

Full Length Research Paper

Economic analysis of rice production in Cross River State, Nigeria

I. U. Odoemenem^{1*} and J. A. Inakwu²

¹Department of Agricultural Economic, University of Agriculture, P. M. B. 2373, Makurdi, Benue State, Nigeria.

²University of Agriculture, P. M. B 2373, Makurdi, Benue State, Nigeria.

Accepted 1 August, 2011

The study was undertaken to examine the economic analysis of rice production in Cross River State of Nigeria. Specifically, the work aimed at examining the socio-economic characteristics of rice producers; identify the production constraints in rice production; identify the resources used for rice production; determine the gross margin and to determine the effect of production inputs on rice output in the study area. The study was carried out through the administration of structured questionnaires and interview. A total of 120 respondents were randomly selected from the study area for this study. Descriptive statistics, gross margin and regression analysis were employed in analyzing the data. The estimated coefficients for all the variables used were significant with the exception of pesticide application and rice variety.

Key words: Small scale, subsistence farmers, family labour, hired labour, lucrative enterprise.

INTRODUCTION

Agriculture contributes a lot to the economy of Nigeria. Not less than 70% of Nigerians earn their living from agriculture and it provides among others food, employment, income and foreign exchange, raw material for the manufacturing sectors (FAO, 1999). Rice is a unique crop grown virtually all over the country, because it requires a wide range of temperature between 20 and 38°C during growth and a long period of sunshine. It can be grown over a wide range of ecological conditions. The prevalent types of rice production systems in Nigeria are the rainfed upland, rainfed lowland and irrigated lowland (Singh et al., 1997). In Nigeria, demand for rice has been increasing at a much faster rate than in any other African country, since the mid 1970 (FAO, 2001). Furthermore, during the 1960s; Nigeria had the lowest per capita annual consumption of rice in West Africa sub region with an annual average of 3 kg. Since then, Nigeria per capita consumption levels have grown significantly at 7.3% per annum (PCU, 2002). Nigeria being the most populous country in Africa with about 124 million people in 1999, has the potential to become a beacon of hope and

Africa's economic giant. However, for this potential role to be achieved, equitable and sustainable economic development in food sufficiency is a prerequisite.

According to FAO (1999), agriculture was the mainstay of the Nigerian economy beyond oil. Rice had been substantially produced in Nigeria to meet local consumption before the oil boom of the 1970s brought in huge foreign exchange, which diverted the disincentive to increase domestic production of rice (Erenstein et al. 2003). This led to acute shortage of rice and increased demand in the 1990s which contrasted with Nigeria's self-sufficiency in rice production during the 1960s (IRR, 1991). In a bid to address the demand-supply gap, government at various times has come up with different policies and programmes. It was observed that those policies were not consistent (Ogundele et al., 2004). The erratic policies reflected the dilemma of securing cheap rice for consumers and fair price for the producers. However, in spite of all these programmes, local rice production has not kept up with domestic consumption demands. The genus *Oryza* belongs to the tribe Oryzaceae in the sub-family Pooideae of the great family Graminae. There are 25 species of *Oryza*. Of these, only two are cultivated *Oryza sativa* L. and *Oryza glaberrima* Steud. *O. sativa* is the common rice grown throughout the

*Corresponding author. E-mail: iodoemenem@yahoo.com.

warmer regions of the world, whereas *O. glaberrima* is grown to a limited extent in the flood plains of West Africa. Indica and japonica are the main sub species of the genus *Sativa*. *O. glaberrima* probably originated around the swampy headwaters of the Niger River in West Africa. Its characteristics are smooth, hairless glumes, red grains, and short legumes with roundish tips, high seed dormancy and stiff upright panicles with few or no secondary branches. Its importance in Africa is decreasing as it is being replaced by modern cultivars of *Oryza sativa*. *O. sativa* has been cultivated in south and East Asia, since ancient times. Zhkorsky (1962) considered that *O. sativa* was domesticated well over 5,000 years ago. The general consensus of opinion is that rice was domesticated in India, probably the coastal area of Eastern India where there are marshy areas. The presence there of wild rice species, the cultivar diversity, including primitive coarse grain forms and the presence of many dominant genes lend support to this view.

According to Singh et al. (1997), disease and pests are important natural factors limiting the production of rice and in severe cases, account for about 100% crop losses. Production of rice in Nigeria is mainly in the hands of small scale farmers who are using unimproved farming techniques. Actual yields of rice differ significantly from potential yields and this has been attributed to low productivity (FMA, 2001). Large losses occur during storage, chiefly as a result of insect and rodent damage. Fungi and bacteria may reduce the quality, if the relative humidity of the air in the storage space remains too high (above 70%) or if rainwater enters the storage building. Fortunately, those losses can be individually eliminated. The cardinal rules for food storage are to allow only clean and properly dried rice to enter the storage and keep to storage building completely rain and rodent proof. The floor should be water tight, so that no moisture seeps upwards through it. The storage should also be fumigated to control insect damage (Onwueme, 1991). Rice has contributed to the socio-economic well being of Nigeria both as a major element in the nation's food security calculations and as a commodity for internal commercial transactions (FAO, 2000).

Rice is primarily consumed in its parboiled form which adds value to rice in the production and consumption chain. It can be used in form of pastries, noodles, puffed rice, fermented sweet rice and related forms. Rice is used in making wine, beer, spirit and vinegar. Rice wine which may contain 10 to 15% alcohol is usually made from glutinous rice. Rice extract from the bran is rich in nutrients such as vitamin E and would not cause high blood cholesterol levels. Unfortunately, the use of rice oil has lagged behind potential value (Onwueme, 1991). Glutinous (sticky) rice has been revealed as a sweet ingredient used by ancient Chinese builders to strengthen their constructions.

FAO (2000) pointed out that the intake of calories by

people in Africa is insufficient to maintain their health and efficiency. As the most practicable way of increasing calorie intake, they suggested consumption of greater amount of rice, provided due regard is paid to the nutritional balance. Economic growth and poverty alleviation in Nigeria will depend to a large extent on the ability of the country to improve on her agriculture, paying more attention to agriculture and improving on rice production will in no small measure improve food security (Erenstein et al., 2003). Indonesia was until 2004, the world's largest importer of rice. Today, Indonesia has with the sense of patriotism surpassed all odds to become self sufficient in the commodity. Nigeria imported rice to the tune of 1.8 million dollars in 2002 alone. The annual demand for rice in the country is estimated at 5 million tons, while production is 3 million, resulting in a deficit of 2 million tons (Chinma, 2004). According to Ogundele (2004), Africa today is described as the "most hunger ridden" continent. The result is unimaginable poverty and degradation of the very essence of human dignity. Unless there is dramatic increase in food production, especially in small scale farming, worse is likely to happen. The aim of this study was to examine among others the effect of production inputs on rice output in the study area.

MATERIALS AND METHODS

The study area

This study was conducted in Cross River State. The State lies within the south-south zone with diverse vegetation belts from the largest tropical rain forest in Nigeria, to mangrove swamps, savannahs, mountains and waterfalls with rare animals, including endangered species and unusual plant families, making it one of the world's richest biodiversity centers attracting scientists and tourists alike. It has a land area of about 21,787 km² with Cameroon to its east and a population of about 2,892,988 people (NPC, 2006). Cross River State soils are richly endowed with fertility. Over 70% of the population of the state is engaged in agriculture. However, small scale and subsistence farmers dominate the sector. Major crops produced in the area include cassava: (*Manihot esculentum*), yam: (*Dioscorea* spp.), maize: (*Zea mais*), cowpea: (*Vigna unguiculata*), banana: (*Musa sapientum*), plantain: (*Musa paradisiacal*), rice: (*O. sativa*), tomato: (*Lycopersicon esculentum*), vegetable: (*Telfaira occidentalis*), and pineapple: (*Ananas comosus*). They also engage in fishing and livestock rearing. Cross Rivers State has a vast 1.8 million ha of untapped agricultural land, extensive water facilities available for irrigation, with rainfall from March to November (NPC, 2006). Opportunities also abound in storage and preservation processing, packaging and marketing of agricultural products.

Data collection

It is impossible and uneconomical to obtain information from all the rice farmers in Cross river state of Nigeria. According to Emaikwu (2008), it is not always possible to determine the size of most populations or to be certain that each element in the population has an equal chance of being included in the sample. Sample size is almost invariably controlled by cost and time (Ogundele, 2004). The factors that make up a feasible sample size are funds, time factor,

Table 1. Socio-economic characteristics of the respondent farmers.

| Index | Frequency | Percentage |
|--------------------|-----------|------------|
| Male | 78 | 65.0 |
| Female | 42 | 35.0 |
| Total | 120 | 100 |
| Family size | | |
| 0-5 | 50 | 41.7 |
| 6 -10 | 56 | 46.7 |
| 11-15 | 14 | 11.7 |
| Total | 120 | 100 |
| Farm size | | |
| 1 - 3 | 94 | 78.3 |
| 4-6 | 15 | 12.5 |
| 7-9 | 10 | 8.3 |
| 9 | 1 | 0.8 |
| Total | 120 | 100 |

Source: Field survey, 2011.

component personnel, transportation facilities. Consequent upon the fact that it is impossible to obtain information from every rice farmer in the study area, coupled with the enormity of its population, a multi-stage random sampling technique was used in selecting the respondents from across the council wards studied. Twelve (12) respondents for each council ward were randomly selected to bring the total population of respondents to 120. Structured questionnaires were administered to the respondents.

Model specification

The analytical methods used in data analysis were inferential statistics, gross margin analysis and descriptive statistics. An econometric model was used to analyze the effect of inputs on rice output. This is because econometric models give room for stochastic error (u). The econometric model is explicitly expressed as follows:

$$Y = a + B_1X_1 + B_2X_2 + B_3X_3 + B_4X_4 + B_5X_5 + B_6X_6 + U$$

Where;

Y = rice output in kg

a = constant factor, representing total rice output

X_1 = land under cultivation in ha

X_2 = total labour used in man-days

X_3 = quantity of rice planted in kg

X_4 = quantity of fertilizer used in kg

X_5 = total cash expenditure on pesticides used

X_6 = rice varieties planted- local variety = 0, improved variety =1

B : (1, 2 ...6) = estimate of the coefficients.

U = An error term measuring variation in rice output unaccounted for by the independent variables.

The effects of variables on changes in rice output. A positive B_i will be found for variables associated with increased rice output, while a negative B_i will be found when a variable is associated with decreased rice output. So, failure to uphold that:

$B_i = B_1 = 0$, suggests that the change in rice output cannot be explained by variation in the independent variables.

Gross margin analysis

Gross margin can be defined as the difference between the gross farm income and the total variable cost. The gross farm income is the total physical product multiplied by the unit price of the product.

$$GM = TR - TC$$

Where

GM = Gross margin of rice production (₦/ha).

RESULTS AND DISCUSSION

From the result in Table 1, 65.0% of rice farmers were male while 35.0% were female. The result indicates that males who are more capable of coping with the drudgery associated with rice farming dominated the study area. Furthermore, the table shows that most respondents' highest family size were between (47.7%) and the least family size was (11.7%). This indicates that farmers had enough family labour for rice production. Table 1 further explained that most respondents had farm size from 1 to 3 ha, (78.3%), 12.5 has between 4 to 6 ha, 8.3% has between 7 to 9 ha of land. This implies that most of the rice farmers' studied were small scale farmers. The result in Table 2 shows that most respondents had rice output of between 500 and 900 kg (25.0%), 19.2 had between 901 and 1300 kg, 15.0% had output of between 1301 and 1700 kg, 17.5% had between 1701 and 2100 kg, 4.2%

Table 2. Distribution of respondents by rice output (kg) and income level (₦).

| Index | Frequency | Percentage |
|-----------------------------|-----------|------------|
| Output | | |
| 500 -900 | 30 | 25.0 |
| 901 -1300 | 23 | 19.2 |
| 1301 -1700 | 18 | 15.0 |
| 1701 -2100 | 21 | 17.5 |
| 2101 2500 | 5 | 4.2 |
| 2500 | 23 | 19.2 |
| Total | 120 | 100 |
| Income level (Naira) | | |
| 50,000 – 100,000 | 30 | 25.0 |
| 1001,000 – 150,000 | 45 | 37.5 |
| 151,000 – 200,000 | 31 | 25.8 |
| 200,000 | 14 | 11.7 |
| Total | 120 | 100 |

Source: Field survey, 2011.

Table 3. Distribution of respondents by production constraints.

| Index | Frequency | Percentage |
|----------------------------------|-----------|------------|
| Inadequate capital | 99 | 82.5 |
| High cost of labour | 81 | 67.5 |
| Inadequate supply of farm inputs | 77 | 64.2 |
| Poor marketing outlet | 57 | 47.5 |
| High cost of pesticides | 84 | 70.0 |
| Land tenure system | 76 | 63.3 |
| High cost of fertilizer | 94 | 78.3 |
| Poor storage facilities | 71 | 59.2 |
| High cost of transportation | 74 | 61.7 |
| Problem of pests and diseases | 72 | 60.0 |

Analysis include multiple response. Source: Field survey, 2011.

had output of between 2101 and 2500 kg and those with output above 2500 kg were 19.2%. This indicates that the output of some respondents were encouraging.

The result in Table 2 further showed that majority of the farmers (37.5%) had annual income of between 1,001,000 and 150,000 Naira (25.8%) had between 150,001 and 200,000 Naira (25.0%) had between 50,000 and 100,000 Naira (11.7%), had greater than 200,000 Naira. The average income of most rice farmers in the study area was 75, 000 Naira which is very low for any serious rice farming. This result agrees with the findings of Ogundele et al. (2004) that small-scale farmers in the study area do not make enough money to increase their rice production. Table 3 shows that the major rice production constraints faced by farmers in the study area were; inadequate capital (82.5%), high cost of labour (67.5%), inadequate supply of farm inputs (64.2%), land

tenure system (63.3%), high cost of fertilizer (78.3%) among others. This implies that inadequate capital, high cost of fertilizer and high cost of pesticides as also pointed out by PCU (2001), constitute the major production constraints faced by farmers in the study area. The result in Table 4 shows that 41.7% of the respondents used fertilizer and pesticides, (20.8%) used only fertilizer, (10.0%) used only pesticides and (27.5) used none. This result implies that most of the respondents used both fertilizer and pesticide for rice production in their farm operations. This finding is in line with FMA (2001).

Gross margin analysis

The result in Table 5 shows that an average rice farmer

Table 4. Distribution of respondents by the use of fertilizer and pesticides.

| Index | Frequency | Percentage |
|------------|-----------|------------|
| Fertilizer | 25 | 20.8 |
| Pesticides | 12 | 10.0 |
| Both | 50 | 41.7 |
| None | 33 | 27.5 |
| Total | 120 | 100 |

Source: Field survey, 2011.

Table 5. Gross margin analysis for average rice farmers in Cross River State of Nigeria.

| Items | Amount (Naira) |
|----------------------------|----------------|
| Rice seed | 555.00 |
| Fertilizer cost | 47998.92 |
| Pesticide cost | 2776.67 |
| Land clearing | 1603.08 |
| Planting | 4068.73 |
| Weeding | 3285.20 |
| Fertilizer application | 1380.06 |
| Pesticide application | 1439.00 |
| Transportation cost | |
| Harvest cost | 2888.33 |
| Gross income | 117213.38 |
| Total variable cost (TVC) | 25875.12 |
| Gross Margin | 91338.26 |

Source: Field survey, 2011.

Table 6. Estimated multiple linear regression analysis.

| Variables | Beta coefficient | Standard error | Significant level |
|-----------------------|------------------|----------------|-------------------|
| Constant | 1298.375 | 135.530 | 0.255 |
| Pesticide cost | -508.151 | 394.702 | 0.201 |
| Fertilizer | 899.528 | 578.585 | 0.628 |
| Rice variety | 41.768 | 85.967 | 0.014** |
| Farm size | 0.330 | 0.139 | 0.930 |
| Pesticide application | 684.17 | 344.613 | 0.050** |
| | 80.200 | 2.276 | |
| | 0.320 | | |
| Rice seed | 1.102 | | |
| | 0.055 | | |
| | 2.147 | | |

in the study area incurred a total variable cost (TVC) of 25,875.12 Naira. This means that an average rice farmer studied earned a gross margin of 91,338.26 Naira. This result implies that rice production is a lucrative/ profitable

enterprise in the study area. Table 6 presents the result of the estimated multiple linear regression analysis. Rice output was regressed on fertilizer, pesticide cost, farm size, rice seed, pesticide application and variety of rice.

The estimated coefficients for all the variables used were insignificant except pesticide application and rice variety. This implies that these variables have no influence on rice output. However, the use of improved variety of rice has significant influence on rice output relative to that of local variety. Similarly, increase in the use of pesticide increased rice output. More specially, an increase in investment in pesticide by one unit increased rice output or yield by 684.2 kg, also a unit increase in pesticide application increased rice output by 41.8 kg.

Conclusion

The study was carried out in Cross River State of Nigeria. The findings revealed that majority of the rice farmers employed both family and hired labour as their source of labour. The gross margin analysis revealed that rice production was a lucrative enterprise in the study area with an average rice farmer earning a gross margin of 91,338.26 Naira per ha in the study area. Furthermore, the multiple linear regression analysis showed that variation in output of rice is explained by variation in pesticides application and the varieties of rice planted – local or improved. This means, the more pesticide is applied and at appropriate time, the more the farm is kept weed free; free from insect attack and the more higher output is realized. The use of the improved variety of rice, which yields more, is photoperiod insensitive, less vulnerable to diseases and insects, and rodent attacks, and produces a higher output.

ACKNOWLEDGEMENT

We acknowledge with gratitude the technical assistance received from Ms. Dodo, University of Agriculture, Makurdi, Benue State.

REFERENCES

- Chinma G (2004). Rice at Risk, Green Peace International Organization; Item ID 616740.
- Erenstein O, Frederic L, Titilola G, Akpokadje G, Ogundele O (2003). The Nigerian Rice Economy in a Competitive World: Constraint, Opportunities and Strategic Choices: Rice Production System in Nigeria: A Survey of WARDA, Abidjan, Cote d'Ivoire.
- Emaikwu SO (2008). Fundamentals of Educational Research Methods and Statistics. Davay Prints Ltd. Keffi road/Lagos Street, Kaduna, Nigeria.
- FAO (1999). Food and Agricultural Organization. "Food Outlook", p. 15.
- FAO (2000). Food and Agricultural Organization. "Rice Information" Vol. 2 Rome, Italy.
- FAO (2001). Food and Agricultural Organization. "Workshop on Policy Support for Rapid Adoption of Hybrid Rice on Large Scale Production in Asia" Hanoi; Vietnam, final Report, p. 10.
- FMA (2001). Federal Ministry of Agriculture, Annual Review, Abuja, Nigeria.
- IRR (1991). "International rice Research Institute" World Rice Statistics, pp. 34-42.
- NPC (2006). National Population Census.
- Ogundele OO, Fredric L (2004). "Rice Production System in Nigeria" WARDA Abidjan, Cote d'Ivoire, Rice Res. Notes, 29(1): 82-83.
- Onwueme IC, Sinha TD (1991). "Field Crop Production in Tropical Africa, Principle and Practice" CTA, Netherlands.
- PCU (2002). Project Coordinating Unit, "Crop Area Yield Survey" Federal Ministry of Agriculture and Rural Development, Abuja, Nigeria.
- Singh MO, Mowa YA (1997). Rice Growing Environments and Biophysical Constraints in Different Agroecological Zones of Nigeria. Met, 1, 2(1): 35- 44.
- Zhukovsky M (1962). "Field Crop Production in Tropical Africa: Principles and Practice" CTA Netherlands.