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## Comparative Analysis of Profitability of Rice Production among Men and Women Farmers in Ebonyi State, Nigeria

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### Authors' contributions

*This work was carried out in collaboration between all authors. Author CYO designed the study, wrote the protocol and supervised the work. Authors OY and SA performed the statistical analysis and managed the analyses of the study. Author ADS managed the literature searches and edited the manuscript. All authors read and approved the final manuscript.*

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### ABSTRACT

**Aims:** Aims of the study were to estimate comparative analysis of profitability of rice production and its determinant in Ebonyi State.

**Study Design:** Primary data was used for this study. These were collected with the aid of structured questionnaire. Information on both irrigated and upland rice production was collected.

**Place and Duration of Study:** This study was carried out in three local government area in Ebonyi State, Nigeria between August and November 2014 cropping season.

**Methodology:** Multistage purposive and random sampling techniques were employed for data collection.

**Results:** The information collected was subjected to various analyses using the production function analysis model and the gross margin equations. The coefficient of determination ( $R^2$ ) of the

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regression was 53% and 47% for men and women rice farmers respectively. The results indicate that out of seven variables included in the model, three (farming experience, cost of labour and cost of seed) were found to significantly influence rice profitability among male farmers while four (farming experience, cost of labour, cost of agrochemical and cost of seed) of the variables were significant at influencing rice profitability among female farmers. The Total Variable Cost (TVC) incurred by the male and female respondents averaged N73, 435.00/ha and N60, 906.80/ha, with a Gross Margin (GM) of N86, 328.00/ha and N62, 035.20/ha respectively. Gross Margin/Naira invested was 1.18 and 1.02 for the male and female farmers respectively.

**Conclusion:** Rice production was a profitable enterprise in the study area as significant profit was recorded per hectare of land cultivated. The study established that if male and female educated farmers are engaged in the production of rice and with proper access to credit, more profit will be realized, hence, the enterprise can serve as a means of employment for the populace as well as improving level of living of both male and female farmers.

*Keywords: Profitability; rice; regression model; Ebonyi State.*

## 1. INTRODUCTION

The greatest challenge to the agricultural production in Nigeria is how to ensure increased food production and value addition of agricultural products. Agricultural Development focuses on gender to create a more effective, transformational approach that achieves poverty reduction and hunger alleviation for all, and also improves equity between men and women [1]. Agricultural Development strategies must identify the participation of smallholder farmers as a critical feature to attaining ultimate success. Women comprise the vast majority of smallholder farmers and food producers [2]. In order to achieve dramatic and sustainable improvements in the lives and wellbeing of the smallholder farmers, initiatives must offer innovative approaches to development challenges that engage, empower and invest in men and women for the long term.

However, thoughtful consideration of the need of all beneficiaries—women, men, and youth—is essential in achieving greater technical efficiency and profitability in agricultural production. This means that an integration of all members of the community, especially the most vulnerable is essential. For example, agricultural activities that increase crop yield may have a detrimental effect on the lives of adolescent girls, who are usually the first to experience increased demands on their time and labour when agricultural production intensifies, and who are most likely to leave school to return to farm labour. It also means that we must understand that improving the lives of women improves the well-being of her children. It is affirmed that reducing inequity for women, men, and youth in the long term must also involve the inclusion of

the whole family and community their daily life [2].

Agriculture Development initiatives should recognize that in order to reach desired objectives, every resource and tool available must be used to ensure that both women and men are active participants in every aspect. To that end, a gender mainstreaming strategy can ensure that the practical needs and strategic interests of women and men, boys and girls are considered in proposals and that understanding the complexities of gender roles helps in refining agricultural project goals and design. Strategies must ensure that gender is at the forefront of how we conceptualize and execute our work; that those most burdened and least empowered must be both the primary beneficiary of resources as well as the catalyst for effecting lasting change in agricultural development.

Gender analysis focuses on the different roles and responsibilities of women and men and how these affect society, culture, the economy and politics [3]. For the purpose of this study, the focus is on the different role and responsibilities of men and women in rice production in the study area. Women have less access to land, and control of resources than men which is why this study emphasizes the role of men and women in rice production. Women therefore, comprise the majority of the world's poor in both the urban and rural sectors and the majority of those working in the formal sector [4].

Rice is one of the food crops which have assumed great significance as a major staple food that is widely consumed in Nigeria [5]. Rice consumption has risen tremendously since 1970 (10.3 per cent per annum), a result of the

accelerating population growth rate (2.8 per cent per annum) and increasing per capita consumption (7.3 per cent per annum) leading to an increase in domestic demand over domestic supply. In response to meeting the shortfall in the supply-demand gap, Nigerian government has continued to resort to importation of milled rice. This situation has made Nigeria to become the largest importer of rice in Africa [6]. Moreover, Nigerian Agriculture has been variously described as being characterized by low farm incomes, low levels of capacity to satisfy the food needs of the population and low productivity because primitive techniques of production are still being used by the farmers [7,8].

In an attempt to address the nation rice demand-supply gap, the Nigerian government has interfered in the rice sub-sector over the past few decades. However, the public policy has neither been consistent nor appropriate and domestic production has continued to lag behind demand [9]. For instance, from 1986 to mid 1990s import was illegal, in 1995 import were allowed at 100 percent tariff and in 1996 it was reduced to 50 percent but it was later increased to 85% in 2001 [10]. Even during the rice ban period, Nigeria was still importing several hundreds of thousand tonnes of rice annually through illegal trade. Notwithstanding, the various policy measures, the domestic rice production has been increased sufficiently to increase demand [10]. The inability of Nigeria rice sub-sector to meet the domestic demand could be attributed to low productivity, inefficiency in the use of resources, disincentives from macro-economic environment and production in the hand of small scale farmers who use traditional technologies. Nigeria has experienced falling yield of rice from 2069.54 kg per hectare in 1990 to 1754.40 kg in 2008 [11].

There is a major problem of increase in demand because of population growth. Farmers output falls below 60 percent irrespective of the interventions and to enhance this, the means of production (i.e. technology) should be improved as well as other factors that support farmers output should be given adequate attention [12,13].

Limited studies have analyzed the gender perspectives of the profitability of rice production in Ebonyi State in one fold, thereby leaving an information gap which this study was designed to fill. Despite several studies on profitability of rice production in Nigeria, very little is known about profitability among male and female rice farmers.

## 2. MATERIALS AND METHODS

### 2.1 Study Area

The study was conducted in Ebonyi State, Nigeria. Ebonyi State lies in the southeastern part of the country's geopolitical zones. The state lies approximately 7°3'N and longitudes 5°4'E and 6°4' E. Abakaliki is the capital city of the present-day Ebonyi State. The inhabitants are primarily members of the Igbo nation. It used to be the headquarters of the old Abakaliki zone in the Old Anambra and Enugu states before the creation of Ebonyi State in 1996. It had an estimated population of 2,176,947 according to the 2006 census. It has a projected population of about 2,742,647 for the year 2014 with a growth rate of 2.8% and a landmass of approximately 5,932 square kilometers [14]. Nigerians from other communities also reside mainly within the state capital city.

The state is located in the southeast zone of Nigeria, which is characterized by mean annual rainfall of between 2250 mm in the south and 1500 mm in the northern part of the zone, average annual temperature of about 27°C with relative humidity of 85% [15]. The vegetation of the state is a mixture of savanna and semi-tropical forest with agriculture as the mainstay of the economy. The underlying parent materials consist of shales inter bedded with sand and limestone. The soil is texturally clay loam, fairly to poorly drained with gravely sub-soil in some locations especially the upland adjacent to lowland areas which makes it very suitable for rice production [15].

Two main seasons prevail in the area-the rainy season, which starts from late April to early November and the dry season, which lasts from late November to early April. However, short dry spell is usually experienced during the month of August and this is termed the August break. Lowland areas popularly called *fadamas* are largely available and serve as good sites for rice and dry season vegetable farming. Major crops grown in the area include rice, yam, groundnut, cocoyam, vegetables, cassava, maize and cowpea.

### 2.2 Sampling Procedure

A combination of purposive and random sampling techniques was used for this study. The first stage involved a purposive selection of

three (3) Local Government Areas out of the thirteen (13) Local Government Areas in the state, thus, representing the three ADP zones in the state. The selection of these communities was based on the predominance of rice production in these areas. Then two (2) villages were randomly selected from each of the three (3) LGA's making a total of six (6) villages. Finally, 10% of the sample frames in each of these villages were randomly selected, giving a total of 213 respondents.

### 2.3 Data Collection and Analysis

Primary data was used for this study. These were collected with the aid of structured questionnaire. Information on both irrigated and upland rice production was collected. Information was also collected on: (a) Farmers' socio-economic characteristics such as age, gender, marital status, educational level, household size, access to credit, membership of association, farming experience and extension contact. (b) Quantity of inputs used in rice farming such as land area, quantity of labour, quantity of fertilizer, quantity of seeds and quantity of agrochemicals. (c) Cost of inputs used in rice farming such as cost of labour, cost of fertilizer, cost of seeds and cost of agrochemicals. (d) Output of rice farmers and selling price of rice.

### 2.4 Model Specification

The gross margin analysis was expressed as:

$$GM = GI - TVC$$

Where:

GM = Gross margin (₦/ha)

GI = Gross farm income (₦/ha)

TVC = Total variable cost (₦/ha)

Return to Naira invested (GM/TVC) was employed to explain the extent to which a naira invested into rice production contributed to the annual gross margin.

Empirical model specification for the determinants of profitability is as follows;

$$\pi = \delta_0 + \delta_1 X_1 + \delta_2 X_2 + \delta_3 X_3 + \dots + \delta_9 X_9 + \varepsilon$$

Where:

$\pi$  = Profit (₦/ha)

$X_1$  = Educational level of farmers (years)

$X_2$  = Farming experience (years)

$X_3$  = Cost of labour (₦)

$X_4$  = Cost of fertilizer (₦)

$X_5$  = Cost of agro-chemicals (₦)

$X_6$  = Cost of seeds (₦)

$X_7$  = Cost of transportation (₦)

$X_8$  = Market distance (km)

$X_9$  = Amount credit obtained (₦)

$\delta_0$  = Intercept

$\varepsilon$  = Error term

## 3. RESULTS AND DISCUSSION

### 3.1 Profitability of Male and Female Rice Farmers in the Study Area

The viability of an enterprise is indicated by the amount of profit realized per period of time. Profit is the difference between the monetary value of goods produced and the cost of the resources used in their production. The amount of revenue realized and operating cost of a business venture determines how much gain or loss the enterprise can achieve within a certain period. The profitability analysis which was used to achieve objective ii is shown in Table 1.

Total Variable Cost is the operating costs of the respondent which are the day-to-day cost incurred for producing rice. The Total Variable Cost (TVC) incurred by the male and female respondents averaged ₦73,435.00/ha and ₦60,906.80/ha, with a Gross Margin (GM) of ₦86,328.00/ha and ₦62,035.20/ha respectively. The average rate of return per naira invested was 1.18 for male rice farmers implying that for every one naira invested in rice production, there is a profit of ₦1.18 while the average rate of return per naira invested was 1.02 for female rice farmers implying that for every one naira invested in rice production, there is a profit of ₦1.02. This indicates that rice production is profitable in the study area.

Labour was sourced from both family and hired. Family labour was evaluated using the principle of opportunity cost and it was assumed that family labour served as a substitute for hired labour. Consequently, the imputed cost of labour used for family labour equals the prevailing wage rate of hired labour. Hence, labour cost accounts for 66% of the TVC for males and 59% for females, while seed, fertilizer and agrochemicals costs account for 13%, 19% and 2% respectively for the male rice farmers in the study area and 16%, 23% and 2% respectively for the female rice farmers. The analysis

revealed that labour is the most used variable among the respondents. This conforms to the study of [16] where labour cost dominates the Total Variable Cost of Cassava-Based Production Systems in the Guinea Savannah, accounting for over 80% of the TVC.

### 3.2 Determinants of Rice Profitability among Male and Female in the Study Area

The results of the parameter estimates of factors influencing rice profitability among male and female farmers are presented in Table 2. As shown in the Table, most of the variables significantly influence rice profitability. The results indicate that of seven variables included in the model, three were found to significantly influence rice profitability among male farmers while four of the variables were significant at influencing rice profitability among female farmers.

Interestingly, estimated parameter for farming experience was positive and significant at 1%

level for both male and female farmers respectively, implying that respondents with higher farming experience tend to be more efficient in the production of rice and hence an increase in their profits. A rise in farming experience of the respondents could enhance the skill of the farmers which in turn increase their productivity and profitability.

The estimated parameter for cost of labour was negative and significant at 1% level for female farmers and also negative but significant for male farmers. This implies that higher the cost of labour needed for farm production activities, the lower the profits derived from sales of farm produce and vice versa. The sign indicates that as labour used in the production of rice increases, quantity of rice produced decreases, hence a decrease in profits.

The estimated coefficient of fertilizer was negative and insignificant for both male and female farmers. Fertilizer is supposed to contribute significantly to rice production but high cost of this input adversely affects profitability of rice and vice versa. The negative sign of the

**Table 1. Costs and returns of rice among male and female farmers**

Cost/Return items	Unit price (₦)	Average yield Kg/hectare		Value (₦/ha)	
		Male	Female	Male	Female
<b>(A) Variable Costs</b>					
Seed (kg)	40	233.41	241.52	9336.4	9660.80
Labour (man-day)	700	69.17	51.64	48790.0	36148.00
Fertilizer(kg)	80	173.67	171.60	13893.6	13728.00
Agro-chemical(litre)	500	2.83	2.74	1415.00	1370.00
Total Variable Costs				73435.00	60906.80
<b>(B) Output (Kg/ha)</b>	50	3195.26	2458.84	159763.0	122942.00
<b>(C) Gross Margin /ha</b>				86328.00	62035.2
<b>(D) Gross Margin/Naira Invested</b>				1.18	1.02

Source: Field survey, 2014

**Table 2. Factors influencing rice profitability among male and female farmers**

Variable	Male	Female
Constant ( $\beta_0$ )	87027.55 (1.03)	76706.61 (2.13**)
Education ( $X_1$ )	11446.03 (0.61)	3157.31 (0.33)
Farming experience ( $X_2$ )	9923.55 (3.59***)	15936 (8.03***)
Cost of labour ( $X_3$ )	-1.704 (-2.11**)	-2.236 (-4.35***)
Cost of fertilizer ( $X_4$ )	-0.420 (-0.11)	-2.624 (1.45)
Cost of agro-chemicals ( $X_5$ )	-17.862 (-0.54)	-40.223 (-2.44**)
Cost of seed ( $X_6$ )	-9.045 (-2.25**)	-14.931 (-13.12***)
Access to credit ( $X_7$ )	0.142 (0.58)	0.2526 (-0.80)
$R^2$	0.53	0.47
F-value	69.7	48.5

Source: Field survey, 2014; \*\*\*Significant at 1%, \*\* significant at 5%; Figures in parenthesis are t-values

coefficient for cost of fertilizer was in line with a priori expectation. Increase in the cost of fertilizer will reduce the profit level. This, notwithstanding, fertilizer is an essential farm input, and one that is critical to rice cultivation.

The estimated parameter for cost of herbicides and insecticides was negative and significant at 5% level for female farmers but insignificant for male farmers. The implication of the result is that as the cost of herbicides and insecticides used for the production of rice increases, the profits realised decreases and vice versa. The sign was as expected because use of herbicides and insecticides reduces drudgery in farm operations such as weeding and clearing as well as increase quantity of output produced stemming from control of pests and diseases.

The coefficient for cost of seed was negatively signed and significant at 1% level for the production of rice by the female respondents and significant but positively signed for the female respondents. The implication of this negative effect for female farmers is that if cost of seed used increases, output will decrease and hence, a decrease in profitability of the enterprise and vice versa for male farmers. Production of rice cannot be embarked upon if seed is not involved in the production process, hence its importance in the enterprise.

The adjusted R square of 0.53 and 0.47 for men and women rice farmers implies that 53 and 47 percent in the variability in factors influencing rice profitability in the study area was explained by the explanatory variables (education, farming experience, cost of labour, cost of fertilizer, cost of agrochemical, cost of seed and access to credit) specified in the model. The F value of 69.7 and 48.5 were statistically significant at 1% probability level and this indicates the joint significance of the specified variables on factors influencing rice profitability in the study area suggesting that the model has a good explanatory power on the variation in the model. The factors that had significant influence on rice profitability were farming experience, cost of labour, cost of agrochemical and cost of seed.

#### 4. CONCLUSION

Rice production was a profitable enterprise in the study area as significant profit was recorded per hectare of land cultivated. The study established that if male and female educated farmers are engaged in the production of rice and with proper

access to credit, more profit will be realized, hence, the enterprise can serve as a means of employment for the populace as well as improving level of living of both male and female farmers.

#### 5. RECOMMENDATIONS

More women should be encouraged to engage in rice production activities as it promises to be a profitable venture. Problem of transportation was identified as a major constraint to the production of rice in the study area. Market access could also be improved by provision of good rural transportation system by government and other stakeholders that would assist farmers to convey their farm produce to the market at cheaper cost.

#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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