Original Research Article

Swamp rice production in Ogoja Local Government Area of Cross River State, Nigeria: An imperative for rice value chain of the agricultural transformation agenda

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The study examined the economics of swamp rice production in Ogoja Local Government Area of Cross River State Nigeria as an imperative for rice value chain of the Agricultural Transformation Agenda. The specific objectives were to describe the socio- economic characteristics of the respondents, determine cost and returns of swamp rice production, determine the relationship between input and output used and to identify the constraints of swamp rice production. Primary data were collected from 120 swamp rice farmers with the aid of structured questionnaire using random sampling technique. Data collected were analyzed using descriptive statistics and production function analysis. Results of the analysis revealed that majority of the respondents (93.3%) were males, 88.40 % were educated (35% primary education, 29.2 % secondary and 24.2% tertiary education).Swamp rice production was profitable as revealed by a gross margin and net farm income of ₦91,604.01 and ₦88,986.01 per hectare. The production function analysis indicated that farm size, family labour, fertilizer and herbicide were significantly related with rice output. The major constraints to swamp rice production in the study area include high cost of labour, inadequate supply of input, high cost of fertilizer; pest and diseases, land tenure system, poor storage facilities and poor marketing. Recommendations to overcome the identified constraints were made in the study.

Key words: Swamp rice, production function, budgetary technique, value chain

INTRODUCTION

Rice is valued as the most important staple food for major population of the world and is deeply embedded in the cultural heritage of many societies. It is a staple food for more than half of the world's population and has become increasingly important in Africa, both as a food source and as an economic commodity (Food and Agriculture Organization, FAO, 2004). It is now the continent's most rapidly growing food source. African rice production increased from 8.6 million tonnes in 1996 to 14.6 million tonnes in 2006 (FAO, 2007). Rice is cultivated in virtually all the agro-ecological zones in Nigeria. Rain-fed lowland rice is the most predominant rice production system in Nigeria, accounting for nearly 50% of the total rice – growing area in Nigeria; 30% of production is rain-fed upland rice, while just 16% is high yielding irrigated system (Rice Data System in Nigeria, 2012). In 2000, out of about 25 million hectares of land under cultivation with various food crops, only about 6.37% was under rice cultivation. During this period, the average national yield was 1.47 tonnes per hectare. Significant improvement in rice production in Nigeria occurred in 1980 when output increased to 1 million tonnes and the area cultivated and yield rose to 550 thousand hectares and 1.98 tonnes per hectare, respectively (Akande, 2002).

Table 1. Rice imports in Nigeria from 1980 to 2009

Year	Imports (`000 tonnes)	Amount (million US$)
1980- 1982	1646.00	942.6
1983 -1985	1265.00	497.4
1986 – 1988	920.00	227.00
1989 – 1991	730.00	200.00
1992 – 1994	1061.26	286.00
1995 – 1997	9631.53	885.12
1998 – 2000	16118.577	918.00
2001 – 2003	7597.911	579.00
2004 – 2006	4500.00	220.00
2007 – 2009	3200.00	NA

Source: Moses (2012)

By 1990, Nigeria was producing 3.4 million tonnes of rice from about 1.2 million hectares (Imolehin, 1991). Increased production over the last two decades could be attributed to the ban imposed on rice imports in 1985 and, if this restriction had been maintained, Nigerian rice farmers would have risen to the challenge of meeting the domestic demand for the commodity. In the 1960s, Nigeria was almost 99 percent self-sufficient in the rice consumed by its citizens. Between 1970 and 1980 rice production decline to 38%, leading to demand outstripping supply (Imolehin and Wada, 2000). To supplement the 62% deficit, the Federal Government of Nigeria resorted to massive importation of rice (Table 1). Per caput rice consumption rose from 3.5 kg in 1970 to more than 4 kg in the 1990s due to   increased per capita income, rapid population growth and changes in the tastes and diet of Nigerians (Akande 2002). The demand for parboiled rice forced the government to commit ₦600 million in foreign exchange to milled rice imports in 1985 and the imposition of a ban on rice imports in October of the same year (Moses, 2012).

The production and consumption levels of rice in Nigeria have increased substantially leading to a surge in rice import and making it a political commodity. For instance, the Nigerian Government had on first May 2008 announced the importation of 50,000 metric tonnes of rice worth $600 million as an interim measure to cushion the impact of global food crisis on vulnerable Nigerians (Moses, 2012). In 2010 alone, Nigeria spent ₦356 billion on rice with an estimated consumption of 5 MT in 2010 and is expected to reach 36 MT by 2050 with 5.1% annual growth. Currently, Nigeria is the world number 2 importer of rice, importing2Million metric tons of rice. The high importation is however linked to the increasing population being witnessed in Nigeria and also increasing share of rice in Nigerians diet (This Day Live, 2011).

In summary, increasing population and share of rice in Nigerians' diet are the drivers of high demand for rice. However, due to high demand-supply gap being witnessed and volatility of rice prices in the world market, there is the need to increase rice production and yield in Nigeria. High global demand for rice and thin trading volume being witnessed, are the major causes of rice price volatility in the global market.

Rice is not only a key source of food, but also a major employer of labour and source of income for the poor. Rice based production activities provide employment for several hundred million people among the poor resource based nations and developing countries in tropical Africa including Nigeria (Guy, 2004). Paddy rice production trend (Table 2) showed tremendous increases in area planted; output and yield in paddy rice production were achieved over the periods in Nigeria. Government policies since 1974 were aimed at encouraging and boosting local rice production. Local rice production has not kept up with the domestic consumption demands of the Nigerian populace and, consequently, rice is still being imported (Singh et al., 1997, Moses and Adebayo, 2007).

Inconsistent government policy on rice imports has seriously affected local production   Government in addressing this problem introduced the   agricultural transformation agenda of the Federal Ministry of Agriculture and Rural Development to transform the Nigerian agriculture. The vision in the transformation strategy is to achieve a hunger-free Nigeria through an agricultural sector that drives income growth, accelerates achievement of food and nutritional security, generates employment and transforms Nigeria into a leading player in global food markets to grow wealth for millions of farmers. Transformation action plan for some priority agricultural commodities which are focused in the six geopolitical zones of the country. The commodities are rice, cassava, sorghum, cocoa cotton, maize, dairy, beef, leather, poultry, oil palm, fisheries as well as agricultural extension.

For instance, rice transformation plan would involve massive local production of milled rice which will be aimed at substituting parboiled (imported) rice. The expectation is that with the advent of high quality lower cost milled rice, a significant portion of demand in the domestic rice market will shift from parboiled rice to milled rice. Job creation in rice   production   is   expected   to   be   through   primary

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Source: Moses (2012)

production, plantation establishment and value chain with an estimated 1Million jobs to be created by 2015. Value chain is a sequence marked by value growth and coordination at each stage of production, processing, distribution, driven by consumer demand. It carried with it a range of support function such as input supply, financial services, transport, packaging, marketing research and advertising. The features of a value chain are coordination of all links in the chain, value added at each stage and market led approach responding to local, national and international consumer demand (Spore, 2012).

Several studies conducted on rice such as Shehu et al.(2007); Tashikalma(2011) and Moses(2012) considered rainfed and irrigated rice production and not Swamp rice production. Considering the importance of rice value chain in transformation agenda of the government, the study was conducted to examine swamp rice production in Ogoja Local Government Area of Cross River State Nigeria as an imperative for rice value chain of the agricultural transformation agenda. The specific objectives were to describe the socio- economic characteristics of the respondents, determine cost and returns of swamp rice production, and determine the relationship between input and output used and to identify the constraints of swamp rice production.

METHODOLOGY

The study area

The study was carried out in Ogoja Local Government Area of Cross River State. Ogoja Local Government Area is in the Northern Senatorial District of Cross River State and lies between Latitudes $6^o 39´ 17´´$ and $7^o 34´$ N of the equator and Longitude $8^o 47´51´´$ E of the Greenwich Meridian. It shares boundary to the south East by Bekwarra Local Government Area, in the West by Yala Local Government Area, Ikom Local Government Area to the South and in the East by Obudu Local Government Area. The Local

Government Area has a population of 171,901 (NPC, 2006). The Local Government Area is rich in fertile soil. The people of the Local Government Area are mostly farmers growing a variety of crops such as cassava, rice, yam, plantain, and pineapple. Other occupations in the State include small and medium scale businesses and jobs done by artisans and civil servants who engage in farming on part time basis. They also engage in fishing and livestock rearing. The relief of the area is mostly sloppy and lowland with extensive water facilities available for irrigation and rainfall from March to November. This favours the cultivation of swamp rice.

Sampling techniques

Purposive and simple random samplings were used in the selection of the respondents. Four council wards that are notable in rice production were selected purposively from the ten council wards. Three villages were randomly selected from each council ward giving a total of 12 villages. 120 rice farmers were randomly chosen from the twelve villages proportionate to size and were served with structured questionnaires.

Data analysis

Data collected were analyzed using descriptive statistics, budgetary technique and Production Function. The relationship between input and output using the general form is specified as $Y= f(X_1 + X_2 + X_3 + \ldots X_n + \mu)$ (1)

Four functional forms were used to select the equation of best fit

Linear function

$Y = \beta_o + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \ldots \beta_8 X_8 + \mu$ (2)

Exponential function

$Log Y = \beta_o + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \ldots \beta_8 X_8 + \mu$ (3)

Semi-logarithm function

Table 3. Socio- economic Distribution of Respondents (N= 120)

Variable	Frequency	Percentage
Gender		
Male	112	93.3
Female	8	6.7
Age Range (years)		
≤ 30	15	12.5
31- 40	22	18.5
41-50	58	48.3
51- 60	25	20.8
Marital status		
Married	94	78.3
Single	21	17.5
Divorced	2	1.7
Widowed	3	2.5
Household size		
1-5	72	60.0
6-10	37	30.8
11-15	11	9.2
Educational background		
No formal education	14	11.6
Primary education	42	35.0
Secondary education	35	29.2
Tertiary education	29	24.2
Farming experience(years)		
1-5	25	20.8
6-10	34	28.3
11-15	39	32.5
16-20	10	8.3
21-25	12	10.0
Farm size(hectares)		
1-3	110	91.7
4-6	10	8.3
Occupation		
Farming	89	74.2
Civil service	9	7.5
Business men	3	2.5
Students	12	10.0
Carpentry	2	1.7
Driving	4	3.3
Tailoring	1	0.8
Land acquisition		
Inheritance	33	27.5
Purchase	55	45.8
Hired	32	26.7

Source: Field survey 2012

$Y = \beta_o + \beta_1 \log X_1 + \beta_2 \log X_2 + \beta_3 \log X_3 + \beta_4 \log X_4 + \beta_5 \log X_{5......} + \beta_8 \log X_8 + \mu$ (4)

Double-logarithm

$\text{Log } Y = \beta_o + \beta_1 \log X_1 + \beta_2 \log X_2 + \beta_3 \log X_3 + \beta_4 \log X_4 + \beta_5 \log X_{5......} + \beta_8 \log X_8 + \mu$ (5)

Where: Y = Output of swamp rice (kg/ha) of the ith farmer, X_1 = farm size (ha); X_2 = Hired labour (mandays); X_3 = family labour (man days); X_4 = Education (years); X_5 = Household size (numbers); X_6 = Farming experience (years); X_7 = Quantity of fertilizer used (in

kg); X_8 = Quantity of herbicides used (litres), $\beta_o = \beta_8$ estimates of the coefficients and μ = error term.

The budgetary technique used for cost and return analysis is the gross margin. The gross margin per hectare, which is the difference between total revenue per hectare and total variable costs per hectare, is expressed by:

$TR = \sum Q_y P_y - \sum X_i P x_i$

Where TR= total revenue; G Q_y = output (kg/ha); P_y = unit price of the output (₦), $Q_y P_y$ = total revenue derived per hectare, X_i = quantity of the ith input/ ha, Px_i = price per unit of the ith input/ ha, $X_i Px_i$ = total cost associated with ith input /ha and $\sum$= summation sign.

Thus,

GM =TR – TVC   (7)

NFI = GM – TFC   (8)

Where TR = total revenue (₦/ha), TVC = total variable cost (₦ /ha); TFC= total fixed cost (₦ /ha) and NFI = net farm income (₦ /ha)

RESULTS AND DISCUSSION

Socio-economic characteristics of respondents

Data in Table 3 shows that majority (69.10 %) is aged 41 to 60 years with a mean age of 47 years. They are relatively older and their productivity is expected to decline. Rice cultivation is dominated by males (93.30%) and majority of them are married (78.30%) Rice farmers are educated (88.40%) and education has been found to be a catalyst in farmers' adoption and productivity. Furthermore, 91.70 % of the respondents cultivated between 1 and 3 hectares with a mean holding of 1.00 hectares. Studies on the production of rice in Nigeria revealed that production is mainly by smallholder farmers. Similarly, majority of the respondents are well experienced in the range of 11 years and above in rice farming. Rice farmers are characterized by small family sizes of 1-5 members with a mean family size of 6 people, a repository of labour for production activities. Also, 74.20 % of the respondents had farming as their major occupation and majority of them obtained their farm land for rice production through purchase.

Cost and returns to swamp rice production

Analysis of the budgetary techniques as contained in Table 4 based on per hectare of rice production reveals associated cost and revenue. Swamp rice production revealed a total revenue of ₦121, 327.06 while variable and fixed cost were ₦29, 723.05 and ₦2,618.00. The gross margin and net farm income were ₦91, 604.01 and ₦88, 986.01 respectively. The result shows that rice production was a profitable venture in the study area. The result is in

Table 4. Average Costs and Returns of Rice Farmers/ hectare

Items	Amount (₦)
Variable cost	
Rent on land	₦ 4,188.00
Fertilizer	₦ 8,850.10
Herbicide	₦ 5,115.10
Rice seeds	₦ 4,620.00
Family labour	₦ 1,328.00
Hired labour	₦ 4,382.59
Transportation	₦ 904.75
Other expenses	₦ 334.51
TVC	₦29,723.05
Rice Output(kg)	**2,022.12**
Price/Kg	₦ 60.00
TR	₦ 121,327.06
GM= TR- TVC	₦ 91,604.01
Depreciation on fixed cost items	₦ 2,618.00
NFI (GM- TC)	₦ 88,986.01

Table 5. Analysis of the relationship between inputs and output

Variables	Parameter	Coefficient	T.value
Constant	β_0	-862.315	-0.955
Farm size	X_1	3663.531***	4.304
Hired labour	X_2	139.858	0.969
Family labour	X_3	225.299*	1.842
Fertilizer	X_4	1249.963***	4.009
Herbicide use	X_5	1739.263***	4.420
R^2adjusted 0.543			
F- ratio 16.513***			

Source: Data analysis *** Significant at 1% * Significant at 10%

conformity with the works of (Ohajianya (2003); Ogundari (2008); Tashikalma (2011) ; Odemenem and Inakwu 2011) who reported that rice production is a profitable venture among small scale producers in Nigeria.

Relationship between input and output use in production

In order to evaluate the influence of selected variables on rice output in the study area, a production function was fitted to the data using four functional forms in an ordinary least square(OLS) technique. Cobb - Douglas gave the best fit and the result is presented in Table 5. The coefficient of multiple determination was 0.543 which implied that 54.30% of the variation in swamp rice output was attributed to the variables included in the model. All variables carried the expected signs. The coefficient for farm size was positively signed and statistically significant at 1% probability. Farm size has been found to be a critical factor in rice production. Several studies conducted by Idiong (2007), Shehu and Mshelia (2007) and Moses and

Adebayo (2007) laid credence to this findings. A unit increase in farm size will lead to an increase of 3663.53 kg of rice ceteris paribus. Fertilizer and herbicides were also significant at 1% level and are factors that contributed to rice output. The result is line with the study conducted by Shehu et al,(2007) who reported that fertilizers and herbicides are necessary input in rice production in Nigeria. Family labour was also statistically significant at 10% and is in conformity with the works of Maurice et al, (2005) who found out that family labour is widely used in rice production.

The constraints of swamp rice production

Analysis in Table 6 revealed constraints of swamp rice production in the study. The result revealed that high cost of labour (75.80), land tenure problem (67.50%), poor market system (63.30%) lack of finance (60.00%), poor storage facility (55.80%) and inadequate supply of inputs (53.30%) were major constraints experienced by the respondents. High cost of labour may not be unconnected

Table 6. Distribution of respondents based on problems of swamp rice production

Identified problems	Frequency	Percentage
High cost of labour	91	75.80
Inadequate supply of inputs	64	53.30
Pests and diseases	56	46.80
Land tenure system	81	67.50
Lack of improved variety	41	34.20
Poor market system	76	63.30
Poor storage facility	67	55.80
Lack of finance	72	60.00
Lack of extension service	35	29.20
Total	**583***	

Source: Field survey 2012. * Multiple responses

with the fact that the study area falls within the oil belt of Nigeria with the prospect for high wage that attracts able bodied young men than the agricultural sub sector (Uraih et al., 2006). Addressing these problems will increase the production of rice in the study area.

Conclusion

Swamp rice production is mainly done by male farmers, majority of the respondents were married, and in their prime of age, majority having a family size of at least 6 people. Only very few had no formal education. Swamp rice production was profitable as revealed by a gross margin and net farm income of ₦91,604.01 and ₦88,986.01 per hectare. The production function analysis indicated that farm size, family labour, fertilizer and herbicide were significantly related with rice output. The major constraints to swamp rice production in the study area included high cost of labour, inadequate supply of input, high cost of fertilizer; pest and diseases, land tenure system, poor storage facilities and poor marketing.

Recommendations

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

i.   Farmers should be encouraged to form cooperative societies so as to enable them obtain loans from Commercial Banks and the Agricultural and Rural Cooperative Bank, at regulated interest rates, this may likely reduce the cost of production.

ii.   The study recommends the deregulation of input prices, such as fertilizer, agro chemical, and seed, through subsidy, soft loans, timely and efficient distribution of inputs to farmers by the government to improve production.

iii.   Farmers should be encouraged to adopt the use of labour saving technologies such as tractors, harrows, and herbicide to reduce the high cost of labour on the farm. In relation to this government should subsidized farm machines, this will go a long way in improving farmers efficiency; and

iv.   Improved seeds for planting materials that are of early maturing and disease resistant varieties should be multiplied and be made available to rice farmers at subsidized prices.

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