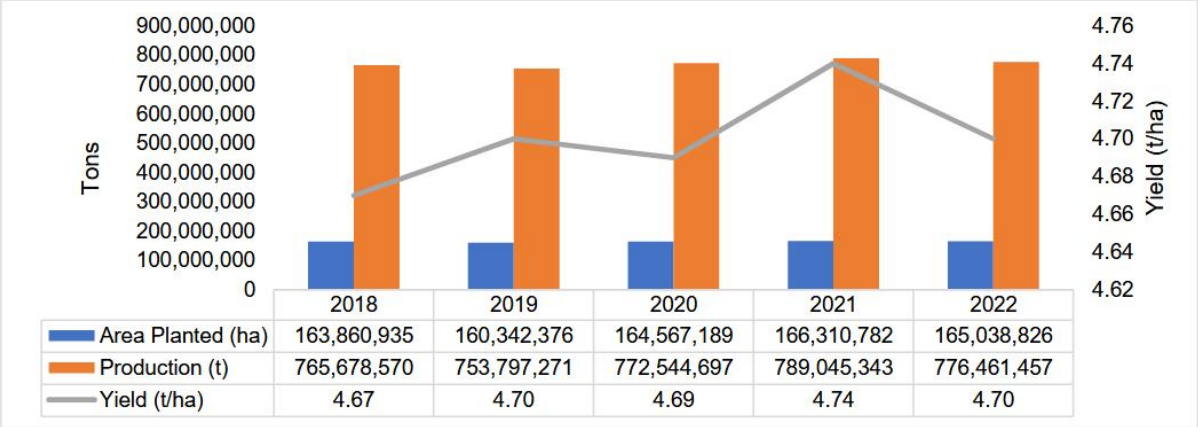


Figure 2.1 Global Rice Production Trend (Milled Terms)

Source: FAO (2025) Dataset

Over the five-year period from 2018 to 2022, global rice production amounted to approximately 3.86 billion tonnes. Major rice-producing countries such as China, India, and Indonesia continued to lead global output, ensuring steady supply despite challenges posed by climate change and volatile market conditions (FAOSTAT, 2022). Figure 2.2 illustrates the

global area planted and production volumes during this period. On average, global rice production exceeded 771 million tonnes annually, cultivated over approximately 164 million hectares. The harvested area remained relatively stable, dipping slightly to 160.34 million hectares in 2019 before peaking at 166.31 million hectares in 2021. Production followed a similar trajectory, decreasing from 765.68 million tonnes in 2018 to 753.80 million tonnes in 2019, then recovering to reach a high of 789.05 million tonnes in 2021 before settling at 776.46 million tonnes in 2022.



	2018	2019	2020	2021	2022
Area Planted (ha)	163,860,935	160,342,376	164,567,189	166,310,782	165,038,826
Production (t)	765,678,570	753,797,271	772,544,697	789,045,343	776,461,457
Yield (t/ha)	4.67	4.70	4.69	4.74	4.70

Figure 2.2 Global Rice Production and area planted (2018 – 2022).

Source: FAOSTAT (2022)

A closer look at global distribution further illustrates regional disparities. As depicted in Figure 2.3, Asia dominates global rice production, contributing approximately 87% of the total output between 2018 and 2022. This overwhelming share is driven by leading rice producers such as China, India, and Vietnam. Africa and the Americas follow with 6% each, with significant contributions from countries like Nigeria in Africa and Brazil in the Americas. Oceania and Europe, by contrast, contribute minimally, with Oceania at 0% and Europe at only a negligible share. These figures highlight Asia's central role in global rice production, while also pointing to the growing importance of other regions in supporting food security worldwide.

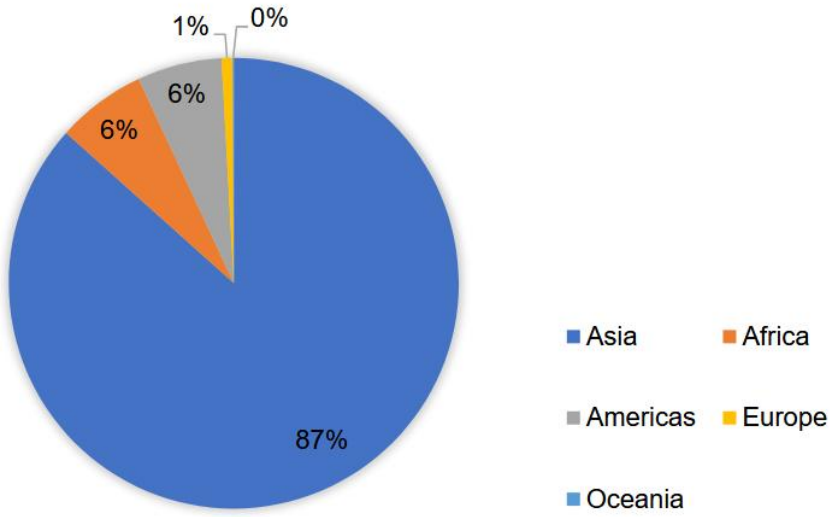


Figure 2.2 Global Rice Production percentage share across the continent (2018 – 2022).

Source: FAOSTAT (2022)

2.2.2 Rice Production in Nigeria

Rice production in Nigeria has experienced significant changes over the decades, shaped by government policies, economic conditions, and technological interventions. The first period of higher output was recorded in the early 1970s, when rice production averaged 321,000 metric tonnes (mt) from 234,000 hectares of cultivated land, with a mean yield of 1.37 metric tonnes per hectare (Optimum Agricultural Consultant, 2007). From 2001 to 2006, production increased steadily, but a decline was observed in 2007. This was followed by a positive recovery in 2008, when output rose by 31.2% compared to the previous year (AfricaRice, 2011). Despite this growth, only 1.8 million hectares of the 4.6 million hectares projected for rice cultivation were actually utilized between 2008 and 2010, contributing to a decline in both harvested area and output in that period (Cadoni & Angelucci, 2013; FAO Statistics, 2013).

The 2010s marked a period of mixed performance in rice production. According to FAO Statistics (2012), Nigeria produced 2.03 million megagrams of rice between 2001 and 2003, compared to a consumption level of 3.96 million megagrams, leaving a supply deficit of nearly 50%. By 2012, only 57% of annual rice demand was met through local production, with the balance made up by imports or smuggling. Similarly, FAO Statistics (2008) indicated that about 13% of the 19 million hectares of cereal land in the country was allocated to rice, reflecting the modest but growing scale of production.

By the mid-2010s, the Nigerian government intensified efforts to boost rice production as part of broader economic diversification strategies. The inauguration of President Muhammadu Buhari in 2015 marked a renewed emphasis on agrarian policies, including the Central Bank of Nigeria's Anchor Borrowers Program, which engaged about 12 million rice farmers across four million hectares of FADAMA rice land (RIFAN, 2017). As a result, national production rose from 5.5 million tonnes in 2015 to 5.8 million tonnes in 2017. During this same period, consumption was estimated at 7.9 million tonnes, underscoring Nigeria's heavy reliance on imports despite growing local capacity. Notably, Nigerians spent over ₦1 billion on rice consumption in 2015, but this expenditure began to decline as local production increased (RIFAN, 2017).

More recent FAO Statistics (2020, 2021) show that Nigeria sustained its position as Africa's largest rice producer between 2014 and 2019, with output fluctuating between 6.0 and 7.5 million metric tonnes. Production dipped to 6.61 million tonnes in 2017 but rose to 6.81 million tonnes in 2018, before declining again to 5.4 million tonnes in 2019. Nevertheless, production peaked at 8.17 million tonnes in 2020, a substantial increase from the 388,000 tonnes recorded in 1971, reflecting an average annual growth rate of 8.74% over nearly five decades. Despite this progress, Nigeria remained unable to achieve full self-sufficiency, with illegal rice smuggling and supply deficits persisting (Erhabor & Ahmadu, 2013).

Several policies and institutional interventions have contributed to the sector's growth. These include the removal of tariffs on farming equipment and machinery, government subsidies for inputs such as seeds and fertilizers, minimum price guarantees, and the establishment of rice-processing credit schemes with low-interest rates and long repayment periods. However, experts argue that further investments in mechanization and sustained support for smallholder farmers are critical if Nigeria is to close its production-consumption gap and reduce its reliance on rice imports (Ogundele & Okoruwa, 2018; Erhabor & Ahmadu, 2013).

2.2.3 Economic Relevance of Rice Production in Nigeria

Rice is one of the most important staple foods globally, serving as the daily dietary base for over half of the world's population and providing nearly 20% of total caloric intake (Prasad *et al.,* 2017). The majority of rice production takes place in Asia, with China, India, Thailand, and Vietnam being the leading producers. China and India alone account for about half of global rice output and consumption (Muthayya *et al.,* 2014). Given its widespread consumption, fluctuations in rice production and trade have significant implications for global food security, especially in developing countries (FAOSTAT, 2022; Prasad *et al.,* 2017).

Rice remains one of the most protected commodities in international trade, which makes it highly volatile and limits the ability of countries to depend solely on imports. In sub-Saharan Africa, rice consumption has grown steadily, with per capita intake doubling since the 1970s. Similar upward trends are observed in Latin America and the Caribbean (Prasad *et al*., 2017). In Nigeria, rice has become an essential component of the national diet, consumed across both rural and urban households. Its growing importance reflects not only its nutritional contribution but also its socio-economic relevance.

Beyond food security, rice production is a major source of income and employment in many developing nations. For Nigeria, the sector is crucial in reducing import bills, conserving

foreign exchange, and stimulating economic growth. Rice (*Oryza sativa*) is now considered the second most important cereal after wheat in terms of global production, partly due to fluctuations in maize output (Imolehin & Wada, 2000; Udemezue, 2014). Although its protein content is relatively lower compared to other cereals, rice provides more than one-fifth of the world's caloric supply (Oladimeji, 2017). Globally, over 92% of rice is produced in Asia, 5% in the Americas, and only 3% in Africa. Nigeria contributes significantly to the African share and has emerged as the continent's largest producer in recent years.

The economic relevance of rice production in Nigeria has attracted diverse scholarly debates. Some studies highlight its positive impact. For instance, Damola (2020), Abah, Ochoche, and Hundu (2021), and Hussaini, Oladimeji, and Sanni (2019) all reported that rice production and cultivation significantly contribute to Nigeria's economy through income generation, employment creation, and rural development. On the other hand, Short, Mulinge, and Witwer (2012) found weaker contributions, while USAID (2019) noted that rice production can only deliver substantial economic benefits if cultivated under the right conditions, particularly with adequate policy support. Similarly, Bamidele *et al.* (2010) argued that the preference for imported rice over local varieties has historically undermined the sector's economic contribution.

Taken together, these perspectives luminates the dual role of rice production in Nigeria: as a staple for food security and as a strategic sector for economic growth. Its potential lies not only in meeting local consumption demands but also in conserving foreign exchange, reducing dependence on imports, and strengthening the livelihoods of millions of smallholder farmers.

2.3 Constraints Affecting Rice Production in Nigeria.

Rice farming across the globe faces multiple challenges, although the severity and nature of these problems vary by region. Nevertheless, several constraints are common, particularly in developing countries such as Nigeria. These include drought, limited access to fertilizer, soil salinity, pest and disease infestations, poor mechanization, inadequate land availability, and insufficient support from government and development partners.

2.3.1 Drought

Irregular rainfall and periodic drought are typical in tropical and sub-tropical regions, significantly reducing rice yields. Estimates suggest that about one-quarter of Nigeria's upland rice fields are highly vulnerable to yield losses from drought. While irrigation and agronomic adjustments are possible solutions, they require high investment. Breeding and distributing drought-tolerant rice varieties therefore remain the most practical and affordable mitigation strategy for smallholder farmers (Jeong *et al*., 2010; Hu & Xiong, 2014).

2.3.2 Fertilizer Availability

Fertilizer scarcity and high cost remain pressing concerns. For example, in 2016, a 50 kg bag of NPK 15:15:15 or Urea sold for nearly ₦6,000 despite government interventions. Such costs discourage adequate fertilizer use, thereby limiting rice productivity. Farmers recognize the importance of both organic and inorganic fertilizers, but affordability often restricts their application (Mohammed *et al.,* 2015; Ezui *et al.,* 2010). Currently, a 50kg bag of NPK is sold at relatively even more outrageous prices.

2.3.3 Soil Salinity

Salinity reduces soil fertility and crop performance, eventually leading to land degradation and declining yields. Globally, poor irrigation and soil management practices contribute to salt accumulation, posing long-term environmental and socioeconomic risks. Sustainable land

and water management is critical to preventing further loss of arable land (Munns, 2002; Chesworth, 2008).

2.3.4 Pests and Diseases

Local rice varieties are especially susceptible to diseases such as blast, rice yellow mottle virus (RYMV), and brown spot, as well as pests like gall midge, grasshoppers, birds, and rodents. Integrated pest management approaches such as using resistant varieties, proper fertilizer management, timely planting, weed control, scarecrows, bio-pesticides, and fencing can help minimize losses (Sié *et al.,* 2008).

2.3.5 Mechanization

Mechanization is essential to improve efficiency, reduce drudgery, and increase output. However, large-scale mechanization in Nigeria is constrained by limited credit facilities, high fuel and electricity costs, poor infrastructure, weak local manufacturing capacity, and ineffective policy enforcement. Addressing these structural challenges should be a priority for agricultural policy (IFPRI, 2010; Lamidi & Akande, 2013).

2.3.6 Land Availability

Land is a critical factor in rice production, yet only a fraction of Nigeria's arable land is devoted to rice cultivation. For example, in 2000, less than 7% of farmland was used for rice, with national yields averaging just 1.47 tons per hectare. Although the cultivated area increased from 2.4 million hectares in 2010 to 3.2 million hectares in 2017, demand for rice still outpaces supply (Ezra & Yahaya, 2012; Erhie *et al.,* 2018).

2.3.7 Institutional and External Support

The Nigerian government has attempted to boost rice production through Agricultural Development Programs (ADPs), River Basin Development Authorities, and cooperative banks. Partnerships with NGOs such as Information and Communication Support for

Agricultural Growth (ICS-Nigeria) have further improved farmer access to information, technology, and inputs. At the global level, organizations including WARDA (now Africa Rice), IITA, IRRI, FAO, IFPRI, and USAID contribute through research, dissemination of best practices, and development of improved rice varieties. Their interventions remain vital in addressing both technical and socio-economic barriers to rice production (Omofonmwan & Kadiri, 2007; ICS-Nigeria, 2010).

2.4 Analytical Framework

2.4.1 OLS Approach: Multiple Linear Regression

According to Gujarati (2006) and Greene (2008), the primary objective of regression analysis is to examine and explain the factors responsible for variations in the dependent variable. In statistical applications such as SPSS, regression analysis is defined as a technique for estimating the linear relationship between a dependent variable and one or more explanatory variables. In practice, regression provides a means of quantifying the effect of independent variables on the outcome of interest, thereby offering deeper insights into the structure of relationships within the dataset.

In this study, the effect of Cooperative societies on small holder rice production and the return to scale of smallholder rice farmers in Edo State were analyzed using the Ordinary Least Squares (OLS) regression model. Originally developed by Gauss in 1794, OLS has since evolved into a core tool across multiple disciplines including agricultural economics, econometrics, political science, and engineering applications such as control theory and signal processing (Burke, 2010). Within this framework, both dependent and independent variables are specified and estimated, with the accuracy of the results largely dependent on the reliability of the data employed (Witt & Witt, 1995). The method's robustness and adaptability explain its prominence in empirical research, making it particularly suitable for studies on agricultural production and profitability.

2.4.2 Gross Margin and Net Returns

The assessment of profitability in agricultural enterprises often relies on measures such as Gross Margin (GM) and Net Returns (NR). Johnson (1982) and Kay (1986) highlight Net Farm Income (NFI) as a reliable profitability indicator for farmers, and for non-farm agricultural enterprises, this corresponds to Net Returns. Gross Margin is derived by subtracting total variable costs from total revenue, while Net Returns account for further deductions including total fixed costs, depreciation, and other relevant adjustments. Kay (1986) emphasizes that Net Returns provide the most comprehensive profitability measure within a production cycle, as it incorporates both variable and fixed cost considerations.

In the context of smallholder rice farming in Edo State, Gross Margin indicates the revenue available after covering variable production costs such as labour, seed, fertilizer, and agrochemicals. Net Returns then represent the residual profit once fixed costs—such as depreciation of tools, machinery, and equipment are also deducted. These indicators thus give a holistic measure of the financial performance of rice farming enterprises.

Mathematically, the measures are expressed as:

$$GM = Total\ Revenue\ (TR) - Total\ Variable\ Cost\ (TVC) \quad (2.1)$$

While for Net Returns (NR), it is expressed mathematically as:

$$NR = Gross\ Margin\ (GM) - Total\ Fixed\ Cost\ (TFC) \quad (2.2)$$

The depreciation of fixed **cost** is calculated using the straight-line method of depreciation stated by Emokaro and Erhabor, (2014).as:

$$D = \frac{C-S}{N} \quad (2.3)$$

Where:

D = Depreciated amount (₦)

C = Initial cost of the assets (₦)

S = Salvage value (₦)

N = Expected number of useful lifespan (years)

The salvage value was assumed to be zero. Thus:

$$Annual\ depreciation\ =\ \frac{Current\ Value}{Expected\ Lifespan} \tag{2.4}$$

2.4.3 Relative Importance Index (RII)

The Relative Importance Index (RII) is a widely applied technique for ranking and prioritizing factors in survey-based research, particularly when Likert scale responses are used. According to Muhwezi and Otim (2014), the RII is calculated as:

$$\text{RII} = \frac{\sum_{i=1}^{n} \omega i}{A \times N} \tag{2.5}$$

where:

• wi = weight given by each respondent (e.g., on a Likert scale, with 1 = least important and A = most important).

• A = highest possible weight on the scale

• N = total number of respondents.

In this study, a five-point Likert scale was employed to elicit farmers' assessments of the roles performed and services rendered by their cooperatives. The scale was designed such that a response of 5 indicated services performed to a "very great extent," while a score of 1 reflected "no extent." The responses provided by farmers were then aggregated and normalized into the RII, which allowed for systematic ranking of cooperative functions.

The use of RII in this context enabled the identification of the most significant roles that cooperatives play in supporting smallholder rice farmers in Edo State. By translating subjective perceptions into quantifiable indices, the method provided a clear picture of which

services such as access to credit, input supply, training, market linkages, or advocacy were regarded as most crucial by the respondents. The decision rule for interpretation was that values between 0.7 and 1.0 signified high importance, values between 0.4 and 0.7 denoted medium importance, and values below 0.4 indicated low importance.

Through this approach, the RII not only ranked the roles and services of cooperatives but also highlighted the extent to which these organizations contribute to enhancing farmers' productivity and profitability. This made it a useful tool for prioritizing cooperative interventions, as it revealed the specific areas where cooperative support is perceived to have the greatest impact on members' welfare and overall rice production.

2.5 Empirical Review of Related Literatures

Afolami, Obayelu, Agbonlahor, and Lawal-Adebowale (2012) examined the socioeconomic characteristics of rice farmers and the effect of cooperative membership on rice production in Ekiti and Ogun States, South-West Nigeria. Using multistage sampling, 310 rice farmers were selected and data were analyzed with descriptive statistics, budgetary techniques, and inferential methods. The findings showed that most farmers (71%) belonged to cooperatives, with cooperative members cultivating slightly larger farm sizes (1.72 ha) than non-members (1.64 ha). Cooperative members also used more purchased inputs such as fertilizer and pesticides, yet there was no significant difference in gross margins per hectare between cooperative (₦90,222) and non-cooperative (₦92,986) farmers. Membership was significantly influenced by household size, access to extension services, number of rice farms owned, use of herbicides, and output level. The study concluded that while cooperatives provided access to subsidized inputs, they functioned more as channels for input distribution than as true producer organizations, highlighting the need for better monitoring and structuring of cooperatives to enhance efficiency and returns.

Luka, Sylvester, and Saleh (2023) investigated the effects of cooperative membership on the income status of rice-producing households in Gwagwalada and Kwali Area Councils of the Federal Capital Territory (FCT), Abuja. Using a multistage and random sampling technique, data were collected from 90 respondents through structured questionnaires and focus group discussions. Descriptive statistics, chi-square, and t-tests were used for analysis. The findings revealed that 57.7% of cooperative members had access to loans, and 88.8% reported an increase in annual incomes. Results from the chi-square test indicated significant differences in income status between cooperative and non-cooperative members, while the independent sample t-test (6.490) confirmed that cooperative members earned significantly higher annual incomes. The study concluded that cooperative membership enhances access to financial resources and improves household income, although gaps remain in the effectiveness of cooperatives. It recommended strengthening the capacity of cooperatives, raising community awareness, and organizing training workshops and seminars to build administrative and technical skills for sustainable development.

Salihu, Tsado, Dauda, Abdullahi, Ibrahim, and Ovaioza (2019) explored the perceived benefits of farmers' cooperative societies on rice production in selected local government areas of Abuja, Nigeria. Data were obtained from 120 respondents drawn from four cooperative societies using a multistage sampling technique, with structured questionnaires and interviews as instruments. Analysis was carried out using descriptive statistics and linear regression. The findings revealed that the average age of respondents was 46 years, with about half (50.8%) attaining at least secondary education, while the majority (83.4%) had been involved in rice farming for over 15 years. However, only 5.8% had been cooperative members for more than a decade. Perceived benefits of cooperatives with high mean scores included advice on quality seeds, fertilizers, pesticides, and cropping practices (WM = 4.68), improved access to markets (WM = 4.57), and education on improved farm practices and

inputs (WM = 4.50). Regression results showed that the model explained 84% of the variation in rice output, with educational level, marital status, and farm output being significant at 1%. A t-test further revealed a significant difference in rice output before and after joining cooperatives (t-cal = 5.211 > t-critical = 1.00). Despite these benefits, farmers faced challenges such as complicated administrative procedures, poor contributions, lack of trust, discrimination by officials, and limited access to credit. The study recommended that agricultural stakeholders encourage functional cooperatives to enhance credit access and promote group cohesion for better productivity outcomes.

Okeke and Nwoye (2019) examined the activities of rice producers' cooperative societies in food production in Ayamelum Local Government Area of Anambra State, Nigeria. Using a multistage and random sampling technique, data were collected from 55 cooperative members through pre-tested questionnaires. The study revealed that the majority of the respondents were male (61.8%) with an average age of 43.9 years, and most were married (80%) with secondary education (72.7%). Household size averaged 5.7 persons, while 49.1% had between 10 to 19 years of farming experience as cooperative members. Farming was identified as the major occupation of 56.3% of the respondents. With respect to cooperative activities in food production, respondents highlighted that cooperatives engaged in providing subsidized farm inputs (78.2%), marketing members' produce (94.5%), and training on improved agronomic practices (70.9%). However, poor managerial skills of cooperative leaders ($\bar{x}$ = 2.73) were cited as a key constraint affecting effectiveness. The authors recommended that government actively participate in the establishment and administration of agricultural cooperatives to curb mismanagement, ensure accountability, and promote sustainability of such organizations.

Olatinwo, Yusuf, and Bamidele (2023) investigated the effect of cooperative societies on agricultural production in Kwara State, Nigeria, using data from 140 randomly selected

farmer-cooperators. Information was collected through interview schedules and analyzed with descriptive statistics and regression analysis. The findings revealed that the majority of respondents (68%) were married. The main activities carried out by cooperatives included providing crop production information (mean = 4.53), group farming (mean = 4.53), and facilitating credit facilities (mean = 4.47). Key contributions of cooperatives to agricultural production were procuring farm inputs for members (mean = 4.58), increasing the quantity and quality of farm output, and providing access to storage facilities (mean = 4.48). Major constraints limiting cooperatives' contributions included lack of skilled personnel (mean = 4.57), corruption and fraudulent officials (mean = 4.54), and inadequate infrastructure (mean = 4.53). Regression analysis further showed that socio-economic factors significantly influenced the benefits derived from cooperative societies ($R^2 = 0.650$, $F = 28.932$, $p < 0.01$). The study concluded that membership in agricultural cooperatives positively impacts agricultural development through improved access to inputs, higher output, and storage facilities. It recommended that government extension agencies and private stakeholders strengthen support, particularly in providing credit facilities to farmer cooperatives.

Adeleye, Atala, Akpoko, and Omolehin (2016) investigated the adoption of improved rice production technologies among members and non-members of Rice Farmers Associations in Kaduna and Kano States, Nigeria. Using a multi-stage sampling technique, 282 respondents were selected (141 members and 141 non-members), and data were collected with semi-structured questionnaires. Descriptive statistics and Z-tests were applied in the analysis. The results revealed significant differences ($p < 0.05$) between members and non-members in socio-economic characteristics such as age, household size, household labour, rice field size, and years of farming experience, although formal education and mobile phone use did not differ significantly. In terms of adoption of recommended practices, association members in Kaduna significantly outperformed non-members, while in Kano, no significant differences

were observed. The study concluded that membership in farmers' associations does not automatically translate to improved technology adoption unless associations are strengthened to function as business entities with access to formal markets.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Area and Scope of the Study

The study was carried out in Edo State, Nigeria (Figure 3.1). Edo State is located in the South-South geopolitical region of Nigeria and shares boundaries with Ondo State to the west, Delta State to the east, and Kogi State to the north. It lies between latitudes 06°30′ and 07°00′ North and longitudes 05°45′ and 06°00′ East, with an average elevation of approximately 88 meters above sea level (Ogbeifun, 2018). The state covers an estimated land area of 19,714 km² and has a population of approximately 44,461,137 people and a Human Development Index (HDI) of 0.530 (NPC, 2024)

Edo State comprises three ecological zones: Edo South, Edo Central, and Edo North. Edo South is predominantly covered by tropical rainforest, with the coastal fringes featuring mangrove swamp forest. Edo Central consists of a combination of rainforest and savanna, while Edo North is mainly savanna with pockets of rainforest. The climate of the state is typically tropical with two major seasons: the wet (rainy) season, lasting from April to November, and the dry (harmattan) season, which spans from December to March. The average annual temperature is around 30°C, while rainfall ranges from 2,500 mm in the southern part to 1,500 mm in the northern areas (Edo State Ministry of Agriculture (EDSMA, 2018).

In addition to its climatic and ecological diversity, Edo State is endowed with natural and mineral resources. It is a producer of crude oil and is also known for its agricultural production, including rubber, cocoa, cashew nuts, yam, and rice, among others. The state is equally rich in minerals such as quartz, amethyst, mica, dolomite, granite, and limestone (EDSMA, 2018).

The study was specifically conducted in the Edo North Ecological Zone, which consists of six Local Government Areas (LGAs): Akoko Edo, Etsako East, Etsako West, Etsako Central, Owan West, and Owan East. This zone has an estimated population of 1,973,000 people and covered a land area of approximately 4,711 km², with a population growth rate of 35.7% (NPC, 2024). It is bounded to the north by Kogi State, to the east by the River Niger, to the west by Ondo State, and to the south by Esan North East and Ovia North East LGAs (EDSMA, 2018). The region's climatic conditions supported the cultivation of various crops such as cocoa, palm produce, rice, cassava, plantain, guinea corn, fruits, and vegetables. Farming activities in this area were based on both rainfed and irrigated systems.

The study focused on two categories of rice farmers in Edo North: members of cooperative societies and non-members. The research specifically examined the production of paddy rice among these groups.

Figure 3.1: Map of the study area (Edo State). Inset, the Map of Nigeria showing the location of Edo State

Source: Ministry of Lands and Survey, 2009

3.2 Sampling Procedure and Sample Size

A multistage sampling procedure was employed for this study. In the first stage, four Local Government Areas (Etsako Central, Etsako East, Etsako West, and Owan West) were purposively selected out of the six LGAs in Edo North based on the presence of the highest number of registered and active rice farmer cooperatives as well as non-registered rice farmers' groups. The second stage involved the purposive selection of thirteen (13) registered and active rice farmer cooperatives with at least ten (10) members, using a list obtained from the Agricultural Development Programme and the Ministry of Industries and Commerce in the selected LGAs. In the third stage, ten (10) members were randomly selected from each of the thirteen cooperatives using simple random sampling, resulting in a total of one hundred and thirty (130) cooperative-member rice farmers. The final stage involved the proportionate sampling of one hundred and thirty (130) non-members of registered rice farmers' cooperatives, selected based on the population distribution of rice farmers across the four LGAs. This brought the total number of respondents for the study to two hundred and sixty (260) rice farmers, comprising both cooperative members and non-members.

Table 3.1 Summary of the Sampling Selection

S/N	Agro Ecological Zone	Local Government. Areas	Names of Farmers Cooperatives	Number of Farmers Sampled
1		Etsako West	Joy of Faith Multipurpose Cooperative	10
2		Owan West	Eme-Ora Farmers Multipurpose Cooperative Society	10
3		Etsako East	Godswill Rice Farmers cooperative	10
4		Etsako Central	Aloaye Rice Farmers Cooperative Society	10
5		Etsako Central	Osomegbe Rice Multi -Purpose Cooperative Society	10
6	Edo North	Etsako Central	Ebokhaisomhi Farmers Association	10
7		Etsako Central	Aeye Rice Farmers Association	10
8		Etsako Central	Uyalo Rice Farmers Cooperative Society	10
9		Etsako East	Back to Farm EDS Multipurpose Cooperative Society	10
10		Owan West	Liberty Multipurpose Cooperative Society	10
11		Etsako Central	Udaba Ekperi Fadama Rice farmers Cooperative Society	10
12		Etsako Central	Ukinowa Ekperi Rice Farmers Multipurpose cooperative Society	10
13		Etsako West	New Time Cattle and Rice Farmers Cooperative Society	10
	Total			**130**

3.3. Source of Data and Data Collection

The study employed primary data source. The primary data were obtained through a cross-sectional survey conducted in four Local Government Areas (Etsako Central, Etsako East, Etsako West, and Owan West) out of the six LGAs in Edo North, selected based on the concentration of active registered rice farmers. The instrument used for the survey was a semi-structured questionnaire consisting of both close-ended and open-ended questions, designed to capture comprehensive information from respondents.

3.4 Analytical Techniques

Objective i –*to describe the socio-economic characteristics of smallholder rice farmers*

This objective was analyzed using descriptive statistical tools such as means ($\bar{x}$), frequencies (*f*) and percentages (*%*).

Objective ii- *to profile rice farmer cooperatives in the study area*

This objective was analyzed using descriptive statistical tools such as mean ($\bar{x}$), frequencies (*f*) and percentages (*%*).

Objective iii–*examine the services rendered by the cooperatives*

Relative Importance index was used in analyzing the perceived services rendered by farmer cooperatives in the study area. The formula is given as

$$\text{RII} = \frac{\sum_{i=1}^{n} \omega i}{A \times N} \qquad (3.1)$$

where:

• wi = weight given by each respondent (e.g., on a Likert scale, with 1 = least important and A = most important).

• A = highest possible weight on the scale

• N = total number of respondents.

For the study, a 5 point type of Likert scale was used to elicit the required information, with the following ratings: 5 – Very great extent, 4 – An extent, 3 – Little extent, 2 – Very little extent, and 1 – No extents.

The decision rule for the RII is given as follows: High: 0.7 <RII ≤ 1.0; Medium: 0.4 <RII ≤ 0.7; Low (L): 0 <RII ≤ 0.4

Objective iv – *to estimate and compare the costs and returns to rice production of members and non-members of cooperatives in the study area*

This objective was analyzed using Gross Margin Analysis and Net Farm Income and student t test. The formulae are specified as follows;

Gross Margin Analysis: This is expressed as

$$GM = GI - TVC \quad (3.2)$$

Where:

GM= Gross Margin (₦)

GI= Gross Income (₦)

TVC= Total Variable cost (₦)

TC = Total Cost (₦)

Net Farm Income (NFI): This is given as

$$NFI = GM - DFC \quad (3.3)$$

Where:

DFC = Depreciated Fixed Cost (₦)

The profitability level of the respondents (cooperative and non-cooperative rice farmers) was compared using student t test statistics. This was used to check the significant difference between the profits of the two groups of rice farmers. The student t test is given as:

$$t = \frac{\overline{X}_c - \overline{X}_N}{\sqrt{\frac{S_C}{N_C} + \frac{S_N}{N_N}}} \quad (3.4)$$

Where:

$\overline{X}_c$ = Mean profit of cooperative rice farmers

$\overline{X}_N$= Mean profit of non-cooperative rice farmers

S_C= Variance of profit among cooperative rice farmers

S_N= Variance of profit among non-cooperative rice farmers

N_C = Number of cooperative rice farmers in the sample

N_N = Number of non-cooperative rice farmers in the sample

t = t-statistic (used to test the significance of the difference in me

Objective v -*determine the effect of cooperative membership on rice production and returns to scale of rice production*

The effect of cooperative membership on rice production was analyzed using multiple regression analysis. The implicit form of the regression model was specified as follows;

$$Y = f(X_1X_2X_3X_4X_5X_6X_7X_8X_9, U) \quad (3.5)$$

Where:

Y= Dependent variable (Rice Yield (Kg)

X_1 = Age of the farmer (Years)

X_2= Sex (Male = 1, Female = 2)

X_3 = Marital Status (Married =1, Otherwise = 2)

X_4 = Household Size (Number of Persons)

X_5 = Educational Level (Formal Education = 1, No Formal Education = 2)

X_6 = Farm Size (Hectares)

X_7 = Farming Experience (Years)

X_8 = Credit Access (Yes = 1, No = 2)

X_9 = Cooperative Membership (Yes = 1, No = 2)

Three functional forms (Linear, Semi-Log and Double-Log) of the specified model was tried in selecting the best functional form. The choice of the best functional form was based on the values of R^2 coefficient, the magnitude of the F-Value as well as the conformity to a priori expectations of signs of coefficient and the number of significant variables.

Explicitly, the functional forms were expressed as follows according to Nandi *et al*. (2011), Osondu (2015) and Elum and Tigiri (2018);

Linear Form:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + e \quad (3.6)$$

Semi-Log:

$$Y = \beta_0 + \beta_1 \log X_1 + \beta_2 \log X_2 + \beta_3 \log X_3 + \beta_4 \log X_4 + \beta_5 \log X_5 + \beta_6 \log X_6 + \beta_7 \log X_7 + \beta_8 \log X_8 + \beta_9 \log X_9 + e \quad (3.7)$$

Double-Log:

$$\log Y = \beta_0 + \beta_1 \log X_1 + \beta_2 \log X_2 + \beta_3 \log X_3 + \beta_4 \log X_4 + \beta_5 \log X_5 + \beta_6 \log X_6 + \beta_7 \log X_7 + \beta_8 \log X_8 + \beta_9 \log X_9 + e \quad (3.8)$$

where;

β_0 = Intercept

$\beta_1 - \beta_9$ = Estimated Coefficients

Y and $X_1 – X_9$ as earlier defined

e = error term

The returns to scale of rice production in the study area was determined using the identity for elasticity of production as employed by Nnamani *et al.* (2022). The analytical model is specified within the framework of the Cobb–Douglas production function in its double-log form as follows:

$$Log\, Y = \beta_0 + \beta_1 \log X_1 + \beta_2 \log X_2 + \beta_3 \log X_3 + \beta_4 \log X_4 + \beta_5 \log X_5 + e \quad (3.9)$$

Where;

Y= Dependent variable (Rice Yield (Kg))

X_1 = quantity of seeds used (kg)

X_2= labour input (man-days)

X_3 = quantity of fertilizer used (kg)

X_4 = quantity of herbicide used (litres)

X_5 = quantity of rodenticide used (litres)

β_0 = Intercept

$\beta_1 - \beta_9$ = Estimated Coefficients

In this specification, the coefficient of each explanatory variable β_i directly represents the elasticity of production with respect to the corresponding input:

$$EP_{xi} = \beta_i \tag{3.10}$$

Where:

EP_{xi} = Elasticity of production of the ith input

The return to scale (RTS) is then obtained as the sum of all estimated elasticities:

$$RTS = \sum_{i=1}^{5} \beta_i = \beta_1 + \beta_2 + \beta_3 + \beta_4 + \beta_5 \tag{3.11}$$

The decision rule for interpretation is as follows:

- If RTS=1RTS = 1RTS=1, rice production exhibits constant return to scale.
- If RTS>1RTS>1RTS>1, rice production exhibits increasing return to scale.
- If RTS<1RTS<1RTS<1, rice production exhibits decreasing return to scale**.**

The perceived effect of cooperatives on the production of smallholder rice farmers in the study area was measured on a 4-Point type of Likert Scale of 4 – Strongly Agree, 3 – Agree, 2 – Disagree and 1 – Strongly Disagree. Factors with mean values above or equals to 2.5 indicated agreement while factors with mean below 2.5 indicated disagreement.

Objective vi – *to examine the constraints facing cooperatives in promoting rice production.*

This objective was analyzed using descriptive statistics. The constraints were measured on a 4-point type of Likert Scale. Where;

Serious Constraints (SC) = 4

Moderate Constraints (MC) = 3,

Minor Constraints (MS) = 2,

Not a Constraint (NC) = 1.

Constraints with mean values greater than 2.5 represented serious constraints, while those with mean values less than 2.5 represented not serious constraints for the study

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 Socio-Economic Characteristics of Smallholder Cooperative and Non-Cooperative Rice Farmers in the Study Area

The socio-economic characteristics of smallholder cooperative and non-cooperative rice farmers in the study area are presented in Table 4.1.

4.1.1 Age (in Years)

Table 4.1 presents the distribution of rice farmers by age. Findings indicate that the largest proportion (41.9%) of farmers were between 40 and 49 years old, with an overall mean age of 46 years. Among the two categories, 38.5% of cooperators and 45.4% of non-cooperators also fell within this age range, with mean ages of 45 and 47 years, respectively. This shows that most of the respondents were middle-aged, a stage often associated with peak economic activity and productivity. Individuals in this group generally combined experience, physical strength, and readiness to adopt improved farming practices. Ibrahim *et al*. (2021) emphasized that farmers in this age bracket possess the energy to manage large farms for higher food output while also taking on off-farm activities to boost household income. In the same vein, Offor *et al*. (2020) observed that farmers within this age group can withstand the demanding nature of rice cultivation. The present study aligns with the findings of Offor *et al*. (2020) and Egbodion *et al*. (2024), who reported mean ages of 45 years and 43 years, respectively, among rice farmers in their research.

4.1.2 Sex

Table 4.1 also presents the distribution of rice farmers by sex. The pooled data reveal that 71.9% of the respondents were males, while 28.1% were females. Among cooperators, 68.5% were male and 31.5% were female, whereas among non-cooperators, 75.4% were males and 24.6% were females.

Table 4.1 Distribution of Smallholder Cooperative and Non-Cooperative Rice Farmers According to Socio Economic Characteristics in the Study Area

	Cooperators		Non-Cooperators		Pooled	
Age	**Frequency**	**Percentages**	**Frequency**	**Percentages**	**Frequency**	**Percentages**
30 - 39	38	29.2	20	15.4	58	22.3
40 - 49	50	38.5	59	45.4	109	41.9
50 - 59	37	28.5	46	35.4	83	31.9
> 59	5	3.8	5	3.8	10	3.8
Total	130	100.0	130	100.0	260	100.0
Mean (SD)	44.63 (7.751)		46.99 (6.555)		45.81 (7.261)	
Gender						
Male	89	68.5	98	75.4	187	71.9
Female	41	31.5	32	24.6	73	28.1
Total	130	100.0	130	100.0	260	100.0
Marital Status						
Single	3	2.3	1	0.8	4	1.5
Married	120	92.3	104	80.0	224	86.2
Divorced	3	2.3	17	13.1	20	7.7
Widowed	4	3.1	8	6.2	12	4.6
Total	130	100.0	130	100.0	260	100.0
Household Size						
1 - 5	48	36.9	44	33.8	92	35.4
6 - 10	74	56.9	75	57.7	149	57.3
11 - 15	8	6.2	11	8.5	19	7.3
Total	130	100.0	130	100.0	260	100.0
Mean (SD)	7.00 (2.539)		7.00 (2.418)		7.00 (2.479)	

Source: Field Survey, 2025

Table 4.1 Distribution of Smallholder Cooperative and Non-Cooperative Rice Farmers According to Socio Economic Characteristics in the Study Area Cont'd

	Cooperators		Non-Cooperators		Pooled	
	Frequency	**Percentages**	**Frequency**	**Percentages**	**Frequency**	**Percentages**
Educational Status						
No Formal Education	4	3.1	11	8.5	15	5.8
Primary Education	45	34.6	56	43.1	101	38.8
Secondary Education	68	52.3	49	37.7	117	45.0
Tertiary Education	13	10.0	14	10.8	27	10.4
Total	130	100.0	130	100.0	260	100.0
Years of Formal Education						
0 - 5	4	3.1	11	8.5	15	5.8
6 - 10	45	34.6	56	43.1	101	38.8
11 - 15	81	62.3	63	48.5	144	55.4
Total	130	100.0	130	100.0	260	100.0
Mean (SD)	9.78 (3.531)		8.62 (4.098)		9.20 (3.862)	
Farm Size						
1.00 - 3.00	129	99.2	125	96.2	254	97.7
3.01 - 6.00	1	0.8	5	3.8	6	2.3
Total	130	100.0	130	100.0	260	100.0
Mean (SD)	1.75 (0.534)		1.68 (0.677)		1.72 (0.610)	
Primary Occupation						
Farming	123	94.6	94	72.3	217	83.5
Fishing	2	1.5	3	2.3	5	1.9
Hunting	0	0.0	1	0.8	1	0.4
Business	4	3.1	18	13.8	22	8.5
Civil Service	1	0.8	14	10.8	15	5.8
Total	130	100.0	130	100.0	260	100.0

Table 4.1 Distribution of Smallholder Cooperative and Non-Cooperative Rice Farmers According to Socio Economic Characteristics in the Study Area Cont'd

	Cooperators		Non-Cooperators		Pooled	
Secondary Occupation	**Frequency**	**Percentages**	**Frequency**	**Percentages**	**Frequency**	**Percentages**
Fishing	65	50.0	27	20.8	92	35.4
Hunting	42	32.3	15	11.5	57	21.9
Business	16	12.3	45	34.6	61	23.5
Farming	7	5.4	43	33.0	50	19.2
Total	130	100.0	130	100.0	260	100.0
Farming Experience (Years)						
1 – 10	55	42.3	43	33.1	98	37.7
11 – 20	56	43.1	50	38.5	106	40.8
21 – 30	16	12.3	36	27.7	52	20.0
31 – 40	2	1.5	1	0.8	3	1.2
> 40	1	0.8	0	0.0	1	0.4
Total	130	100.0	130	100.0	260	100.0
Mean (SD)	14.05 (6.671)		15.62 (6.707)		14.83 (6.722)	
Contact with Extension Agents						
Contact	98	75.4	42	32.3	140	53.8
No Contact	32	24.6	88	67.7	120	46.2
Total	130	100.0	130	100.0	260	100.0
Mode of Land Acquisition						
Inheritance	48	36.9	49	37.7	97	37.3
Purchase	25	19.2	12	9.2	37	14.2
Lease/Rent from Individual	49	37.7	60	46.2	109	41.9
Lease/Rent from Government	5	3.8	2	1.5	7	2.7
Gift	3	2.3	7	5.4	10	3.8
Total	130	100.0	130	100.0	260	100.0

Source: Field Survey, 2025

These figures indicate that rice production in the study area is largely dominated by men. This male predominance may be linked to the physically intensive nature of rice farming, as earlier highlighted in Section 4.1.1, particularly under traditional systems with limited mechanization. Tasks such as land preparation, transplanting, and harvesting demand substantial labour and physical strength, which men are more likely to provide. Furthermore, socio-cultural norms in rural communities often constrain women's access to land, credit, extension services, and other productive resources, thereby restricting their involvement in large-scale rice cultivation. According to Olorunsanya (2009), traditional practices prevent most women from owning farmland, leading them to engage more in processing activities rather than primary production. This outcome corroborates the findings of Egbodion *et al*. (2024), Egbodion and Ahmadu (2015), and Ben-Chendo *et al*. (2017), who similarly observed male dominance in cassava production across Nigeria.

4.1.3 Marital Status

Table 4.1 also presents the distribution of rice farmers according to their marital status. The results show that the majority (86.2%) of the farmers were married, while 7.7%, 4.6%, and 1.5% were divorced, widowed, and single, respectively. Among cooperators, 92.3% were married, while 80.0% of non-cooperators were married, indicating that both groups were dominated by married rice farmers.

The predominance of married individuals in rice farming may be attributed to several socio-economic factors. Married farmers are more likely to have access to family labour, which is a significant advantage in traditional farming systems where labour costs can be high. This observation is consistent with the findings of Bamiro and Aloro (2013), who revealed that married persons constitute the bulk of individuals engaged in rice production, primarily due to the high labour demands associated with the crop. Similarly, Offor *et al.* (2020) reported

that 95% of the rice producers in their study on the economic analysis of rice production in Abia State, Nigeria, were married, further emphasizing the strong link between marital status and participation in rice farming.

4.1.4 Household Size

Table 4.1 also presents rice farmers distribution by household size. The pooled results indicate that the majority (57.3%) had between 6 and 10 household members, 35.4% had between 1 and 5, while 7.3% had between 11 and 15 members. The average household size across all rice farmers was 7 persons. A similar trend was observed among both cooperators and non-cooperators, each with an average of 7 members, with 56.9% and 57.7% respectively falling within the 6–10 household size categories.

These findings suggest that most rice farmers in the study area belong to moderately large households. In rural farming communities, larger household sizes are often advantageous because they provide more family labour for agricultural activities, reducing dependence on hired labour. This is particularly beneficial in labour-intensive enterprises like rice production. Ibrahim *et al*. (2021) highlighted that large household sizes act as a buffer against labour shortages and play a critical role in sustaining farm operations. Similarly, Egbodion *et al.* (2024) reported an average household size of 7 among rice farmers in Edo State, reinforcing the present findings.

4.1.5 Educational Status

Table 4.1 further shows rice farmers' distribution by educational status. The pooled data indicate that 94.2% of rice farmers had received some form of formal education, with an overall average of 9 years of schooling. Among cooperators, 96.9% had formal education, averaging 10 years, while 91.5% of non-cooperators were educated, with a mean of 9 years. This demonstrates that the majority of respondents were literate.

The relatively high literacy level among farmers is encouraging, as education is central to the adoption of improved production techniques, access to extension services, accurate record-keeping, and effective farm management. Offor *et al.* (2020) observed that literate farmers are more inclined to adopt technological innovations, particularly those promoted under the Federal Government's rice transformation programme. Educated farmers are also better equipped to respond to market dynamics, apply modern practices, and make efficient use of available technologies to enhance productivity.

Babatunde *et al.* (2007) further emphasized that education serves as a form of social capital that positively influences households' capacity to make informed production and nutritional decisions. The slightly higher average years of schooling among cooperators may partly explain their greater participation in cooperative societies, which typically require basic literacy for involvement in decision-making processes, training programmes, and access to credit opportunities.

4.1.6 Farm Size (in Hectares)

Table 4.1 also presents rice farmers distribution by farm size. Results show that cooperators cultivated an average of 1.75 hectares, slightly higher than the 1.68 hectares recorded by non-cooperators. The pooled average farm size across all respondents was 1.72 hectares. This aligns with the scope of the study, which focuses on examining the effect of cooperative membership among smallholder farmers. The Food and Agriculture Organization (FAO, 2013) defines small-scale farmers as those cultivating less than 5 hectares of land. Thus, the relatively small average farm sizes observed confirms that rice production in the area is dominated by smallholder farmers. This result is consistent with Ibrahim *et al.* (2021), who reported an average farm size of 1.6 hectares among rice farmers in their study.

4.1.7 Occupation

Table 4.1 further presents rice farmers' distribution by primary and secondary occupations. Results indicate that the vast majority (94.6%) of cooperators identified farming as their main occupation, while 50.0% reported fishing as a secondary source of livelihood. Among non-cooperators, 72.3% engaged primarily in farming, with 34.6% participating in business as a secondary occupation. Occupation plays a critical role in determining household income levels, which in turn influence consumption patterns. Since consumption is typically regarded as a function of disposable income, households with more stable or diversified income sources are more likely to experience improved consumption outcomes and enhanced welfare.

These findings are consistent with Fakayode *et al.* (2010), who observed that most respondents in their study relied on farming as their primary occupation while engaging in trading or business activities secondarily in their analysis of rice consumption patterns in Nigeria. The involvement of rural farmers in supplementary occupations such as fishing or trading reflects a deliberate strategy to diversify income, mitigate agricultural risks, and strengthen household food and income security.

4.1.8 Farming Experience (in Years)

Table 4.1 also presents respondents' distribution by farming experience. The pooled data reveal that 40.8% had between 11 and 20 years of experience, 37.7% had 1–10 years, and 20.0% had 21–30 years, while only 1.6% reported more than 30 years of experience. On average, respondents had 15 years of farming experience, with cooperators averaging 14 years and non-cooperators 16 years.

These findings suggest that most rice farmers in the study area have considerable farming experience, which likely enhances their productivity and resilience. Farming experience is often linked with better decision-making, more effective risk management, and deeper

knowledge of the local production environment. Over time, experienced farmers are typically better positioned to cope with market changes, climate variability, and resource limitations. Keghter *et al*. (2023) noted that experienced farmers tend to utilize limited resources more efficiently, resulting in higher output. Generally, the longer farmers remain in agriculture, the more efficient and productive they become. This observation is consistent with Kadiri *et al.* (2014), who reported an average of 17 years of farming experience among rice farmers, and Danmaigoro *et al*. (2023), who found that 56.3% of rice farmers in Kebbi State had between 11 and 20 years of experience.

4.1.9 Contact with Extension Agents

The pooled results indicate that 53.8% of rice farmers had contact with extension agents, while 46.2% reported no access to such services. A closer look at the disaggregated data reveals a clear difference between cooperators and non-cooperators: 75.4% of cooperators had contact with extension agents, compared to only 32.3% of non-cooperators.

This sharp contrast highlights the important role cooperatives play in facilitating access to extension services. As organized groups, cooperatives provide an effective channel for the dissemination of agricultural technologies and information, enabling members to benefit from training, demonstrations, and advisory programmes delivered by government agencies or Non Governmental Organizations (NGOs). Regular interaction with extension personnel is vital for enhancing farmers' knowledge of modern practices, proper input use, pest and disease control, and improved crop varieties, all of which can improve efficiency and productivity. Orisakwe and Agomuo (2011) emphasized that frequent extension contact motivates farmers and increases their exposure to innovations.

By contrast, the limited access to extension services among non-cooperators reduces their opportunities to acquire technical knowledge and adopt new technologies, thereby

constraining their productivity. This observation is consistent with Keghter *et al.* (2023), who found that only 32% of farmers in their study had extension contact, with the majority (76.0%) being non-cooperative members further underscoring the positive link between cooperative membership and access to extension services.

4.1.10 Mode of Land Acquisition

Table 4.1 also presents rice farmers distribution by mode of land acquisition. The pooled results show that 41.9% of farmers acquired land for rice production through lease or rental agreements. A similar pattern was observed among the sub-groups, with 37.7% of cooperators and 46.2% of non-cooperators obtaining land through lease/rent arrangements.

This indicates that land leasing or renting is a widespread practice among rice farmers in the study area, likely reflecting limited land ownership rights or restricted access to inherited family land. Such dependence on rented land also suggests a degree of land tenure insecurity, which may discourage long-term investments in land development and hinder the adoption of sustainable farming practices. Keghter *et al*. (2023) emphasized that secure land tenure provides farmers with greater confidence to adopt improved production technologies. In addition, land ownership often serves as collateral for credit access, meaning insecure tenure can constrain farmers' ability to secure financing. These findings are consistent with Nwahia (2020), who reported that inheritance and rental were the predominant means of land acquisition among rice farmers in Ebonyi State.

4.2 Production Resource Characteristics of Smallholder Cooperative and Non-Cooperative Rice Farmers in the Study Area

The information on smallholder rice farmers' sources and access to production resources are presented in Table 4.2.

4.2.1 Source of Seed

Table 4.2 shows the distribution of rice farmers by their sources of rice seed. The results reveal that just over half of both cooperators (53.1%) and non-cooperators (53.8%) relied on old stock, with the pooled data indicating that 53.5% of farmers used seeds saved from previous harvests. This suggests that most rice farmers in the study area depended on recycled seeds rather than certified or improved varieties. Although this practice reduces input costs, it poses risks to productivity. Over successive seasons, saved seeds may suffer from genetic decline, lower germination capacity, and increased vulnerability to pests and diseases, ultimately reducing yield potential. This outcome supports the findings of Keghter *et al.* (2023), who reported that 74% of rice farmers in their study reused seeds from earlier cropping cycles.

4.2.2 Type of Rice Seed Cultivated

Table 4.2 shows that the majority of both cooperative (53.1%) and non-cooperative (66.2%) farmers cultivated upland rice in the study area. This indicates that upland rice is the predominant variety grown by farmers, irrespective of cooperative affiliation. The result suggests that upland rice plays a leading role in the rice production system of the region.

Table 4.2 Distribution of Smallholder Cooperative and Non-Cooperative Rice Farmers According to Production Resources in the Study Area

	Cooperators		Non-Cooperators		Pooled	
Source of Seed	**Frequency**	**Percentages**	**Frequency**	**Percentages**	**Frequency**	**Percentages**
ADP	9	6.9	0	0.0	9	3.5
Friends	15	11.5	18	13.8	33	12.7
Old Stock	69	53.1	70	53.8	139	53.5
Purchase	37	28.5	42	32.3	79	30.4
Total	130	100.0	130	100.0	260	100.0
Type of Rice						
Upland Rice	69	53.1	86	66.2	155	59.6
Lowland Rice	61	46.9	44	33.8	105	40.4
Total	130	100.0	130	100.0	260	100.0
Credit Access						
Access	71	54.6	55	42.3	126	48.5
No Access	59	45.4	75	56.7	134	51.5
Total	130	100.0	Total	130	260	100.0
Source of Credit						
Cooperative	35	26.9	0	0.0	35	13.5
Commercial Bank	4	3.1	1	0.8	5	1.9
Friends and Relatives	53	40.8	65	50.0	118	45.4
Agricultural Bank	0	0.0	5	3.8	5	1.9
Money Lender	38	29.2	59	45.4	97	37.3
Total	130	100.0	130	100.0	260	100.0

Source: Field Survey, 2025

Table 4.2 Distribution of Smallholder Cooperative and Non-Cooperative Rice Farmers According to Production Resources in the Study Area Cont'd

	Cooperators		Non-Cooperators		Pooled	
Source of Information	**Frequency**	**Percentages**	**Frequency**	**Percentages**	**Frequency**	**Percentages**
Extension Agents	39	30.0	0	0.0	39	15.0
Research Institutes	9	6.9	0	0.0	9	3.5
Friends and Neighbours	8	6.2	61	46.9	69	26.5
Radio/Television	1	0.8	33	25.4	34	13.1
Cooperative Society	73	56.2	0	0.0	73	28.1
Others	0	0.0	36	27.7	36	13.8
Total	130	100.0	130	100.0	260	100.0
Type of Labour Used* **						
Family	117	90.0	126	96.9	243	93.5
Communal	85	65.4	123	94.6	250	96.2
Hired	128	98.5	130	100.0	258	99.2

Source: Field Survey, 2025

4.2.3 Credit Access

Table 4.2 presents rice farmers distribution according to access to credit. The results show that more than half of the cooperators (54.6%) accessed credit during the last growing season, compared to only 42.3% of non-cooperators. The pooled data indicate that 48.5% of farmers overall had access to credit. This demonstrates that credit access among rice farmers in the study area is generally limited. This finding is in line with Odoemenem and Obinne (2010) that only few farmers have access to rural credit. Though, cooperative members are relatively more likely to secure loans. Cooperative membership likely improves access through mechanisms such as group guarantees, better record-keeping, and linkages with microfinance institutions or agricultural development programmes. Credit access is critical for smallholder farmers because it enables the purchase of quality inputs including seeds, fertilizers, and agrochemicals as well as investments in productivity-enhancing practices. Similarly, Ojo *et al*., (2019) emphasizes that credit plays an important role in increasing agricultural productivity at both the pre-planting and harvesting stages.

4.2.4 Source of Credit

The results also show that 40.8% of cooperators sourced credit from friends and relatives, 29.2% from moneylenders, and 26.9% from their cooperative societies. Among non-cooperators, 50.0% relied on friends and family, while 45.4% turned to moneylenders. This indicates that farmers in the study area depend largely on informal credit sources rather than formal financial institutions. Such reliance can be linked to barriers including lack of collateral, cumbersome loan procedures, high interest rates, and limited financial literacy, which collectively restrict smallholder farmers' access to institutional credit. Limited access to formal finance constrains investments in modern farming techniques and quality inputs, thereby reducing productivity. Danmaigoro *et al.* (2023) similarly found that most rice

producers relied on informal channels, emphasizing the need for inclusive credit schemes tailored to smallholder farmers.

4.2.5 Sources of Information

Table 4.2 further shows rice farmers' sources of agricultural information. Among cooperators, 56.2% relied on their cooperative societies, while 30.0% obtained information from extension agents. In contrast, 46.9% of non-cooperators depended on friends and neighbours, with 27.7% drawing from other informal sources. The findings from the results indicated that farmers depended on multiple information sources and a combination of sources highlighted above might be a better way of reaching them with information on improved rice production technologies. This is somewhat in line with the findings of Babaji *et al*. (2024) and Adetimehin *et al.* (2021) who reported that, most of the respondents in their study used more than one source of information on agricultural production. Their result revealed that rice farmers' cooperatives, radio and friends were the major sources of information among members of rice cooperatives in their study areas. Access to credible and up-to-date information is vital for decision-making in areas such as input use, pest and disease control, market dynamics, and adoption of improved agronomic practices.

4.2.6 Type of Labour Used

The findings also reveal that rice farmers relied on multiple labour sources. Specifically, 93.5% used family labour, 96.2% engaged communal labour, and 99.2% employed hired labour. This indicates that rice cultivation in the study area is highly labour-intensive, requiring contributions from various labour sources to meet the demands of land preparation, planting, weeding, harvesting, and other production activities. Similarly, Obayelu *et al* (2024) reported that 55% of the rice farmers in their study used combined labour in their rice production enterprise. This is contrary to the findings of Odetola and Adepoju (2022) that the majority of the farmers in Nigeria used hired labour.

4.3 Profile of Rice Farmer Cooperatives in the Study Area

The profile of the cooperative societies to which the rice farmer cooperators belonged is presented in Table 4.3. Results show that the majority (76.9%) of farmers belonged to rice production cooperatives, while 23.1% were members of multipurpose cooperatives. Additionally, 69.2% of respondents indicated membership in cooperatives established between 2015 and 2024. This reflects a growing emphasis on commodity-specific cooperatives, particularly rice-focused groups, which provide targeted support such as improved seeds, training, market linkages, and bulk input purchases. The relatively recent establishment of many cooperatives also suggests a rising interest in group-based approaches to agricultural development, possibly influenced by policy support, donor initiatives, and increased awareness of the benefits of collective action.

Furthermore, results show that the average cooperative had 29 members. About 38.5% of respondents belonged to cooperatives with 21–30 members, while 30.8% were part of cooperatives with 41–50 members. These relatively small-to-medium membership sizes may promote group cohesion, participatory decision-making, and effective service delivery. Smaller cooperative groups can also facilitate closer monitoring, stronger interpersonal ties, and more tailored support for members.

Table 4:3 Profile of Rice Farmer Cooperatives in the Study Area

Types of Cooperatives	Frequency	Percentages	Average
Rice Production	100	76.9	
Multipurpose cooperative	30	23.1	
Total	130	100.0	
Year of Formation			
1995 – 2004	10	7.7	
2005 – 2014	30	23.1	
2015 – 2024	90	69.2	
Total	130	100.0	
Membership Size			
1 – 10	20	15.4	
11 – 20	10	7.7	
21 – 30	50	38.5	29
31 – 40	10	7.7	
41 – 50	40	30.8	
Total	130	100.0	

Source: Field Survey, 2025

4.4 Services Rendered by Farmer Cooperative Societies in the Study Area

Table 4.4 presents the roles performed by cooperative societies and the extent of their implementation, as ranked by respondents using the Relative Importance Index (RII). The results show that cooperatives are particularly active in several key areas of rice production. The highest-ranked services include assistance with farm implements (RII = 0.908), facilitation of land access (RII = 0.898), and provision of farm inputs (RII = 0.878). These functions are critical for improving productivity and reducing production costs for smallholder farmers. This finding is consistent with Tumenta *et al.* (2021), who reported that cooperatives play a major role in input supply.

Other important services highlighted include the supply of market information (RII = 0.863), support for nursery preparation and transplanting (RII = 0.849), and the organization of communal manual weeding (RII = 0.825), all of which contribute significantly to enhancing farming operations. Additionally, cooperatives were noted to assist members in accessing credit and ensuring rice quality standards (both RII = 0.797), provide consumer information (RII = 0.786), and offer milling services (RII = 0.732). These findings underscore the multifunctional role of cooperatives—not only in input distribution but also in facilitating processing and market linkages. Similarly, Ingrid *et al.* (2018) reported that cooperatives actively contribute to produce marketing, while Nlerum and Ogu (2014) emphasized their role as platforms for collective action and community advocacy.

Some roles, however, were reported to be carried out only to a moderate extent. These include facilitating access to rice parboiling machines (RII = 0.620), controlling price of farm produce (RII = 0.597), provision of de-stoning machines (RII = 0.511), bagging and labelling services (RII = 0.474), and provision of insurance against disasters or crop failure (RII = 0.409).

Table 4.4 Distribution of Respondents According to Services Rendered by Cooperative Societies in the Study Area

Roles Performed	Very Great Extent	An Extent	Little Extent	Very Little Extent	No Extent	Cum. Score	RII	Extent Level
	Freq	Freq	Freq	Freq	Freq			
Assist in Preparation of nursery/transplanting	68	35	19	7	1	552	0.849	High
Facilitate members access to land	68	58	3	0	3	584	0.898	High
Communal manual weeding	46	60	21	0	3	536	0.825	High
Assist members with farm implement	81	43	3	1	2	590	0.908	High
Provide insurance for disaster/crop failure	2	8	26	53	40	266	0.409	Medium
Assist members with access to farm input	69	47	12	0	2	571	0.878	High
Facilitate credit procurement and use	43	54	24	6	3	518	0.797	High
Facilitate access to rice parboiling machines	17	37	35	24	17	403	0.620	Medium
Provision of milling services	28	52	30	18	2	476	0.732	High
Ensure standard/quality rice	51	47	16	11	5	518	0.797	High
Provision of de-stoning machine	16	27	18	21	48	332	0.511	Medium
Bagging/labelling of the produce	8	17	27	41	37	308	0.474	Medium
Provide information on consumers preference	40	54	26	7	3	511	0.786	High
Provision of transport	6	7	5	33	79	218	0.335	Low
Control price of farm produce	17	26	41	30	16	388	0.597	Medium
Supply information on marketing	66	48	10	3	3	561	0.863	High

Source: Field Survey, 2025

These results suggest that while cooperatives acknowledge the importance of post-harvest handling, branding, and risk management, they may lack the financial strength or institutional support required to deliver these services effectively across their membership base.

Finally, the provision of transport services was ranked low (RII = 0.335), indicating a significant gap in the support system offered by cooperatives. This finding is consistent with Olatinwo *et al*. (2023), who observed that transport services were among the least supported activities by cooperative societies in their study. Transport remains a major challenge for smallholder farmers, as it directly affects their ability to move produce to market efficiently and affordably. The low ranking may reflect the high capital requirements for owning or maintaining transport infrastructure or the lack of coordinated logistics among cooperative members.

4.5 Costs and Returns Analysis of Rice Production among Cooperators and Non-Cooperators in the Study Areas

Tables 4.5 and 4.6 compare the profitability levels of cooperative and non-cooperative rice farmers in the study area. Table 4.5 presents the costs and returns associated with rice production for both categories of farmers. The analysis revealed that labour cost constituted the highest component of total production costs for both groups. Specifically, for cooperators, the average cost of labour per kg of rice produced was ₦103.90, accounting for 52.82% of the total cost, while for non-cooperators; it was ₦118.74, representing 47.90%. This confirms that labour remains a critical input in rice production, particularly in systems that rely heavily on manual labour. This finding aligns with those of Danmaigoro *et al.* (2023) and Keghter *et al.* (2023), who similarly reported that labour constituted the largest share of production costs in their respective studies.

The second major cost component was seed, which made up 14.91% and 14.39% of total production costs for cooperators and non-cooperators, respectively. This is consistent with Abdullahi (2012), who noted that seed accounted for 17.64% of total production costs, second only to labour. Other important inputs included agrochemicals and fertilizers, which contributed 11.16% and 10.72% of total production costs for cooperators, and 11.78% and 10.05% for non-cooperators, respectively. As observed by Baiyegunhi and Fraser (2009), the use of seed-protection chemicals like herbicides and fungicide/rodenticide is essential for improving yield and preventing crop losses due to pest and disease infestations.

The total variable cost per kg of rice output was ₦176.27 for cooperators and ₦208.54 for non-cooperators. Fixed costs per kg were lower for cooperators (₦20.44 or 10.39% of total cost) compared to non-cooperators (₦39.37 or 15.88% of total cost). The fixed cost items included Land, Hoe, Cutlass, Knapsack sprayers, and bowls.

Table 4.5 Costs and Return Analysis of Rice Production in the Study Area (Per Kg Output)

	Cooperators			Non-Cooperators		
	Average Quantity (Units)	**Amount per Kg Output (₦)**	**Percentage TC**	**Average Quantity (Units)**	**Amount per Kg Output (₦)**	**Percentage TC**
Output (Kg)/ha	4789.34			3308.69		
Sales (TR)(₦)	3,333,103.08	695.94		2,064,687.69	624.02	
Variable Costs						
Seeds (Kg)	116.3	29.34	14.91%	113.4	35.66	14.39%
Fertilizers (Kg)	101.3	21.08	10.72%	84.2	24.93	10.05%
Herbicides (Litres)	26.1	19.93	10.13%	22.0	25.95	10.47%
Fungicides (Litres)	1.7	1.87	0.95%	1.5	3.26	1.31%
Rodenticide (Litres)	1.2	0.15	0.08%	0.0	0.00	0.00%
Labour		103.90	52.82%		118.74	47.90%
Total Variable Cost (TVC)		176.27	89.61%		208.54	84.12%
Fixed Cost (Depreciated)						
Land		11.66	5.93%		28.31	11.42%
Hoe		1.15	0.58%		0.86	0.35%
Cutlass		3.62	1.84%		3.98	1.61%
Knapsack Sprayers		2.64	1.34%		3.95	1.59%
Bowls		1.38	0.70%		2.28	0.92%
Total Fixed Cost (TFC)		20.44	10.39%		39.37	15.88%
Total Cost (TC = TFC + TVC)		196.71	100.00%		247.92	100.00%
Gross Margin (TR – TVC)		**519.68**			**415.48**	
Net Farm Income (TR – TC)		**499.23**			**376.10**	

Source: Author's computation from Field Survey, 2025

Table 4.6 T-Test Analysis of Difference in Profit Between Cooperative Members and Non-Cooperative Members in the Study Area

Group	Mean (₦)	Standard Error	Standard Deviation	t-Value	Probability Level	Decision
Cooperative Members	499.23	12.65	144.21			
Non-Cooperative Members	376.10	21.92	249.88	4.8672	<0.0001	Significant
Difference	123.13	25.30				

Source: Author's computation from Field Survey, 2025

In terms of revenue, cooperators recorded higher average revenue of ₦695.94 per kg, compared to ₦624.02 for non-cooperators. This difference could be attributed to the better marketing structures and collective bargaining power available to cooperative members. Cooperatives often help their members access more favourable market prices and reduce exploitation by middlemen.

Consequently, the gross margin and net farm income per kg were higher for cooperators (₦519.68 and ₦499.23, respectively) than for non-cooperators (₦415.48 and ₦376.10, respectively). These figures imply that rice farming is a profitable venture for both groups, but more so for cooperative members. This agrees with the findings of Nwahia (2020), Ben-Chendo *et al*. (2017), Abdullahi (2012), and Danmaigoro *et al.* (2023), who all reported the profitability of rice production in their respective studies.

Furthermore, Table 4.6 presents the t-test result for differences in profit between the two groups. The analysis shows an average profit difference of ₦123.13, with a t-value of 4.8672, indicating a statistically significant difference in profitability between cooperative and non-cooperative rice farmers. This suggests that cooperative membership has a positive impact on farmers' profitability, likely due to access to shared resources, collective bargaining, improved market information, and better access to credit and inputs.

This finding is consistent with Ezeokafor *et al.* (2019), who reported that cooperative membership significantly improved members' income levels. Similarly, Luka *et al* (2023) reported that there is a significant difference between the incomes of rice cooperative members when compared with non-cooperative rice farmers. The cooperative model not only enhances profitability but also contributes to improved welfare and reduced poverty among smallholder rice farmers in the study area.

4.6. Effect of Farmer Cooperatives Membership on Rice Production and Returns to Scale in the Study Area

4.6.1 Determinants of Rice Production in the Study Area

The results of the Ordinary Least Squares (OLS) regression analysis, which examined the effect of various independent variables including cooperative membership on rice yield, are presented in Table 4.7. To determine the most appropriate model for the analysis, three functional forms were tested: the Linear functional form, the Cobb-Douglas (Double-log) functional form, and the Semi-log functional form. The Double-Log function was found to be the most appropriate because the R^2value was higher than others, and had the highest number of significant variables, indicating a strong explanatory power and a better ability to capture the relationships between inputs and output. In contrast, the Linear model performed the poorest, yielding the lowest R^2 value and the fewest significant variables, which suggests that it was the least suitable for explaining variations in rice yield. The Semi-log model performed slightly better than the Linear model, with a marginally higher R^2 and more significant variables, but still fell short of the Double-log model in terms of overall robustness. This outcome aligns with the findings of Ben-Chendo *et al*. (2013), who also identified the Double-log functional form as the most appropriate in a similar agricultural productivity study, due to its better statistical performance. Consequently, the Double-log model was adopted for further interpretation of the regression results in this study.

The results revealed that the coefficient of determination (R^2) was 0.597, indicating that approximately 59.7% of the variation in rice yield among respondents was explained by the variations in the explanatory variables included in the model. This suggests a reasonably strong model fit. Additionally, the F-value was 24.290 and statistically significant at the 1% level of probability, confirming that the overall regression model was significant.

Table 4.7 Determinants of Rice Production Yield in the Study Area

	Linear Form			Semi-Log			Double Log		
	Coefficient	**Standard Error**	**T**	**Coefficient**	**Standard Error**	**T**	**Coefficient**	**Standard Error**	**T**
Age	-12.911	25.539	-0.506	-0.010	0.012	-0.809	-0.345*	0.215	-1.610
Sex	-125.233	254.623	-0.492	-0.022	0.124	-0.181	-0.032	0.173	-0.186
Marital Status	-50.025	234.424	-0.213	0.009	0.114	0.076	0.080	0.287	0.280
Household Size	1.600	58.091	0.028	-0.008	0.028	-0.293	-0.014	0.173	-0.082
Educational Status	222.537*	128.583	1.731	0.123*	0.063	1.962	0.328***	0.129	2.545
Farm Size	1589.524***	183.306	8.671	0.508***	0.090	5.675	1.112***	0.161	6.898
Farming Experience	37.387	26.456	1.413	0.025***	0.010	2.529	0.313*	0.164	1.902
Credit Access	66.691	224.505	0.297	0.017	0.110	0.158	0.009	0.154	0.057
Cooperative Membership	1920.271***	230.697	8.324	1.096***	0.113	9.725	1.556***	0.159	9.790
Constant	4707.661	1153.802	4.080	9.094	0.563	16.139	8.644	1.627	5.314
F Value	17.670			21.820			24.290		
R Squared	0.489			0.563			0.597		
Adjusted R Squared	0.467			0.540			0.575		
Prob > F	0.000			0.000			0.000		
No. of Observations				260					

*****Significant at 1%, **Significant at 5%, *Significant at 10%**

Source: Author's computation from Field Survey, 2025.

This implies that the set of explanatory variables collectively had a meaningful influence on the dependent variable rice yield. Furthermore, the result revealed that Cooperative Membership, Educational Status, and Farm Size were statistically significant at the 1% level. This suggests that these variables were the most influential determinants of rice yield in the study area. In addition, Age and Farming Experience were found to be significant at the 10% level, implying that they were also major contributors to yield variation of rice production in the study area.

The result showed that the coefficient of cooperative membership (1.556) was positive, implying that being a member of a cooperative society significantly increases the yield of rice farmers in the study area. This suggests that cooperative members benefit from enhanced access to quality inputs, credit facilities, extension services, and agricultural training, all of which contribute to improved productivity. Cooperatives also promote knowledge sharing, collective problem-solving, and improved market access, enabling members to more easily adopt modern farming practices and technologies. Consequently, the support systems and institutional backing provided by cooperatives play a crucial role in boosting farm output. This finding is consistent with the study by Anigbogu and Uzondu (2018), which also reported a positive impact of cooperative membership on the output of rice farmers.

Furthermore, the result also showed that the coefficient of educational status (0.328) was positive, indicating that higher levels of education among farmers are associated with increased rice yield. This finding suggests that educated farmers are more likely to adopt improved agricultural practices, make informed decisions, and effectively utilize extension services and modern technologies. Education enhances a farmer's ability to understand and implement information related to input application, pest and disease management, and market dynamics, ultimately leading to higher productivity. This result aligns with the findings of

Mbam and Edeh (2011), who reported a positive and significant relationship between farmers' educational status and rice yield in their study.

Similarly, the result showed that the coefficient of farm size (1.112) was positive, implying that an increase in the size of land cultivated leads to a higher rice yield. This indicates that farmers operating on larger plots of land are better positioned to optimize the use of agricultural inputs, benefit from economies of scale, and adopt more efficient farm management practices. Larger landholdings may also enable diversification of farm activities and greater investment in modern technologies or hired labour, thereby improving productivity. According to Akinbile (2007), farmers with larger farms tend to make significant investments and are more driven to maximize output in order to recover costs and generate profit. This finding aligns with the observations of Basoru and Fasakin (2012) and Ajah and Ajah (2014), who reported a positive relationship between farm size and rice output in their respective studies.

The result also shows that the coefficient of farming experience was positive, implying that as farmers gain more years of experience, their rice yield tends to increase. This finding suggests that experienced farmers are more knowledgeable about the nuances of rice cultivation, such as optimal planting periods, efficient input usage, and effective pest and disease control. Over time, these farmers refine their techniques, make more informed production decisions, and are better able to adapt to challenges such as climate variability or market fluctuations. Furthermore, experienced farmers are likely to have established stronger social networks within the agricultural community, which can facilitate access to labour, market information, and shared resources. This aligns with the findings of Nwaobiala (2016), who reported a positive and significant relationship (at the 10% level of probability) between farming experience and rice yield in his study.

By contrast, age had a negative coefficient (–0.345), indicating that older farmers recorded lower yields. This may be attributed to declining physical capacity, reduced willingness to adopt innovations, and health-related constraints that limit farm efficiency. Younger farmers, on the other hand, tend to be more energetic, open to modern technologies, and better positioned to sustain high productivity levels. Similar outcomes were reported by Cordelia and Edwin (2020) and Osanyinlusi and Adenegan (2016), both of whom found a negative association between age and rice yield.

Other variables such as sex, marital status, household size, and credit access were not statistically significant, suggesting that they did not exert a direct influence on rice yield in this context, even though they may shape farmers' broader livelihood strategies.

4.6.2 Return to Scale of Rice Production in the Study Area

Table 4.8 presents the estimated elasticities of production for the major inputs used by rice farmers in the study area. The return to scale (RTS) was obtained by summing the individual elasticities of production associated with seeds, labour, fertilizer, herbicide, and rodenticide/fungicide. The result revealed that the RTS of rice farmers in the study area was 1.035, indicating increasing return to scale. This implies that a proportional increase in all inputs will result in a more than proportional increase in output. Specifically, a 1% increase in the combined use of seeds, labour, fertilizer, herbicide, and rodenticide/fungicide would lead to approximately a 1.035% increase in rice output. This finding suggests that farmers can still expand production efficiently by scaling up their input use, as they are operating in a stage of production (stage 1) the irrational inefficient stage, where resources are not yet fully optimized.

However, it is important to note that the coefficients of fertilizer (–0.235) and rodenticide/fungicide (–0.061) were negative, implying that these inputs are over-utilized by rice farmers in the study area. The over-application of fertilizer may lead to soil nutrient imbalance or toxicity, while excessive rodenticide/fungicide use may harm the crop or disrupt farm ecology. Thus, although farmers generally have the potential to expand production, the addition of fertilizer and rodenticide/fungicide beyond recommended levels will reduce, rather than increase, output. In other words, while overall production can still be expanded by scaling up resource use, the misapplication of certain inputs may lead to inefficiencies and reduced output.

The overall result is consistent with Nnamani *et al.* (2022), Ajani *et al.* (2014), and Ogundari and Ojo (2007), who reported increasing return to scale for rice production in their respective studies.

Table 4.8 Elasticity of Production for Rice Farmers in the Study Area

Variables	Elasticity
Seeds	0.355
Fertilizer	-0.235
Herbicides	0.271
Rodenticide/fungicide	-0.061
Labour	0.705
Return to Scale	1.035

Source: Author's computation from Field Survey, 2025

4.7 Perceived Effect of Cooperatives on the production of Smallholder Rice Farmers in the Study Area

Table 4.9 presents the perceptions of cooperative members regarding the factors influencing the effect of cooperatives on the yield of smallholder rice farmers in the study area. The factors were assessed using a four-point type Likert scale, where values above 2.5 indicate agreement with the identified factors. The results show that respondents agreed with all the listed factors, indicating a general belief in the positive effect of cooperatives on rice yield.

Improved access to inputs ($\bar{x}$ = 3.59) was ranked as the most influential factor. This highlights the critical role of cooperatives in providing members with essential agricultural inputs such as improved seeds, fertilizers, and agrochemicals, which directly enhance productivity. The next most important factors were improved access to credit ($\bar{x}$ = 3.43) and improved extension contact ($\bar{x}$ = 3.36). These results emphasize the dual importance of financial services and technical guidance in boosting output, as cooperatives often serve as intermediaries for loan disbursement and as platforms for delivering extension services, training, and modern farming knowledge.

Other highly rated factors included leasing of land to farmers ($\bar{x}$ = 3.35) and the facilitation of government loans through cooperatives ($\bar{x}$ = 3.32), underscoring the role of cooperatives in enhancing access to productive resources and institutional support. Furthermore, the provision of opportunities for income diversification ($\bar{x}$ = 2.95) was also acknowledged, suggesting that cooperatives assist members in reducing livelihood risks and stabilizing household income by promoting alternative income-generating activities alongside rice production.

Overall, these findings demonstrate that cooperatives are widely perceived as vital institutions for strengthening smallholder rice farming through improved access to inputs, credit, extension services, land, and complementary livelihood opportunities. This finding is in line with Odebiyi (2000) that cooperative groups ensure that members derive benefits from the groups which they could not derive individually. Similarly, Idiong *et al.* (2007), reported that membership of cooperative affords the farmers opportunities of sharing information on modern rice production practices.

Table 4.9 Perceived Effect of Cooperatives on production of Smallholder Rice Farmers in the Study Area

Factors	Strongly Agree	Agree	Disagree	Strongly Disagree	Mean	S.D
	Freq (%)	Freq (%)	Freq (%)	Freq (%)		
Leasing out land to farmers	53 (40.8)	71 (54.6)	5 (3.8)	1 (0.8)	3.35*	0.595
Improved access to Credit	64 (49.3)	56 (43.1)	10 (7.7)	0 (0.0)	3.43*	0.670
Improved Extension Contact	56 (43.0)	65 (50.0)	7 (5.4)	2 (1.5)	3.36*	0.682
Giving loan to farmers by Government	69 (53.1)	43 (33.1)	8 (6.2)	10 (7.7)	3.32*	0.898
Provision of income diversification opportunities	38 (29.2)	51 (39.2)	37 (28.5)	4 (3.1)	2.95*	0.838
Improved access to input supply	80 (61.5)	47 (36.2)	3 (2.3)	0 (0.0)	3.59*	0.538

***Agree (Mean score ≥ 2.50)**
Source: Field Survey, 2025

4.8 Constraints Facing Farmer Cooperatives in Promoting Rice Production in the Study Area

The results for the constraints militating against Farmers' cooperatives in promoting rice production according to rice farmers in the study area are presented in Table 4.10. The constraints were assessed using a 4-point type Likert scale, where constraints with a mean score ($\bar{x}$) of 2.5 and above were regarded as serious, while those with a mean score below 2.5 were considered not serious. The findings indicate that 10 out of the 11 listed constraints were perceived as serious challenges to cooperative effectiveness.

The most severe constraint identified was unfavourable government policy ($\bar{x}$ = 3.67), followed by inadequate government support ($\bar{x}$ = 3.58) and poor funding ($\bar{x}$ = 3.51). These top-ranked issues reflect the critical importance of enabling policy environments and adequate financial resources in strengthening the capacity of farmer cooperatives. The result is consistent with Nwike and Ugwumba (2015), who reported insufficient funding as a major limitation to cooperative-driven rice promotion, and Nwalieji (2016), who noted that funding constraints are particularly problematic for start-up cooperatives.

Another serious challenge was poor market infrastructure ($\bar{x}$ = 3.45), which points to the lack of adequate market access and facilities for smooth cooperative operations. Additional constraints included dispersed settlement of farmers ($\bar{x}$ = 3.22), poor member commitment ($\bar{x}$ = 3.10), weak institutional linkages ($\bar{x}$ = 3.06), and the seasonality of rice production ($\bar{x}$ = 2.90). These factors underline organizational and logistical difficulties that can reduce cooperative efficiency.

Respondents also highlighted poor access to extension services ($\bar{x}$ = 2.89) and poor leadership in cooperative businesses ($\bar{x}$ = 2.71) as significant constraints. Leadership-related

challenges are in line with the observations of Opata *et al*. (2014), who noted that weak leadership and managerial inexperience often undermine cooperative performance.

Interestingly, the only factor rated below the seriousness threshold was the low literacy level of members ($\bar{x}$ = 2.49), suggesting that literacy is not considered a major barrier to cooperative effectiveness in the study area. This may indicate that cooperative activities and services are structured in ways that accommodate members regardless of their formal educational attainment.

Overall, the results highlight that while farmer cooperatives play an important role in rice production, their effectiveness is undermined by policy, financial, infrastructural, and organizational challenges that require targeted interventions.

4.10 Constraints Facing Farmer Cooperatives in Promoting Rice Production in the Study Area

Constraints	Serious Constraints	Moderate Constraints	Minor Constraints	Not a Constraints	Mean	S.D
	Freq (%)	Freq (%)	Freq (%)	Freq (%)		
Poor member commitment	48 (36.9)	51 (39.2)	27 (20.8)	4 (3.1)	3.10*	0.834
Inadequate government support	83 (63.8)	43 (33.1)	0 (0.0)	4 (3.1)	3.58*	0.657
Poor Funding	72 (55.4))	52 (40.0)	6 (4.6)	0 (0.0)	3.51*	0.587
Dispersed settlement of farmers	53 (40.8)	54 (41.5)	21 (16.2)	2 (1.5)	3.22*	0.767
Poor access to extension services	25 (19.2)	68 (52.3)	35 (26.9)	2 (1.5)	2.89*	0.718
Poor institutional linkages	35 (26.9)	68 (2.3)	27 (20.8)	0 (0.0)	3.06*	0.691
Poor market infrastructures	64 (49.2)	61 (46.9)	5 (3.8)	0 (0.0)	3.45*	0.572
Poor leadership of cooperative business	26 (20.0)	57 (43.8)	30 (23.1)	17 (13.1)	2.71*	0.935
Seasonality of rice production	30 (23.1)	61 (46.9)	35 (26.9)	4 (3.1)	2.90*	0.786
Low literacy level of members	20 (15.4)	47 (36.2)	40 (30.8)	23 (17.7)	2.49	0.958
Unfavourable Government Policy	90 (69.2)	37 (28.5)	1 (0.8)	2 (1.5)	3.67*	0.602

***Serious Constrains (Mean score 2.50 and above)**
Source: Field Survey, 2025

CHAPTER FIVE

5.0 SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

This study examined the effects of farmers' cooperatives on smallholder rice farmers in Edo State, Nigeria. The specific objectives were to: describe the socio-economic characteristics of rice farmers; profile existing rice farmers' cooperatives; examine their roles and services; compare the costs and returns of cooperative and non-cooperative farmers; determine the effect of cooperatives on yield; and identify the constraints hindering their effectiveness.

A multi-stage sampling technique was employed to select 260 respondents (130 cooperative and 130 non-cooperative rice farmers). Data were analyzed using descriptive statistics (mean, frequency distribution, and percentages), the Relative Importance Index (RII), Gross Margin (GM), Net Farm Income (NFI), Student's t-test, and regression analysis.

The results showed that the average age of farmers was 46 years, with a majority being male (71.9%) and married (86.2%). Most farmers were literate (94.2%), with an average household size of seven persons. Farming was the major occupation for 83.5% of respondents. Cooperative members had greater extension contact (75.4%) compared to non-members (32.3%). Land was mostly accessed through lease or rent (41.9%).

Seed sourcing revealed that 53.5% of farmers relied on old stock, while lowland rice (40.4%) was the most cultivated variety. Access to credit was higher among cooperative members (54.6%) than non-members (42.3%), with informal credit (mainly from friends and relatives) being the dominant source (45.4%).

In terms of cooperative services, respondents strongly agreed that cooperatives provided access to farm implements (RII = 0.908), facilitated land acquisition (RII = 0.898), supplied

inputs (RII = 0.878), and disseminated market information (RII = 0.863). Other roles included support in nursery preparation and transplanting, credit facilitation, quality assurance, milling, and consumer information.

The cost and returns analysis showed that rice farming was profitable for both groups, but more so for cooperators. Cooperative members' recorded higher gross margin (₦519.68) and profit per kg output (₦499.23) compared to non-members (₦415.48 and ₦376.10, respectively). A Student's t-test confirmed a significant difference in profit levels (t = 4.8672).

Regression results revealed that cooperative membership, educational status, and farm size were highly significant at 1%, while age and farming experience were significant at 10%. The return to scale (RTS) was 1.035, indicating increasing returns.

Major constraints faced by cooperatives included unfavourable government policy ($\bar{x}$ = 3.67), inadequate government support ($\bar{x}$ = 3.58), poor funding ($\bar{x}$ = 3.51), and weak market infrastructure ($\bar{x}$ = 3.45).

5.2 Conclusion

The findings establish that farmers' cooperatives significantly enhance rice production in Edo State by improving members' access to farm inputs, credit facilities, extension services, and market information. Cooperative members consistently outperformed non-members in yield and net farm income. Socio-economic factors such as education, farm size, and farming experience also played a significant role in determining productivity.

While cooperatives performed crucial functions such as facilitating land acquisition, providing farm services, and organizing collective farming. However, their effectiveness was constrained by unfavourable policies, inadequate government support, poor funding, and

infrastructural challenges. Strengthening cooperatives can therefore serve as a key pathway for improving smallholder rice productivity and rural livelihoods.

5.3 Recommendations

Based on the findings, the following are recommended.

1. Promote cooperative membership: Non-member farmers should be encouraged to voluntarily join or form cooperatives to access shared resources, economies of scale, and collective bargaining, thereby improving productivity and income.
2. Strengthen internal governance: Cooperatives should improve their organizational structures through transparency, accountability, and peer-monitoring. They should also engage actively with policymakers to advocate for favorable agricultural policies.
3. Enhance training and knowledge sharing: Since education and experience influence productivity, cooperatives should organize regular training workshops, farmer field schools, and peer-learning sessions to build members' capacity in modern rice farming, agribusiness, and cooperative management.
4. Strengthen linkages with support institutions: Cooperatives should forge stronger partnerships with extension agents, NGOs, and research institutions to improve members' access to innovations, technologies, and advisory services.
5. Improve access to finance: Cooperatives should explore multiple financing avenues, including partnerships with microfinance banks, agricultural investors, and development agencies. Internal savings mobilization should also be encouraged to build financial resilience.
6. Address infrastructural challenges: Investments in rural infrastructure, particularly market facilities, storage, and processing centers, should be prioritized through public-private partnerships to reduce post-harvest losses and improve cooperative efficiency.

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APPENDIX

RESEARCH QUESTIONAIRE

UNIVERSITY OF BENIN, BENIN CITY
FACULTY OF AGRICULTURE
DEPARTMENT OF AGRICULTURAL ECONOMICS AND RESOURCE MANAGEMENT

Dear Sir/Madam,

I am a post graduate student of the above-named department. I am carrying out research on The **Effects of Farmers Cooperatives on Smallholder Rice Farmers in Edo State, Nigeria.** I solicit 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 response will be used as such.

Sincerely
Oseseamhe Solomon

Researcher

Instruction: Please tick ( ) where appropriate or fill in the spaces provided.

SECTION A: Socioeconomic Characteristics of Respondents

1. Name of Village/Local Government: ……
2. Age: …….years
3. Sex: Male [ ]Female [ ]
4. Marital Status: (a) Single [ ] (b) Married [ ] (c) Divorced [ ] (d) Widow [ ]
5. Household Size: ……
6. Educational status: (a) none [ ] (b) Primary [ ] (c) Secondary [ ] (d) tertiary [ ]
7. Years of schooling ……
8. Farm size (Ha): ……..
9. Is farming your primary occupation yes [ ] No [ ]
10. If no, what is your primary occupation…….……..
11. What is your secondary occupation ……
12. Farming experience (years): ……
13. Do you have contact with extension service Yes [ ] No [ ]
14. Where do you source your seeds (a) ADP [ ] (b) friends [ ] (c) old stock [ ] (d) purchase [ ]
15. What type of rice do you cultivate ……
16. Do you have any access to any credit facilities Yes [ ] No [ ]
17. Where do you source the credit/fund? (a) cooperative [ ] (b) Commercial bank [ ] (c) friend & relatives [] (d) Agricultural bank [ ] (e) money lender [ ].
18. How did you acquire the land for your rice farm? (a) inheritance [ ] (b) purchase [ ] (c) lease / rent from individual [ ] (d) lease / rent from government [ ] (e) gift [ ]

19. What is your major source of information on rice? (a) Extension agents [ ] (b) Research institutes [ ] (c) Friends/neighbours [ ] (d) Radio/television [ ] (e) Cooperative society [ ] (f) Internet [ ] (g) Others……..

SECTION B: Profile of Farmers Cooperatives

20. Name of the organization ----------

21. Year of formation ----------

22. Types of farmers cooperative; Rice production [ ] Rice processing [ ] Rice marketing [ ] multipurpose cooperative [ ] Inputs supply [ ]

23. Membership size…….

SECTION C: Roles Performed By Farmers Cooperative Society.

24. Please indicate the extent to which your cooperative performs the following functions below.

Role performed Production	**Very great extent**	**An extent**	**Little extent**	**Very little extent**	**No extent**
Assist in preparation of nursery/ transplanting					
Facilitate members access to land					
Communal manual weeding					
Assist members with farm implement					
Provide insurance for disaster /crop failure					
Assist members with access to farm input.					
Facilitate credit procurement& use					
Facilitate access to rice parboiling machines					
Provision of milling services					
Ensure standard/quality rice					
Provision of de-stoning machine					
Bagging/labeling of the produce					
Provide information on consumers preference					
Provision of transport.					
Control market price.					
Supply information on marketing					

SECTION D: Costs and Returns in Rice Production of Respondents

25. How much is an hectare of land leased out for rice farming in this locality ₦……....
26. Kindly indicate the cost of inputs (resource) used in rice production

FIXED INPUTS	QUANTITY	YEAR OF PURCHASE	PRICE/UNIT	EXPECTED LIFE SPAN
Land (ha)				
Hoe				
Cutlass				
Knapsack Sprayers				
Bowls				
Others specify				

VARIABLE INPUT	QUANTITY (PRICE/UNIT)	COST (NAIRA)
Seeds (Kg)		
Fertilizer(Kg)		
Herbicides (Litres)		
Pesticides(Litres)		
Rodenticides (Litres)		

27. What types of labour did you use (a) Family labour [ ] (b) Communal labour [ ] (c)Hired labour [ ] (Tick more than an option if applicable)
28. if family labour, what quantity of family labour did you use and which operation?

OPERATION	NO. MAN-DAYS	MALE ADULT	FEMALE ADULT	NO. OF CHILDREN
Land clearing				
Planting				
Spraying				
Weeding				
Fertilizer Application				
Harvesting				
Sun drying				
Winnowing				
Any Other Operation				

29. if communal labour, what quantity of communal labour did you use and which operation?

OPERATION	NO. MAN-DAYS	MALE ADULT	FEMALE ADULT	NO. OF CHILDREN
Land clearing				
Planting				
Spraying				
Weeding				
Fertilizer application				
Harvesting				
Sun drying				
Winnowing				
Any Other Operation				

30. If hired labour, what is the charge for hired labour in a day on rice production?

Operation	Total no of man days	Male Adult	Female Adult	Number of Children	Hours worked per day	Price per day	Total cost
Land Clearing							
Planting							
Spraying							
Weeding							
Fertilizer Application							
Harvesting							
Sun-drying							
Winnowing							
Any other Operations							

31. Did you use any farm machinery for your farm operation (a) Yes[ ] (b) No[ ]

32. if yes, how did you get the machinery (a) purchased [ ] (b) hired [ ]

33. if purchase. Estimate the cost spent in the table below.

MACHINERIES	QUANTITY BOUGHT	YEAR BOUGHT	PRICE/UNIT	ESTIMATED LIFESPAN
PLANTER				
HARVESTER				
TRACTOR				
RIDGER				
THRESHER				

34. If hired, estimate the cost spent on each in the table below:

MACHINERIES	NO. OF HOURS/DAY	PRICE PER MONTH (N)	TOTAL COST PER YEAR (N)
PLANTER			
HARVESTER			
TRACTOR			
RIDGER			
THRESHER			

35. Please, provide the marketing information of your rice production last farming season.

Quantity Produced (Output)		**Quantity Sold**		**Total Income**
		Unit Price		
		Bags	**Tons**	
Bags	**Tons**	**₦**	**₦**	**₦**

SECTION E: Constraints of Rice Farmers Cooperative Society

36. Tick from the following the major constraints you encounter in rice farmers cooperative society. To what extent?

	Problems	**Serious Constraints**	**Moderate Constraints**	**Minor Constraints**	**Not a Constraint**
a	Poor member commitment.				
b	Inadequate government support				
c	Poor funding				
d	Dispersed settlement of farmers.				
e	Poor access to extension services.				
f	Poor institutional linkages				
g	Poor market infrastructures				
h	Poor leadership of cooperative business				
i	Seasonality of rice production				
j	Low literacy level of members				
k	Unfavourable Government policy				

SECTION F

37. The factors influencing farmers' cooperatives effect on the yield of smallholder rice farmers in the study area

Indicate factors influencing farmers' cooperatives effect on the yield of smallholder farmer

	Factors agree	Strongly Agree	Agree	Disagree	Strongly disagree
a	Leasing out land to farmers				
b	Improved access to credit.				
c	Improved extension contact.				
d	Giving loan to farmers by government				
e	Provision of income diversification opportunities.				
f	Improved access to input supply.				