



**PROFIT ANALYSIS OF RICE (*ORYZA SATIVA L.*) FARMING BUSINESS AMONG  
SMALLHOLDER FARMERS IN NORTHWEST AGRICULTURAL ZONE OF  
BENUE STATE, NIGERIA**

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**ABSTRACT**

The study analyzed the profitability of rice farming among smallholder farmers in the Northwest Agricultural Zone of Benue State, Nigeria. Multistage sampling was used to select 217 rice farmers across 8 rice farming communities in 2 LGAs. Data from 216 valid questionnaires were analyzed using descriptive statistics and farm budgeting techniques, including Gross Margin and Net Farm Income. Results of the study revealed that, rice farming was dominated by male (65.74%), married (71.30%) and youthful farmers with mean age of 39.1 years, 9.2 years of experience and 1.1 hectares of land. The result further indicated that, mean total revenue per hectare was ₦1,008,866.70 against total variable cost of ₦208,941.91 and fixed cost of ₦59,048.96, resulting in an average gross margin of ₦800,078.24 and average net farm income of ₦740808.89. The study concluded that smallholder rice farming is generally profitable, though returns vary widely due to differences in input use, labour costs, and market risks. Community-based mechanization, gender-responsive land reforms and cooperative land pooling were recommended to enhance efficiency and equity.

**Keywords:** Rice, Farming, Profitability, Income, Smallholder, Farmers.

**INTRODUCTION**

Agriculture is one of the most important sectors of the economy in most developing countries that contributes significantly to food security, employment generation, poverty reduction, rural development and economic growth (World Bank, 2024). In Sub-Saharan Africa, the agricultural sector provides livelihoods for more than 60 percent of the rural population and serves as a major source of income and employment for millions of households (FAO, 2023). In Nigeria, agriculture contributes substantially to the Gross Domestic Product (GDP) and has been a critical sector for achieving national food security and sustainable development goals (NBS, 2024; FMAFS, 2024). Among the various food crops cultivated in Nigeria, rice (*Oryza sativa L.*) has become one of the most important staple foods due to its increasing consumption across rural and urban households. Rice consumption in Nigeria has increased considerably over the last three decades owing to population growth, urbanization, changing dietary preferences, rising incomes and the relative ease of preparation of rice-based meals (Mottaleb *et al.*, 2021; Arouna *et al.*, 2021; IRRI, 2023). Consequently, rice has evolved from being a luxury commodity to a strategic food security crop and a major component of the Nigerian food system (FAO, 2023).

Nigeria is currently the largest producer of rice in Africa and one of the leading rice-producing countries globally (FAO, 2023). Despite this achievement, domestic rice production has consistently lagged behind national demand, resulting in recurrent supply deficits and substantial pressure on food markets (IRRI, 2023; World Bank, 2024). Although government interventions such as the Presidential Initiative on Rice, Agricultural Transformation Agenda, Anchor Borrowers' Programme and various import restriction policies have stimulated local production, the country continues to face challenges related to productivity, efficiency, and profitability in rice farming (CBN, 2022; FMAFS, 2024). Rice production in Nigeria is dominated by smallholder farmers who cultivate relatively small landholdings using varying levels of traditional and improved technologies (Ayanwale & Amusan, 2022; Mottaleb *et al.*, 2021). These farmers contribute significantly to national rice output and rural employment. However, their production activities are constrained by inadequate access to quality inputs, limited



mechanization, poor extension services, climate variability, weak market integration and insufficient access to agricultural finance (Arouna *et al.*, 2021). Furthermore, recent macroeconomic challenges, including inflation, exchange rate volatility and increases in fuel prices, have significantly raised production costs and reduced farmers' purchasing power (World Bank, 2024; NBS, 2024). Profitability is a fundamental indicator of the economic performance and sustainability of agricultural enterprises. It reflects the ability of a farming business to generate returns above the costs incurred in production and serves as a basis for farmers' production and investment decisions (Goni *et al.*, 2023). According to Alabi *et al.* (2023), profitability analysis provides essential information on the efficiency of resource utilization and the viability of agricultural enterprises. Similarly, Anyasie *et al.* (2023) argued that understanding the profitability of rice farming is critical for designing interventions aimed at increasing farmers' income and promoting agricultural commercialization.

Benue State occupies a unique position in Nigeria's agricultural economy because of its vast agricultural potential and substantial contribution to national food production. The state is endowed with fertile soils, favourable climatic conditions, abundant water resources, and a large farming population, earning it the designation of the "Food Basket of the Nation" (BNARDA, 2023; Benue State Government, 2023). Agriculture remains the dominant economic activity in the state, with crops such as yam, cassava, maize, soybean, rice, sorghum, and vegetables cultivated extensively across its agricultural zones (Odoemenem & Obinne, 2018; BNARDA, 2023). Rice production has become increasingly important in Benue State due to growing market demand and government efforts to promote domestic food production. The state's extensive lowland and upland ecologies provide favourable conditions for rice cultivation, making it one of the emerging rice-producing states in Nigeria (Ojo *et al.*, 2022). Nevertheless, rice farmers in the state face numerous challenges, including escalating input prices, inadequate mechanization, limited access to credit facilities, poor rural infrastructure, flooding, insecurity, and post-harvest losses (Adewumi *et al.*, 2024; Dzahan, 2025; International Crisis Group, 2023). These constraints have implications for production costs, productivity, and ultimately farm profitability. Rice has emerged as one of the most important staple foods in Nigeria, accounting for a significant proportion of the daily caloric intake of both rural and urban households. The increasing population, rapid urbanization, changing food preferences and rising incomes have led to a steady increase in rice demand over the years (FAO, 2023). Despite various policy interventions aimed at increasing domestic rice production, Nigeria continues to experience a persistent gap between rice production and consumption, resulting in periodic shortages, high market prices and continued dependence on imports and informal cross-border trade (IRRI, 2023; World Bank, 2024).

To address this challenge, successive governments have implemented several programmes and policies, including the Presidential Initiative on Rice, the Agricultural Transformation Agenda, the Anchor Borrowers' Programme and various input subsidy schemes to stimulate local rice production and improve farmers' incomes (CBN, 2022; FMAFS, 2024). Although these initiatives have contributed to increased rice production, evidence suggests that productivity and profitability among smallholder rice farmers remain below their potential due to numerous production and marketing constraints (Ayanwale & Amusan, 2022). Smallholder farmers dominate rice production in Nigeria, accounting for over 80 percent of the country's rice output (FAO, 2023). However, these farmers operate under conditions characterized by limited access to credit, inadequate mechanization, poor rural infrastructure, low adoption of improved technologies, high post-harvest losses, and unstable output markets (Mottaleb *et al.*, 2021). In recent years, rising inflation, exchange rate depreciation and increasing prices of agricultural inputs such as fertilizers, agrochemicals, seeds, fuel and labour have further increased the cost of rice production, thereby threatening the profitability and sustainability of rice farming enterprises (World Bank, 2024; NBS, 2024). Benue State occupies a strategic position in Nigeria's agricultural landscape and is widely recognized as the "Food Basket of the Nation" because of its substantial contribution to national food production. The state possesses abundant arable land,



favourable climatic conditions and extensive water resources that support rice cultivation (BNARDA, 2023). Consequently, rice farming has become an important livelihood activity among rural households in the state. However, rice farmers in Benue State continue to face several challenges, including increasing input costs, inadequate access to modern production technologies, poor storage facilities, limited access to agricultural finance, flooding, insecurity and weak market linkages (Adewumi *et al.*, 2024; Dzahan, 2025; Ojo *et al.*, 2022).

Furthermore, the recurring farmer-herder conflicts, banditry and flooding incidents experienced in many parts of Benue State have negatively affected agricultural production, farm investments and profitability (International Crisis Group, 2023; Adewumi *et al.*, 2024). These challenges have increased production risks and reduced farmers' ability to maximize returns from rice farming enterprises. At the same time, rising production costs have raised concerns regarding whether rice farming remains sufficiently profitable to sustain household livelihoods and encourage continued investment in the enterprise (World Bank, 2024; FAO, 2023). Several empirical studies conducted in different parts of Nigeria have reported that rice farming is profitable under varying production conditions (Goni *et al.*, 2023; Anyasie *et al.*, 2023; Usman *et al.*, 2024; Alabi *et al.*, 2023). Nevertheless, profitability levels vary considerably across locations due to differences in resource endowments, production technologies, management practices, institutional support, market access and prevailing economic conditions (Mottaleb *et al.*, 2021; Arouna *et al.*, 2021). Most existing studies have focused on productivity, technical efficiency, value-chain performance, climate change adaptation and food security issues, while relatively few have comprehensively examined the current profitability status of rice farming businesses among smallholder farmers in Benue State under prevailing economic realities. More importantly, the recent increases in fertilizer prices, labour costs, transportation expenses, and agrochemical costs following macroeconomic reforms and inflationary pressures have altered the cost structure of agricultural production in Nigeria (World Bank, 2024; NBS, 2024). Consequently, findings from earlier profitability studies may no longer accurately reflect the present economic realities facing rice farmers in Benue State. There is therefore a need for an updated and location-specific assessment of the profitability of rice farming businesses in the state.

The lack of current empirical information on the costs and returns associated with rice production among smallholder farmers in Benue State creates a knowledge gap that may hinder effective policy formulation, investment planning, and agricultural development interventions. Without reliable information on profitability indicators such as gross margin and net farm income, policymakers and development agencies may be unable to design targeted interventions that address the economic challenges facing rice farmers. Therefore, this study seeks to analyze the profitability of rice farming businesses among smallholder rice farmers in Benue State, Nigeria, with a view to providing empirical evidence that will guide policy decisions aimed at improving farm income, enhancing resource-use efficiency, promoting agricultural commercialization and strengthening food security. Specifically, this study described the socio-economic characteristics of smallholder rice farmers and estimated the profitability of rice farming business among smallholder rice farmers in the study area.

## **METHODOLOGY**

### **Study Area**

The study was conducted in the Northwest Agricultural Zone of Benue State, Nigeria. Benue State is located in the North-Central geopolitical zone of Nigeria and lies between latitudes 6°25'N and 8°08'N and longitudes 7°47'E and 10°00'E. The state shares boundaries with Nasarawa State to the north, Taraba State to the east, Cross River State to the south, Enugu State to the southwest, Kogi State to the west, and the Republic of Cameroon to the southeast. The state derives its name from the River Benue, which traverses the state and serves as a major source of water for agricultural and domestic activities (Benue State Government, 2023). The Northwest Agricultural Zone is one of the three



agricultural zones established by the Benue State Agricultural and Rural Development Authority (BNARDA) to facilitate agricultural administration, extension service delivery and rural development programmes across the state (BNARDA, 2021). The zone comprises seven Local Government Areas (LGAs), namely Makurdi, Guma, Gwer West, Tarka, Buruku, Gboko, and Gwer East (BNARDA, 2021).

The area experiences a tropical wet-and-dry climate characterized by distinct rainy and dry seasons. The rainy season usually extends from April to October, while the dry season spans November to March. Annual rainfall ranges from about 1,200 mm to 1,800 mm, creating favourable conditions for agricultural production. Mean annual temperatures range between 25°C and 32°C, while relative humidity is generally high during the rainy season and moderate during the dry season (NiMeT, 2023; Adebayo & Oruche, 2020). These climatic conditions support the cultivation of a wide range of crops and livestock enterprises within the zone. The vegetation of the Northwest Agricultural Zone falls predominantly within the Southern Guinea Savannah ecological zone of Nigeria. The vegetation is characterized by tall grasses interspersed with scattered trees and shrubs while the soils are largely loamy and alluvial in nature, making them suitable for diverse agricultural activities (Ityavyar & Thomas, 2019). The presence of River Benue and its tributaries further enhances agricultural productivity through the provision of water resources for irrigation, fishing and livestock production (Benue State Government, 2023). Agriculture is the principal occupation of the inhabitants of the zone. The area is widely recognized for the production of staple crops such as yam, cassava, maize, rice, soybean, sorghum, millet and groundnut, as well as vegetables and fruits (FAO, 2022; Odoemenem & Obinne, 2016). Livestock production, including cattle, sheep, goats, pigs and poultry, also constitutes an important component of the rural economy. The substantial agricultural output of the zone contributes significantly to Benue State's status as the "Food Basket of the Nation" (FMAFS, 2022).

The population of the zone is predominantly rural, with farming serving as the primary source of livelihood. The inhabitants are mainly of Tiv ethnic origin, although other ethnic groups such as Idoma, Igede, Hausa and Fulani also reside in the area (NPC, 2022). The availability of fertile agricultural land, favourable climatic conditions, extensive farming experience and a high concentration of farming households make the Northwest Agricultural Zone particularly suitable for agricultural research (Ogunleye *et al.*, 2021). The choice of the Northwest Agricultural Zone for this study was informed by its prominence in agricultural production, high concentration of farming households and strategic contribution to food security, employment generation and economic development in Benue State and Nigeria at large (FAO, 2022; FMAFS, 2022). These characteristics provide an appropriate setting for investigating issues relating to agricultural production, resource use efficiency, profitability and farmers' livelihood outcomes.

### **Sampling Procedure and Data Collection**

A multi-stage sampling technique was employed to select 217 rice farmers in the Northwest Agricultural Zone of Benue State as delineated by the Benue State Agricultural and Rural Development Authority [BNARDA]. In the first stage, the North-West Agricultural Zone was purposively selected due to its prominence in rice production and high concentration of smallholder rice farmers. This ensured the study was conducted in an area directly relevant to the research objectives.

In the second stage, two Local Government Areas were randomly selected from the seven LGAs in the zone to minimize selection bias and give each LGA an equal chance of inclusion. The selected LGAs were Buruku LGA and Guma LGA.

In the third stage, four rice farming communities were purposively selected from each of the two sampled LGAs resulting in a total of eight communities. Selection was based on high concentration of active rice farmers, established history of rice production and accessibility for data collection. The communities selected in Buruku LGA were Binev with 84 registered rice farmers, Etilo with 222, Mbaapen with 229 and Mbaya with 99. In Guma LGA, the selected communities were Mbawa with



207 registered rice farmers, Nyiev with 201, Nzorov with 215 and Uvir with 192. The total population of registered rice farmers across the eight communities was 1,449.

In the final stage, a sampling proportion of 15% was uniformly applied to the registered farmer population in each community which yielded a sample size of 217 rice farmers. Respondents were then selected using simple random sampling from the list of registered rice farmers in each community to ensure equal and independent chances of selection.

Structured questionnaires were used as the primary instrument for data collection. Of the 217 questionnaires distributed, 216 were completely and comprehensively filled, returned and used for analysis. Enumerators from BNARDA assisted in the data collection process to ensure coverage and quality control. Prior to the main survey, enumerators were trained for 3 days on the objectives of the study, questionnaire administration and ethical considerations to enhance data reliability. Field data collection from the 216 respondents was carried out over a period of 14 days across the eight communities, with an average of 15–16 farmers interviewed per day by the team of enumerators.

Content validity of the instrument was established through review by experts in Agricultural Economics and extension professionals to ensure the questionnaire adequately covered the study objectives. Reliability of the instrument was determined using the test-retest method. The reliability process involved three stages: pretesting of the draft questionnaire with 20 non-sample rice farmers outside the study area, pilot testing after modifications and test-retest reliability conducted with a two-week interval between administrations. The consistency of responses across the two administrations confirmed the instrument's reliability for the main study.

#### **Analytical Technique**

The analytical techniques used for this study were descriptive statistics and farm budgeting analysis. These were employed to address the specific objectives of the study. Descriptive statistics such as frequency distribution, percentages and means were used to describe the socioeconomic characteristics of the respondents. Farm budgeting techniques, specifically gross margin analysis and net farm income analysis were used to estimate the profitability of rice farming among smallholder farmers.

The Gross Margin (GM) was specified as:

$$GM = TR - TVC$$

Net Farm Income (NFI) was specified as:

$$NFI = GM - TFC$$

Where:

GM = Gross Margin (₦)

NFI = Net Farm Income (₦)

TR = Total Revenue (₦)

TVC = Total Variable Cost (₦)

TFC = Total Fixed Cost (₦)

Land Cost (₦)

Seed Cost (₦)

Inorganic Fertilizer Cost (₦)

Organic Fertilizer Cost (₦)

Pre-emergence Herbicide Cost (₦)

Post-emergence Herbicide Cost (₦)

Pesticide Cost ₦.

Packaging Material Cost (₦)

Cost of Hired Labour (₦)

Cost of Family Labour (₦)



## RESULTS AND DISCUSSION

### Socio-economic Characteristics

Sex is the attribute of either being male or female in a population. Sex is important in understanding how male and female differently experience, perceive and respond to changes in farming innovations. Table 1 revealed that, 65.74 % of the respondents were male and 34.26 % were female. This implies that rice production in the study area is dominated by male. This could be as a result of land ownership and access, physical nature and requirement of rice production operations and socio-cultural norms of the farming communities. This result is in line with the findings of Agyo and Ornan (2021) and Banseka *et al.* (2023) that rice farming is dominated by male in Taraba State. The result is also in line with the result of Adiyu (2020) who found that rice farming is dominated by male in Kaduna State.

Age is the number of years, months or days that have passed since the birth of a respondent. Age in this study, is expressed as the chronological number representing the duration of time measured in years a respondent has lived. Age has a significant effect on agricultural production as it can affect decision of farmers to implement new practices, technologies or innovations. The result as presented in Table 1 showed that, 38.89 % of the respondents fell within the age range of 31-40 years, 30.09 % were between age range of 41 and 50 years, 18.98 % were at most 30 years of age, 8.33 % were within the age of 50-60 years and about 3.70 % of the respondents were at least 61 years of age. Table 1 also showed that, average age of the respondents was 39.1 years. This indicates that, the respondents are in the active and productive age and this might imply that the respondents have the capability and potential of effectively implementing agricultural practices that reduce the negative impact of climate change on rice production efficiency. This result is similar to the findings of Obianefo *et al.* (2020) and Orifah *et al.* (2021) that mean ages of rice farmers in Anambra State and Jigawa State are respectively 42 years and 40.79 years. The result varies slightly with findings of Ojo *et al.* (2020), Adzawla and Alhassan (2021) and Datta and Behera (2022) that the average ages of rice farmers in Southern Nigeria, Northern Ghana and Eastern Himalayan foothills of West Bengal, India are 47 years, 47.15 years and 48 years respectively.

Marital status describes the position of respondents in institution of marriage or partnership. It is the state of being single, married, widowed or divorced. Findings from this study as presented in Table 1 revealed that, majority (71.30 %) of the respondents were married, 22.22 % were single, 4.63 % were widowed and about 1.85 % of the respondents were divorced. This means that rice farming in the study area is dominated by married individuals. There is hence the tendency of availability of family labour that can enhance capacity to implement labour intensive climate change adaptation strategies. This result corroborates the results of Banseka *et al.* (2023), Wabi *et al.* (2022) and Adekunmi (2022) who observed respectively in various studies and study locations that majority (78.8 %, 96.5 % and 78.5 %) of rice farmers in Taraba State, Benin and Ondo State were married.

Household size is the number of individuals including household head, spouses, children, other relatives and non-relatives living together, sharing resources, meals and living space. Table 1 also showed that, 50.46 % of the respondents had household size of at most 5 persons, 43.98 % had household size of 6-10 individuals, 4.17 % had household size of between 11 and 15 individuals and about 1.39 % of the respondents had household size of at least 16 individuals with a mean household size of 6 individuals. This means that rice farmers in the study area had relatively large household size implying that labour could be sourced from the household for farming activities and this has potentials of increasing productivity and implementation of labour-intensive agricultural practices that reduce negative impact of climate change. This result aligns with result of Adekunmi (2022) which showed that average household size of rice farmers in Ondo State was 6.5 individuals. The result is similar with the findings of Adiyu (2020) that the average household size of rice farmers in Soba Local Government



Area of Kaduna State was 8. The result disagrees with Offor *et al.* (2020) who found an average household size of 4.1 individuals among rice farmers in Abia State.

Farming experience is the time period that the respondents have been engaged in farming as an occupation. Farming experience might significantly account for the ability of the respondents to effectively implement farming practices and efficiently utilise production resources. Result of analysis presented in Table 1 revealed that, 44.91 % of the respondents had farming experience of 6-10 years, 26.39 % of the respondents had at most 5 years of farming experience, 18.98 % of the respondents had 11-15 years of farming experience, 6.02 % of the respondents had farming experience of 16-20 years and 3.70 % of the respondents had at least 21 years of farming experience. The result shows that the respondents had an average of 9.2 years of farming experience. This indicates that the respondents were experienced in rice farming business, hence there is tendency of proper application of farming operations among the respondents. The result aligns with Alabi and Anekwe (2022) who observed that rice farmers in Federal Capital Territory, Abuja had an average of 7 years of farming experience. The result disagrees with the findings of Adekunmi (2022) and Agyo and Ornan (2021) that the mean farming experience of rice farmers in Ondo State and Taraba State of Nigeria were 19.7 years and 16 years respectively.

Level of education is the attainment of formal education which is basically the highest certificate completed such as primary, secondary or tertiary education by the respondents. Result of the study as presented in Table 1 showed that 43.98 % of the respondents had tertiary education, 40.74 % had secondary education, 10.65 % had primary education and 4.63 % of the respondents had no formal education. The result also showed that the respondents spent an average of 12.3 years in formal education. This indicates that the respondents had at least secondary education or its equivalent and can read, write and interpret climate information, science-based adaptation strategies, weather forecast and agronomic research findings. The findings of the study agree with the result of Agyo and Ornan (2021) that rice farmers in Taraba State had an average of 10.27 years of formal education and could write, read and understand printed media. The result disagrees with the findings of Danmaigoro *et al.* (2023) that most (50.0 %) of the rice farmers in Kebbi State had no formal education and cannot write, read and interpret written media.

Land holding is the total area of land measured in hectares owned, rented or controlled by the respondents or farming households for agricultural purposes. Land holding is expected to enable farmers to implement crop diversification and other agricultural practices that reduce climate risks. Table 1 revealed that, 86.57 % of the respondents had land holding of 2 hectares or less and 13.43 % of the respondents had land holding 3 hectares and more. The mean land holding in the study area was 1.1 hectares. As a result, the farmers could invest more in climate change adaptation strategies such as soil management and irrigation to ensure greater returns on investment. This result is in disagrees with the observation of World Bank (2021) that 70 % of farmers in Northern Nigeria had land holding of at least 3 hectares.

Annual income is the total amount of money earned by the respondents or household within a year. It indicates the financial well-being of the respondents and might come from salary, wages, investment and/or farming. Result of the study as presented in Table 1 indicated that, 31.82 % of the respondents earned annual income of at most ₦500,000, 30.56 % of the respondents earned annual income of ₦500,001 - ₦1,000,000, 23.15 % of the respondents earned annual income of ₦1,000,001- ₦1,500,000 and 7.87 % of the respondents earned annual income of ₦2,000,000 or more and 7.41 % of the respondents earned annual income between ₦1,500,001 and ₦2000000. The average annual income of the respondents was ₦604083.3. This result indicates a wide variation in annual income within the study area. This result contradicts the findings of Ojo *et al.* (2022) that the average annual income of rice farmers in Ogun was about ₦520000. The result is similar to the estimates of Counseal Team (2024) that rice farmers in Nigeria can make between ₦3000000 and 4800000.



**Table 1:** Distribution of the Respondents according to Socio-economic Characteristics

<b>Variables</b>	<b>Frequency</b>	<b>Percentage</b>	<b>Mean</b>
<b>Sex</b>			
Female	74	34.26	
Male	142	65.74	
<b>Age</b>			
≤30	41	18.98	<b>39.1</b>
31-40	84	38.89	
41-50	65	30.09	
51-60	18	8.33	
≥61	8	3.70	
<b>Marital status</b>			
Single	48	22.22	
Married	154	71.30	
Widowed	10	4.63	
Divorced	4	1.85	
<b>Household size</b>			
≤5	109	50.46	<b>6.0</b>
6-10	95	43.98	
11-15	9	4.17	
≥16	3	1.39	
<b>Level of education</b>			
No formal education	10	4.63	<b>12.3</b>
Primary	23	10.65	
Secondary	88	40.74	
Tertiary	95	43.98	
<b>Farming experience</b>			
≤5	57	26.39	<b>9.2</b>
6-10	97	44.91	
11-15	41	18.98	
16-20	13	6.02	
≥21	8	3.70	
<b>Land holding</b>			
≤2	187	86.57	<b>1.1</b>
≥3	29	13.43	
<b>Annual income</b>			
≤500000	67	31.02	<b>604083.3</b>
500001-1000000	66	30.56	
1000001-1500000	50	23.15	
1500001-2000000	16	7.41	
≥2000001	17	7.87	

**Source:** Field Survey, 2025

### **Profitability of Rice Farming Business**

The result as presented in Table 2 indicated that, smallholder rice production in the study area involved varying levels of input utilization and production costs, which subsequently influenced profitability outcomes. The cost of seed per hectare ranged from ₦76,000 to ₦160,000, with a mean value of ₦45,869.17. This suggests a considerable variation in seed procurement practices among farmers, likely arising from differences in seed varieties used, seed sources, and farm sizes. The relatively moderate average seed cost implies that most farmers relied on affordable seed sources while a few incurred substantially higher expenditures. Expenditure on inorganic fertilizer ranged from ₦0 to



₦210,000 per hectare, with an average cost of ₦36,249.40. The wide disparity in inorganic fertilizer use indicates differences in farmers' financial capacity, access to fertilizer and soil fertility management practices. In contrast, the use of organic fertilizer was minimal, as reflected by the average cost of only ₦101.70 per hectare despite a maximum value of ₦12,500. This finding suggests that rice farmers in the area depend predominantly on inorganic fertilizers for nutrient supplementation.

The cost of pre-emergence herbicides varied from ₦6,200 to ₦78,000 per hectare, with an average expenditure of ₦13,258.96 while post-emergence herbicide costs ranged from ₦0 to ₦92,750, averaging ₦14,767.12. These figures demonstrate the importance of chemical weed control in rice cultivation, given the adverse effects of weed infestation on crop performance. Similarly, expenditure on pest control ranged from ₦0 to ₦14,500, with a mean cost of ₦1,753.00, indicating that pest management constituted a relatively small proportion of production costs for most farmers.

The cost of packaging materials, mainly sacks used for storage and transportation, ranged between ₦2,100 and ₦39,000 per hectare, with an average cost of ₦7,497.72. Labour constituted one of the major cost components in rice production. Hired labour costs varied substantially from ₦0 to ₦360,000 per hectare, with a mean expenditure of ₦61,726.55, while family labour costs ranged from ₦0 to ₦159,000 per hectare and averaged ₦27,718.28. The higher average cost associated with hired labour underscores the labour-intensive nature of rice farming operations, particularly during land preparation, planting, weeding and harvesting activities.

The total variable cost per hectare ranged from ₦32,500 to ₦732,600, with a mean value of ₦208,941.91. This wide variation reflects differences in scale of operation, input application rates, and production practices among farmers. Despite these costs, total revenue per hectare ranged from ₦68,000 to ₦3,200,000, with an average of ₦1,008,866.70. The large revenue differential indicates substantial variation in yield levels, market prices and production efficiency across farms.

The gross margin per hectare ranged from a loss of ₦9,440 to a maximum gain of ₦2,940,000, with an average gross margin of ₦800,078.24. The positive mean gross margin suggests that rice production generated sufficient returns to cover variable production costs and provided substantial returns to management and fixed factors of production. Although some farmers recorded negative gross margins, indicating operational losses, the overall profitability position remained favourable for the majority of farmers. The result of this study is consistent with the findings of Usman *et al.* (2024), who reported that rice production in Nasarawa State was profitable and yielded a positive gross margin, indicating that rice farming remains a viable livelihood enterprise for smallholder farmers in Nigeria.

Regarding fixed costs, depreciation on farm assets ranged from ₦1,200 to ₦1,112,963, with an average value of ₦34,896.65. Rent on land varied between ₦3,000 and ₦80,000 per hectare, reflecting differences in land tenure arrangements and land quality. Consequently, total fixed cost ranged from ₦6,109 to ₦1,163,964, with a mean value of ₦59,048.96. The net farm income per hectare, obtained after deducting both variable and fixed costs from total revenue, remained positive on average, indicating that rice farming was a profitable business among smallholder farmers in the study area. The substantial difference between average total revenue (₦1,008,866.70) and average total cost (₦267,990.87) demonstrates that farmers were able to generate considerable returns from their investment in rice production. This finding implies that rice cultivation serves as a viable source of income and livelihood for smallholder farmers in the study area and contributes significantly to household welfare and food security. Overall, the profitability indicators reveal that smallholder rice farming is economically rewarding despite variations in production costs and revenues among farmers. The high average gross margin and positive net farm income suggest efficient resource utilization and favorable market conditions, thereby supporting the continued promotion of rice production as a means of enhancing rural incomes and agricultural development. This study aligns with the findings of Bwala and John (2018), who reported that paddy rice production in Niger State yielded positive net returns and profitability ratios, demonstrating that rice farming contributes significantly to household income



and poverty reduction among rural farmers. This finding supports the results of Anyasie *et al.* (2023), who found that rice production enterprises in Anambra State generated positive net returns and remained economically viable despite fluctuations in input prices.

**Table 2:** Cost and Return of Rice Farming Business among Smallholder Farmers

Variable	Mean	Standard Deviation	Minimum	Maximum
Total depreciation	34896.645	90643.756	1200	1112963
Land cost	24151.318	14367.438	3000	80000
Seed cost	45869.169	26950.136	30000	160000
Inorganic fertilizer cost	36249.403	35552.995	0	210000
Organic fertilizer cost	101.698	952.284	0	12500
Pre-emergence herbicide cost	13258.96	10849.254	6200	78000
Post-emergence herbicide cost	14767.121	13748.152	0	92750
Pesticide cost	1753.002	2558.147	0	14500
Packaging material cost	7497.719	6394.231	2100	39000
Cost of hired labour	61726.553	51938.442	0	360000
Cost of family labour	27718.283	27838.443	0	159000
Total variable cost	208941.91	125296.47	32500	732600
Total fixed cost	59048.963	93792.947	6109	1163964
Total revenue	1008866.7	734194.76	68000	3200000
Gross margin	800078.24	646511.42	-9440	2940000
Net farm income	740808.89	626075.78	-40500	2890000

**Source:** Field Survey, 2025

## CONCLUSION AND RECOMMENDATIONS

This study concluded that smallholder rice farming business in Benue State is generally profitable, though profit outcomes vary considerably across farmers. The enterprise is dominated by youthful, literate and married male farmers with moderate experience. While some farmers achieve substantial returns, others operate at the margin of profitability or incur losses due to inefficient input use, high production costs and exposure to price and climate risks.

Based on the findings of the study, the following recommendations were made:

- i. Government should facilitate community-based mechanization services to reduce the heavy reliance on manual labour, particularly for farmers with limited family labour.
- ii. Land reform and input support programmes should deliberately target women to expand their access to productive resources and correct gendered profit disparities in rice farming.
- iii. Policy incentives for cooperative leasing, land pooling and voluntary consolidation will help smallholders achieve economies of scale and improve net returns.
- iv. Research and training should emphasize integrated soil fertility management and climate-smart practices to enhance long-term productivity and profitability.

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