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ANALYSIS OF AGRONOMIC FACTORS IN RICE (ORYZA SATIVA) PRODUCTION AMONG SMALLHOLDER FARMERS IN AYAMELUM LOCAL GOVERNMENT, ANAMBRA STATE

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ABSTRACT

The study analyses the agronomic factors of rice production among smallholders' farmers in Ayamelum Local Government Area, Anambra State had two objectives which identified the various species of rice produced; determined the factors influencing output, and the constraints faced by the farmers in the sector. The null hypothesis tries to establish the link between some important factors and the farmer's profit from rice production. Data were collected from a random sample of 120 respondents and were analysed with a multiple regression analysis, and mean threshold from the 4-point Likert scale. The study revealed that from the lead functional form (semi-log), the factors influencing rice output include age (2.20) **, sex (6.12) ***, marital status (5.40) ***, farming experience (2.20) **, access to credit (7.87) ***, and extension contacts (3.65) ***. The null hypothesis that no factors were influencing the profit from the enterprise was rejected on the basis of the following significant factors: age (6.71) ***, sex (2.31) **, marital status (6.00) ***, farming experience (4.03) ***, farm size (6.21) ***, labour cost (9.64) ***, fertilizer cost (4.33) ***, transportation cost (3.76) ***, and planting materials (7.45) ***. Furthermore, some of the constraints to rice production in the study are poor storage facilities, high cost of input, and inadequate capital among others. The researcher, therefore, recommends that policymakers should adopt a holistic approach to problem-solving to address these challenges.

Keywords: Agronomic, Factors, Production, Smallholder, Farmer.

1. INTRODUCTION

Nigeria has a rapidly growing population, which directly influences the demand for food, including rice (Nwalieji, 2020). As the population increases, the demand for staple foods like rice increases to meet the dietary needs of a larger number of people in the country (Oduntan, 2019). There has been a shift in dietary patterns in Nigeria, with a greater emphasis on carbohydrate-rich foods. Rice, with its versatility and ability to be paired with various dishes and flavors, has gained popularity as a preferred carbohydrate source, replacing traditional staples like yam, cassava, and maize (Nwalieji, 2016). The increasing number of working individuals and busy households contribute to the demand for quick and easy-to-cook meals like rice (Okeke & Oluka, 2017). Rice is a versatile grain that can be prepared in numerous ways, making it suitable for a wide range of dishes and cuisines. Its versatility and ease of preparation make it a convenient choice for households, restaurants, and food service providers, driving its demand. Farmers often use traditional methods to plant and cultivate rice, but there are increasing efforts

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to adopt modern techniques such as mechanized farming, irrigation, and the use of high-quality seeds and fertilizers to boost yields and improve efficiency (Nwalieji, 2015).

After rice is grown, it is harvested and transported to processing centers. This stage involves cleaning, drying, and storing the rice to preserve its quality and prevent spoilage. Rice processing involves converting harvested paddy rice into edible rice. In Nigeria, rice processing mills and factories help to clean, sort, and package rice for distribution. These processing units play a vital role in ensuring quality control and meeting consumer demands (Adekambi et al. 2014).

Rice is packaged in different sizes ranging from small sachets to larger bags to cater to different consumer needs. It is then distributed through various channels in Nigeria, these include wholesalers, retailers, open markets, supermarkets, and online platforms (FAO, 2018).

Marketing and sales of rice involve promoting locally produced rice, creating awareness among consumers, and developing strong brand identities. Nigerian rice brands have gained popularity in recent years, offering consumers a choice between locally produced rice and imported varieties.

Many studies have been made on rice production, (FAO, 2019) have identified problems of rice production as relatively high production costs, relatively poor producer prices and marketing systems, this results to low returns and subsequently decline in rice production. According to the International Fund for Agricultural Development [IFAD], (2012), small holders constitute the majority of farmers, and in most studies, they have been observed to contribute less in terms of total output. They apply a low-input strategy to agriculture, with minimum input requirements and low output (Okonkwo-Emegha, 2025). This has made livelihood of these small holder farmers to be filled with a lot of constraints such as: Low productivity; little opportunities for value addition; limited access to productive assets and inputs; inadequate support services (extension and research); inadequate market and rural infrastructure; post-harvest losses and a constrained enabling environment (FOA, 2017; Emegha, etal. 2023). Despite the favorable ecological conditions in Nigeria, small holder rice farmers are yet to explore this advantage for profitability purposes. Small holder farmers constitute the majority of rice farmers, but yet contribute less in terms of total rice output in Nigeria (IFAD, 2012). Many governments intervention has been targeted at small holder rice farmers but yet, recent studies have reported an increasing poverty rate among small holder farmers (Nwalieji, 2020 ; Emegha, 2020). In Anambra State, Ayamelum LGA is the major rice producing LGA among the 21 LGAs in Anambra State; thereby making Ayamelum the "Rice Food Basket" of Anambra State, Nigeria. Therefore, there is a need to carry out this study on the analysis of agronomic factors in rice production among small holder farmers of Ayamelum local government of Anambra state, as it seeks to fill this gap. The specific objectives were to; determine the factors influencing rice output and identify constraints faced by rice producers in the study area?

2. LITERATURE REVIEW

Concept of Rice Production

Rice Cultivars and Harvesting in Nigeria

Rice cultivars are often classified by their grain shapes and texture. High-yield cultivars of rice suitable for cultivation in Africa and other dry ecosystems have been developed. It is hoped that their cultivation will improve food security in West Africa. A wide variety of improved seeds are available in Nigeria, produced by the National Cereals Research Institute, often in conjunction with the West Africa Rice Development Association (WARDA). The varieties are widely

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known, from NERICA (the New Rice for Africa, developed in the 1990s) to Nigerian varieties that offer a range of characteristics around length of growing season, size of the grain, water requirements, etc. Farmers generally use a seed that is adapted to their conditions (USAID, 2020). Some of the rice cultivars commonly grown in Nigeria:

Nerica: Nerica stands for "New Rice for Africa" and is a group of rice cultivars developed through crossbreeding between African and Asian rice varieties. Nerica cultivars are known for their high yield potential, tolerance to biotic and abiotic stresses, and early maturity. Examples include Nerica L-19, Nerica L-14, and Nerica 8.

Ofada: Ofada rice is a popular local rice variety in Nigeria, primarily grown in the southwestern part of the country. It is known for its distinctive taste, aroma, and brownish color. Ofada rice is usually parboiled and has a coarse texture. It is preferred by many consumers for its unique flavor and cultural significance.

Faro: Faro rice is a series of improved upland rice varieties developed by the Africa Rice Center (AfricaRice). These cultivars are suitable for rain-fed upland ecosystems in Nigeria. They are known for their high yield potential, disease resistance, and tolerance to drought and poor soil conditions. Examples include Faro 44, Faro 52, and Faro 61.

ITA 150: ITA 150 is an improved upland rice variety developed by the National Cereal Research Institute (NCRI) in Nigeria. It is known for its high yield potential, early maturity, and resistance to major rice pests and diseases.

FARO 52: FARO 52 is a lowland rice variety developed by the Africa Rice Center. It is a high-yielding cultivar suitable for irrigated lowland ecosystems. FARO 52 exhibits good cooking qualities, disease resistance, and adaptability to diverse agro-ecological zones in Nigeria.

WITA 4: WITA 4 is an improved upland rice variety developed by the West Africa Rice Development Association (WARDA). It is known for its adaptability to upland conditions, disease resistance, and good grain quality.

Sahel 108: Sahel 108 is a lowland rice variety developed by the National Agricultural Seeds Council (NASC) in Nigeria. It is characterized by its high yield potential, early maturity, and resistance to diseases such as rice blast and bacterial leaf blight.

The biggest challenge is to get farmers to purchase new seeds on a regular basis, reinvigorating their productive potential, rather than planting old seeds that have lower yields. The use of mechanized soil preparation is limited primarily to farms that are larger than 2 hectares, or are part of a larger production system conducive to mechanized plowing (such as most of the irrigation schemes). Smaller farms tend to be fragmented and difficult to plow mechanically. Additionally, the high cost of tractor services makes it just as economical for small farms to prepare the land by hand. There is strong potential to increase productivity if the right conditions are in place. The process of collecting the mature rice crop from the field is called harvesting — this can be done manually or mechanically. Depending on variety, a rice crop usually matures between 115 and 120 days after establishment (activities include cutting, stacking, handling, threshing, cleaning and hauling). Good harvesting methods help maximize yield and minimize damage and deterioration. Manual harvesting is common in Africa and Asia and involves cutting the rice crop with simple hand tools like sickles and knives: this requires between 40 and 80 person-hours per hectare plus additional labor to manually collect and haul the crop. Mechanical harvesting — using reapers or combine harvesters — is not so common due to the unavailability and high cost of machinery.

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Theory of consumer behavior

Consumer theory is the study of how people decide to spend their money based on their
Individual preferences and budget constraints. Individuals have the freedom to choose between different bundles of goods and services. Consumer theory seeks to predict their purchasing patterns by making the following basic assumptions about human behavior: Utility maximization: Individuals are said to make calculated decisions when shopping, purchasing products that bring them the greatest benefit, otherwise known as maximum utility in economic terms.

Non-satiation: People are seldom satisfied with one trip to the shops and always want to consume more.

Decreasing marginal utility: Consumers lose satisfaction in a product the more they consume it.

Budget Constraint: The theory recognizes that consumers face a budget constraint, which means they have limited income or resources to allocate towards different goods and services. Consumers must make choices that optimize their utility within the constraints of their budget.

Indifference Curve Analysis: Indifference curves are graphical representations that depict different combinations of goods or services that provide the consumer with the same level of satisfaction or utility. By analyzing indifference curves and their properties, economists can understand consumer preferences and decision-making.

Consumer Equilibrium: Consumer equilibrium occurs when a consumer maximizes their utility given their budget constraint. It is achieved when the consumer has allocated their resources in a way that the marginal utility per unit of money spent is equal for all goods and services.

Income and Substitution Effects: Changes in income or prices of goods can lead to income and substitution effects, which influence consumer behavior. The income effect refers to the change in consumption resulting from a change in real income, while the substitution effect refers to the change in consumption caused by a change in relative prices.

These are some of the key principles and concepts involved in the theory of consumer behavior. Economists use these ideas to study and predict consumer choices, market demand, and the impact of various factors on consumer decision-making.

3. METHODOLOGY

The Study Area

Ayamelum Local Government Area

Research Design

This study made use of Survey Research Design.

Area of study

The study area for this research is Ayamelum local government area (LGA). Ayamelum LGA is one of the 21 local government areas in Anambra State, Nigeria. Anambra State is presently located in the south-east of Nigeria. The state is bounded by Delta state to the west, Imo state to the south, Enugu state to the east and Kogi state to the north. It has an estimated population of 9,000,000 million people (National Population Commission, 2022) which stretches over about 60 kilometers between surrounding communities. Anambra state lies on the longitude 6º35E and 7º21E and latitude of 5º38N and 6º47E (Wikipedia.org/wiki Anambra state, 2022).

Anambra State is occupied by the Igbo ethnic group and is majorly business men and farmers. Farmers in the state grow crops such as; yam, oil palm, rice, cassava, cocoyam, vegetables and different varieties of fruit trees, among others. The local government areas that are involved in

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rice production are Anambra East West, Orumba North, Awka South, Awka North and Ayamelum Local Government. Ayamelum local government is made up of 8 communities; Omor, Anaku, Umerum, Umumbo, Igbakwu, Ifite-ogwuari, Umueje and Omasi. It is located at the North East of the State situated on the shores of the Omambala and Ezu Rivers. Ayamelum L.G.A has land area of 196 km2 and an estimated population of 223,641 in 2017 and 233,763 persons in 2019.

The population of the study

The population of the study comprises of all the registered rice farmers (1,463) in Ayamelum LGA of Anambra State.

Sampling technique and sample size

Two stage sampling technique was used for this study.

In the first stage, five (5) communities out of the eight (8) communities were randomly selected. These include: Umueje, Igbaku, Umumbo, Ifite-Ogwari and Omasi.

In the second stage, twenty-four (24) rice farmers from each of the selected communities were randomly selected and this will give a total of 120 respondents that served as the sample size for this study.

Validation of the instruments

For the validity of the instruments, the drafts were given to an expert in the department to review and criticize the various items on the instrument, as regards its clarity, relevance, appropriateness of language and response patterns as they relate to the study. Suggestions and modifications from the expert were used to improve the research instrument.

Factors influencing rice production

The farmers were asked to list the number of factors influencing rice production in the local government area. And the factors were analyzed using multiple regression model.

The regression model is specified as follows;

$T = \square\square + b1X1 + b2X2 + b3X3 + b4X4 \text{ ------- } b11X11 + \mu$

Where T = rice output based on individual farmer (dependent variable)

$\square\square$= constant term

b1 – b12 = regression coefficients

X1 = age: (measured in year)

X2 = Sex; (male = 1, female = 0)

X3 = education; (measured by the number of years spent in formal education)

X4 = marital status, (1 for being married and 0 for none)

X5 = household size (measured by the number of people living under one roof)

X6 = credit; (dummy variable for receiving credit = 1 and 0 for not received).

X7 = Extension contacts (measured by number of times visited by extension agent in the last one year)

X10= Income. Respondents were asked to give the amount of money they earn annually from rice production.

X11 = Farming experience (measured in years)

μ = error term

Constraints faced by rice producers

To identify constraints to rice production in the area, the respondents were asked to indicate on a 4-point Likert-scale how serious the various shortlisted problems influence rice production in the area. Their response categories include: very serious (4), serious (3), somewhat serious (2) and

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not serious (1), with a mean of 2.50 as cut off value. Variables with mean scores of 2.50 and above was regarded as serious problems, while those with mean scores less than 2.50 was regarded as not serious problems.

Methods of data analysis

Objective (i) was realized using regression analysis and this was used to get the hypothesis, objective v was analyzed using a 4-point likert-scale.

4.RESULTS AND DISCUSSIONS

Factors influencing Rice output

The factors influencing the rice output in the study area are presented in table 1. The functional form of linear, semi-log, exponential, and double log form were investigated. The semi-log form was the lead equation because the functional form had the highest adjusted R-value and highest number of significant variables. The adjusted R-value of 0.683 implies that 68.3% of the variation in rice output were explained by the explanatory variables while the remaining 31.7% unexplained was as a result of the error beyond the control of the farmers. The F-statistic value of 22.33*** significant at a 1% level of probability is an indication that at least one of the independent variables influenced rice output in the study area. The coefficient of age and farming experience were positive and significant at a 5% level of probability, this implies that a unit increase in age and farming experience will increase rice output by 0.004 unit (age), and 0.010 unit (farming experience). The coefficient of sex and access to credit were negative and significant at a 1% level of probability, this implies that an increase in the number of female farmers will reduce the farmers output by 0.241 unit. A unit increase in number of farmers with access to credit 0will reduce rice output by 0.337 unit. Increased access to credit may cause diversion to other lucrative ventures other than agricultural sector.

The coefficient of marital status was positive and significant at a 1% level of probability, this implies that an increase in the number of farmers that are married will increase rice output in the area by 0.204 unit. As expected in the a priori expectation, the coefficient of extension contacts was positive and significant at a 1% level of probability, this implies that a unit increase in the number of extensions visit to the farmers will increase rice output by 0.026 unit.

Furthermore, the coefficient of labour cost, fertilizer cost, and transportation cost were all negatively significant at a 1% level of probability, but no meaningful increase or reduction in output were recorded. This is in line with the study of Okonkwo-Emegh, Achoja & Okeke (2019) & Okonkwo-Emegha, Umebali & Obiekwe 2025 who stated that marital status positively correlate with yield and profitability and cost of labour were 1% of probability level to output.

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Table 1: Factors influencing Rice output

Determinants	Linear		Semi log		Exponential		Double log	
	Coeff.	*t Stat*	*Coeff.*	*t Stat*	*Coeff.*	*t Stat*	*Coeff.*	*t Stat*
Intercept	2303.141	4.99	8.079	38.61	11058.746	3.52775	15.330	9.54
Age	6.053	1.45	0.004	2.20**	223.640	1.54	0.191	2.57**
Sex	-239.911	-2.76**	-0.241	-6.12***	-255.627	-3.05***	-0.219	-5.10**
Level of education	33.654	0.89	0.021	1.23	29.776	0.83	0.011	0.62
Marital status	291.448	3.49***	0.204	5.40***	314.173	3.97***	0.209	5.16***
Farming experience	9.312	0.94	0.010	2.20**	144.201	1.72*	0.130	3.03***
Access to credit	-365.514	-3.86***	-0.337	-7.87***	-392.681	-4.36***	-0.347	-7.54***
Farm size	-0.287	-0.20	0.000	0.05	-8.495	-0.17	0.007	0.28
Extension contacts	25.868	1.67*	0.026	3.65***	89.528	1.49	0.104	3.37***
Labour cost	-0.013	-2.72**	0.000	-6.23***	-120.837	-1.90*	-0.139	-4.27***
Fertilizer cost	-0.047	-3.57***	0.000	-6.47***	-947.109	-3.40***	-0.746	-5.24***
Transportation cost	-0.061	-2.16**	0.000	-4.06***	-79.100	-1.21	-0.097	-2.91**
Planting materials	-0.006	-0.32	0.000	-0.39	29.326	0.34	0.028	0.63
F-stat	5.85***		22.33***		6.49***		18.03***	
Adjusted R Square	0.328		0.683		0.356		0.632	

Source: field Survey, 2025.

Constraints of Rice Production

The information about the farmers challenges in small-scale rice production in the study area was captured on a 4-points Likert scale, the mean threshold of 2.5 was set for decision making, the instruction is that any farmers with a mean score of 2.5 and above agreed with the constraints while those with a mean score below 2.5 disagreed with the constraints.

Among the variables identified as constraints to rice production, the farmers agreed with the following variables poor storage facility (M = 3.08), high cost of input (M = 3.21), high cost of labour (M = 2.80), scarcity of improved seeds (M = 2.88), inadequate capital (M = 3.05), and climate change (M = 2.63).This is in Line with the report of Emegha, Bosah and Oforbuike (2025) who reported that food sector are faced with a huge challenge in the south east. Emegha, et.al. (2025) also stated that insecurity in the area has posed as a great challenge in food sector.

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Table 2: Constraints Faced by Rice Producers

Sn.	Constraints	Mean	Std. Dev.	Decision
1	Poor storage facility	**3.08**	0.875	Agree
2	Inadequate improved processing and milling machinery	2.38	1.182	Disagree
3	High cost of input	**3.21**	0.869	Agree
4	High cost of labour	**2.80**	1.097	Agree
5	Scarcity of improved seeds	**2.88**	1.149	Agree
6	Inadequate capital	**3.05**	0.798	Agree
7	Availability of land	2.03	0.761	Disagree
8	Inter and intra communal clash over land ownership	2.48	1.209	Disagree
9	Lack of formal education	2.09	1.152	Disagree
10	Climate change	**2.63**	1.159	Agree
11	Cattle menace	2.34	1.170	Disagree
12	Poor extension service visit to farmers	2.35	1.042	Disagree
	Grand mean	**2.61**	**1.04**	**Agree**

Source: Field survey, 2025.

5. CONCLUSIONS

The study analyzed the agronomic factors in rice production among small holder farmers in Ayamelum LGA of Anambra state. The major constraints faced by farmers were poor storage facilities, high cost of input, high cost of labor, scarcity of improved seeds and climate change. The study also revealed that very little extension contacts have been organized in this area and most of the farm size were below 2hecters.

6. RECOMMENDATIONS

1. Extension outreaches should be organized more often in these areas to better sensitize the people on new rice species, and educate them on better farm practices.
2. Rice farmers are encouraged to unite as cooperative societies in their respective areas to adequately use their resources so as to tackle financial limitations and achieve overall expansion.

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