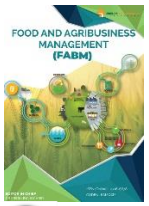
ZIBELINE INTERNATIONAL™ PUBLISHING
ISSN: 2716-6678 (Online)
CODEN: FAMOCP

Food & Agribusiness Management (FABM)

DOI: http://doi.org/10.26480/fabm.01.2024.32.36



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RESEARCH ARTICLE

PROFITABILITY OF RICE PRODUCTION SYSTEMS IN SOUTH EAST NIGERIA

Esheya Samuel Esheya

Department of Agricultural Economics and Extension, National Open University of Nigeria, Kaduna Campus, Nigeria
****Corresponding Author Email: samesheya2@gmail.com***

ARTICLE DETAILS

Article History:

Received 10 February 2024
Revised 15 March 2024
Accepted 24 April 2024
Available online 26 April 2024

ABSTRACT

The profitability of the various rice producing systems in South East Nigeria was compared in this study.A series of structured questionnaire was distributed to 120 rice farmers who were chosen through a three stage random sample technique. Both descriptive and inferential statistics were used to analyze the data. While objective ii was studied using cost and return analysis, objective i was analyzed using percentage responses and a frequency distribution table. The majority of respondents, regardless of the production system, were elderly, educated, small-scale, and utilized capital, fertilizer, pesticides, herbicides, and seed in their rice farming. These findings were based on the socioeconomic characteristics of the respondents. Profitability varied among rice producers in lowland, highland, and swamp rice cultivation methods. The results of comparing the various production methods revealed that the swamp production system had the highest net return, at N715,677.9 per hectare, with a 30.6% return on investment. This means that for every N1 invested in rice cultivation within the system, N30.6 was returned. Farmers that used the upland and lowland production strategies saw net returns per hectare of N606, 916 and N642,377.9, respectively. Furthermore, the lowland and upland production systems yielded returns on investment of 27.7% and 26.7%, respectively. According to this, there was a N26.7 return for every N1 invested in upland rice farming and a N27.6 return for every N1 spent on lowland rice cultivation utilizing a production method. To improve the living conditions of rice farmers, the best possible resource combination must be found in order to maximize profits.

KEYWORDS

Comparative analysis, profitability, rice, production systems, farmers

1. INTRODUCTION

In Nigeria, rice production is mostly done on a small scale, with farmers a dopting specific systems based on inputs, output expectations, topograph y, and returns. Nigeria is currently the largest producer of rice in West Af rica, producing an average of 3.2 million tons of paddy rice or 2.0 million tons of milled rice annually (Akenbor et al., 2022). Rice is becoming a sta ple food in many homes, moving from a ceremonial food to a food that is consumed on a daily basis due to changing consumer preferences (FAO, 2 018). However, the local supply of rice does not keep up with Nigeria's growing demand for it. Nigeria has extremely favorable ecologies for producing rice, although paddy rice output is still quite low. Utilizing rice production techniques in a balanced manner offers a chance that should be taken advantage of (Macauley 2015). One of the main rice-producing regions and a market for rice grown locally is the South East states of Nigeria. As a result, it serves as a benchmark for Nigerian rice production. In the South East states of Nigeria, rice growers frequently use various production strategies. Because they are the two main rice-producing regions in the east, Anambra and Ebonyi States contribute the most to rice production (Esheya, 2021). Rice is mostly grown in upland and swamp production environments in southeast Nigeria (Inyang et al., 2023; WARDD, 2015). Parts of the plain that are classified as upland are those that are 200–500 meters above sea level. The lowlands are typically between 200 and 500 meters (660 and 1,600 feet) above sea level. The soil has several notable features, including being heavily saturated with water, having poor drainage, having a low pH (acidity), and being frequently cultivated with rice (Adamu, et al, 2021). In coastal regions where the ocean floods the land at high tide and drains it at low tide, the swamp rice producing system is present. During the rainy season, when freshwater flooding washes the land and displaces tidal flows, the majority of mangrove swamps have a salt-free growing phase (Oloyede, et al, 2020). About 30 to 35 percent of Nigeria's total rice acreage is used for upland rice production, which produces between 0.8 and 2.0 tonnes/kg; the remaining 25 percent is used for swamp rice farming, which can yield up to 8 tonnes/hectare. Additionally, between 43 and 45 percent of the country's rice is produced in the latter (IRRI, 2015).

However, lowland and upland ecologies that get rain make up 80–85% of the country's farmed rice area and account for 73–80% of rice production overall (Udemezue, 2019). Several policy publications have emphasized the need to boost agricultural productivity through resource usage efficiency (AGRA, 2014; FAO, 2014). Unfortunately, there is insufficient data on the profit margins of various rice production systems, as well as the barriers preventing farmers in the research area from increasing their rice production investments. Inputs are used in the production of rice, and inefficient use of these resources could harm rice production and cause a supply and demand imbalance (Esheya, 2022). Empirically, it is unknown which production system yields larger profits. This study aimed to assess the profitability of farmers in various production systems within the study area and analyze the socio-economic traits of farmers in various rice production systems.

Quick Response Code	Access this article online	
	Website: www.fabm.org.my	**DOI:** 10.26480/fabm.01.2024.32.36

Cite the Article: Esheya Samuel Esheya (2024). Profitability Of Rice Production Systems In South East Nigeria. *Food & Agribusiness Management, 5(1): 32-36.*

2. METHODOLOGY

2.1 Study Area

One of Nigeria's six geopolitical zones, the South East encompasses the inland Southeast of the country as both a political and topographical area. The states that make up this region are Abia, Anambra, Ebonyi, Enugu, and Imo. The zone is bounded to the west by the Niger River, to the east by the Cross River, to the north by the North Central Plain, and to the south by the riverine Niger Delta (Amusa et al., 2017). It is split between the Guinean forest–savanna mosaic in the dry north and the Cross–Niger transition forests ecoregions in the south. Culturally, Igboland—the native cultural homeland of the Igbo people, who comprise the greatest ethnic group in the Southeast- constitutes the great bulk of the zone (Omogo et al., 2023). Despite being the smallest geopolitical zone, the South East of Nigeria has substantial economic contributions from oil and natural gas reserves as well as a developing industrialized economy. With 36 million residents, the region makes up around 18% of the nation's overall population. The most populated cities in the South East and the tenth and fourteenth most populous cities in Nigeria are Aba and Enugu. According to population, Onitsha, Umuahia, Owerri, Nnewi, Awka, and Abakaliki are among the other major cities in the Southeast (Obazi et al., 2022). Because the region is rich in arable land, agriculture flourishes there. In the zone, the principal food crops planted are yam, cassava, rice, cocoyam, and maize; the cash crops include oil palm, rubber, cocoa, bananas, and several kinds of fruits. Rich deposits of solid minerals and natural resources, including lignite, kaoline, clay, coal, tin, columbite, bauxite, and iron ore, are abundant in the zone (Esheya, 2023).

2.2 Sampling Techniques and Data Analysis

For this study, a sample size of one hundred and twenty respondents was chosen through the technique of purposeful sampling. To create a total of twenty local government areas (LGAs), four purposively selected LGAs from each state were obtained in stage one. In order to bring a total of forty communities, two villages were purposefully chosen in stage two from each of the twenty local government areas. Three rice growers were chosen at random from each community for the third stage. Primary data were obtained by an oral interview and a structured questionnaire. Descriptive and inferential statistical methods were then utilized to analyze the data. While objective ii was studied using cost and return analysis, objective i was analyzed using percentage responses and a frequency distribution table.

2.3 Model specification

2.3.1 Profitability

Profitability (net returns) is obtained by deducting the total cost of production from the total revenue. It is represented by the formula:

$$\text{Profitability} = TR - TC \quad (1)$$

where TR is total revenue, and TC is total cost.

$$TR = P\,Q \quad (2)$$

Equation (2) indicates that TR is the product of output price and quantity of output produced. Also,

$$TC = TVC + TFC \quad (3)$$

where TVC is total variable cost and TFC is the total fixed cost.

$$\text{Gross margin= (g.m.)} = tr - tvc \quad (4)$$

$$\text{i.e. } G.M = \sum_{1-1}^{n} P_1 Q_1 - \sum_{j-i}^{m} r_i x_i \quad (5)$$

Therefore,

Profitability (net income) can be calculated by gross margin less fixed input. The net farm income can be expressed as thus:

$$NFI = \sum_{1-1}^{n} P_1 Q_1 - \left[\left(\sum_{j-i}^{m} r_i x_i\right) + k\right] \quad (6)$$

Where:

GM = Gross margin (N),

NFI = Net farm income (N),

P1 = Market (unit) price of output (N),

Q = Quantity of output (kg),

ri = Unit price of the variable input (kg),

xi = quantity of the variable input (kg) ,

K = Annual fixed cost (depreciation) (N),

i = 1 2 3 …….. n, j = 1 2 3

Also, Profitability (net income) can be deduced as:

$$PQ - TVC + TFC \quad (7)$$

Returns per Naira invested can be calculated as follows:

$$\text{Returns/GH₵} = \text{net income/TC} \quad (8)$$

- The total variable cost for this study comprises the costs of rice seed, costs of fertilizer, Costs of labour for weeding, fertilizer application, pesticides and herbicide application, harvesting and miscellaneous items/services (transportation).
- Similarly, the total fixed cost items include the depreciated costs of farm equipment (hoe, knife, drinkers, and wheelbarrow) and land rent.

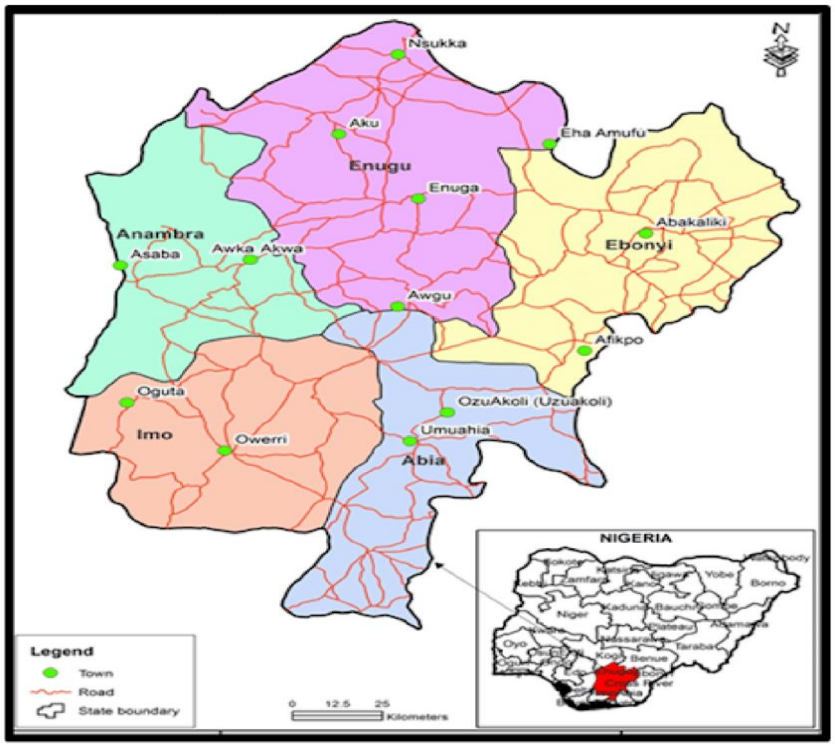

Figure 1: Map of the South East states of Nigeria

3. Results And Discussion

3.1 Socio-Economic Characteristics Of Respondents

Table 1: Socio-Economic Distribution of the Respondents

S/N	Variable	Frequency	Percentage
1.	**Age (years)**		
	20 – 29	9	7.5
	30 – 39	36	30.0
	40 – 49	45	37.5
	50 – 59	24	20.0
	60 and above	6	5.0
2.	**Educational Level**		
	No formal education	30	25.0
	Primary	63	52.5
	Secondary	21	17.5
	Tertiary	6	5.0
3.	**Farm Size (ha)**		
	0.01-1.00	36	30.0
	1.01 – 2.00	60	50.0
	2.01 – 3.00	12	10.0
	3.01 – 4.00	12	10.0
	3.01 – 4.00	-	-
	> 5.00	-	-
4.	**Seed Used**		
	Improved	102	85.0
	Local	18	15.0
5.	**Labour Use (Manday)**		
	Family labour	24	20.0
	Hired	30	25.0
	Communal	6	5.0
	Family & hired	45	37.5
	Family, hired & communal	15	12.5
6.	**Fertilizer Use**		
	Yes	120	100.0
	No	0	0.0
7.	**Pesticides Use**		
	Yes	90	75.0
	No	30	25.0
8.	**Herbicides Use**		
	Yes	105	87.5
	No	15	12.5
9.	**Capital Use**		
	100,000 - 200,000	36	30.0
	201,000 – 400,000	51	42.5
	401,000 – 6000,00	12	10.0
	601,000 and above	21	17.5

Source: Field Survey, 2022.

Table 1 demonstrates that the majority of rice farmers (67.5%) were in the 30- to 50-year-old age range. Based on years of experimentation and observation, age enhances a farmer's ability to use resources. A research found that youths can overcome the drudgery of rice production by being physically fit and energetic (Ume et al., 2015). The Table also shows that 85.0% of the rice farmers have completed some kind of formal education. In group discussed how easily educated farmers may obtain knowledge to improve their technical and allocative efficiency in high-yield and productive rice growing operations (Amaechina and Ebo, 2017). Ninety percent of the respondents operated on less than 3.01 hectares. The majority of respondents, as indicated in Table 1, were small-scale farmers, which is consistent with the widely held belief that small-scale farming is the norm in many developing nations. Because their farms are too small for modernization and industrialization, the farmers' smallholding characteristic frequently puts them at risk for low profitability (Ume et al., 2018). It is countered, nonetheless, that small farms yield higher yields than comparatively large farms. This is explained by the ability of small farms to achieve resource efficiency (Abah et al., 2021).

This Table also showed that enhanced rice varieties were used by 85.0% of rice farmers. Research indicates that higher-quality seed varieties are frequently associated with improved crop output, which has a significant impact on crop production status and the responsiveness of other inputs (IRRI, 2015). Once more, family and hired labor was used to produce 67.5% of the rice. As per, labor plays a crucial role in eliminating weeds from farms, particularly for small-scale farmers, and accounts for about 75% of the overall production expenses (FAO, 2018). The Table also shows that all respondents—100% of them—used fertilizer when growing rice. The importance of using fertilizer to balance nutrients in order to increase crop output and improve soil texture is highlighted by (Ingabire et al., 2014). Furthermore, 75.0% and 87.5% of rice farmers, respectively, employ pesticides and herbicides to fight diseases and pests, control weeds, and conserve soil.

Studies show that pesticides and herbicides save labor expenses, time, and effort, particularly in situations when labor is expensive, labor demand is high, or mechanical hoeing would harm immature crops (Ahmed et al., 2019). The sampled farmers who confessed to not using pesticides or herbicides may have been affected by adulteration issues, the high cost of inputs, or their unavailability at various farm levels. On the other hand, misusing or abusing the resource could be harmful to both man and the environment (Esheya, 2012). Herbicides have been noted as a significant labor-saving tool, according to, since weeding labor is consistently responsible for a significant amount of the overall agricultural labor costs associated with rice production (Slam et al., 2017). Lastly, Table 1 shows that 70.0% of operators made N200,000.00 or more. As the following table illustrates, large financial obligations may result from rice production's capital-intensive nature. In order to increase their production, farmers might pay for labor and purchase farm inputs with the use of credit (FAO, 2018).

3.2 Profitability of Upland, Lowland and Swamp Rice Production Systems

The quantity of profit realized over a given period of time is a good indicator of an enterprise's profitability. The difference between the cost of the resources required to manufacture a good and its monetary value is known as profit. The amount of profit or loss a business can make in a given time frame depends on the revenue realized and operating expenses (Ubokudom, et al., 2022). The respondent's operating costs, or the daily expenses related to rice production, make up the total variable cost. The selected upland rice farmers paid N228,900 in Total Variable Costs (TVC), whereas the lowland rice farmers paid N231,200, and the swamp rice farmers paid N308,000. The farmers' Gross Margin (GM) for the upland, lowland, and swamp rice production systems, respectively, was N607100, N642,600, and N716, 100. According to research, the various production systems exhibited varying gross margins, which he attributed to variations in labor operation costs among the systems (Adamu and Esheya's, 2020).

The results of the various production systems were displayed in Table 2, where the swamp rice production system had the greatest net return of N715,677.9 per hectare and a 30.6% return on investment, or N30.6 return for every N1 invested in rice cultivation within the system. The outcome is consistent with findings, which showed that swamp rice production methods were more profitable than lowland and upland systems (Esheya's, 2021). Farmers that used the upland and lowland production strategies saw net returns per hectare of N606, 916 and N642,377.9, respectively. Furthermore, the lowland and upland rice production systems yielded returns on investment of 27.7% and 26.7%, respectively. According to this, there was a N26.7 return for every N1 invested in upland rice farming and a N27.6 return for every N1 spent on lowland rice cultivation utilizing a production method.

It is essential to mention that, out of all the production systems, labor cost contributed the most to the TVC. In the upland production system, labor constituted 79.2% of the overall production cost, whereas it accounted for 79.3% in the lowland and 79.3% in the swamp. This is in line with a study that found that labor costs accounted for more than 75% of the total cost of production in rice-based production systems in Nigeria by (Kadir et al.,

2015). Labor costs dominated the study. This is consistent with research, which discovered that labor accounted for the largest portion of the total cost of farm production by (Okoye et al., 2010; Muhammad et al., 2023). The employment of hired manual labor in key rice-producing tasks (such as land clearing, planting, weeding, etc.) is responsible for the high cost of labor. Additionally, Nigerian migration from rural to urban areas contributes to inefficient labor use in agricultural output. The most expensive fertilizer came next, and the least expensive seed came last. The majority of farmers use their old or previous stock as planting material, which accounts for the least amount of the seed's cost to TVC. Additionally, the majority of farmers use inexpensive local rice cultivars to upgrade the variety on their rice farms.

Table 2: Costs and Return of Rice Production Under Different Production Systems

Variable		Upland		Low		Swamp	
	Unit price	Quantity	Amount	Quantity	Amount	Quantity	Amount
(A) Revenue	380,000	2.2	836,00	2.3	874,00	2.5	950,00
Operating Capital							
Seed	N300/kg	30kg	N9000	30kg	N9000	30kg	N9000
Agrochemical							
Herbicides	N500/litre	4L	N2000	4L	N2000	4L	N2000
Insecticides	N300/Litre	1litre	N300	2Litres	N600	2Litres	N600
Fertilizer	N9,000/ 50kg	200kg	N36000	200kg	N36000	200kg	N36000
Total Capital Operating Cost (TCOC)			47300		47600		47600
Labour							
Land clearing	N3000	7	21,000	8	24,000	10	30000
Land preparation	4000	12	48000	17	68000	20	80000
Nursery	1000	1	1000	1	1000	1	1000
Planting/ Transplanting	2500	12	30,000	13	32500	15	37,500
Applic. of herbicides	1,200	4	4,800	4	4800	2	2400
Applic. of fertilizer	2000	4	8000	4	8000	4	8000
Weeding	3000	10	30000	8	24000	5	15,000
Bird scaring	800	2	1600	2	1600	2	1600
Harvesting	1800	4	7200	6	10,800	6	10,800
Threshing/winnowing	1500	8	12000	10	15000	8	12,000
Others (Bagging)	500	2	1000	2	1000	2	1000
Total Labour Input (TLI)			181,600		183,800		186,300
C. Total Variable Cost (TVC= TCOC+TLI)			228,900		231,400		233,900
D. Gross Margin (R-TVC)			607,100		642,600		716,100
Fixed cost							
Depreciation on equipment			56.8		56.8		56.8
Rent on land			68.8		86.9		86.9
Interest on operating capital(27%)			58,4		78.4		78.4
F. Total Fixed Cost			184		22.1		22.1
G. Total Cost (TC = TVC+TFC)	,		229,084		231,622.1		234,122.1
H. Net Return (R - TC)			606,916		642,377.9		715,877.9
I. Return on investment (H/G)			26.5		27.7		30.6

Source: Field Survey; 2022.

4. Conclusion

The profitability of rice production techniques in South East Nigeria—upland, lowland, and swamp—was compared in this study. Regardless of the production style, the majority of respondents, according to the results of the socioeconomic characteristics, were old, educated, small-scale, and utilized capital, fertilizer, pesticides, herbicides, and seed in their rice farming. The results of the profitability analysis of the various production systems indicated that the rice production systems in swamps and lowlands had the highest net returns per hectare, respectively. Farmers would learn sound agronomic techniques from the agricultural extension program, which would increase productivity by lowering the average unit cost of output and maximizing profit.

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