Global Journal of Agricultural Research
Vol.2, No.4, pp. 11-18, December 2014
Published by European Centre for Research Training and Development UK (www.eajournals.org)

RESOURCE-USE AND ALLOCATIVE EFFICIENCY OF PADDY RICE PRODUCTION IN NIGER DELTA REGION OF NIGERIA

Kadiri, F. A.; C. C. Eze; J.S. Orebiyi; S. U. O. Onyeagocha.

ABSTRACT*: The study examined resource-use and allocative efficiency of paddy rice production in the Niger Delta Region of Nigeria with the view of determining the profitability, resource productivity and allocative efficiency of inputs used in rice production in the study area. The data for the study was collected from 300 rice farmers in three out of nine states in the region based on their intensity in rice production in the study area using multistage and simple random sampling technique.Data analysis was carried out using descriptive statistics, profitability model and allocative efficiency model. Rice production was found to be profitable as farmers realized* **₦319,046.84***/ha as Gross Margin in the study area. Result of the allocative efficiency of inputs confirmed thatrice producers in the area did not attain optimal allocative efficiency, seed input (0.94) had the highest allocative efficiency while land input (0.05) showed the least allocative efficient input. It was recommended that concerted efforts from individual rice farmers and government to establish farmers' participatory extension service to ensure timely supply and proper use of rice farm inputs in order to improve farmers' resource use efficiency.*

KEYWORDS*:* Resource – Use: Allocative Efficiency, Paddy Rice, Niger Delta, Nigeria.

INTRODUCTION

\

Globally, rice is a very important food crop. It is an ancient crop consumed as healthy and staple food by more than half of the world population. Rice is consumed by more than 4.8 billion people in 176 countries and is the most important food crop for over 2.89 billion people in Asia, over 40 million people in Africa and over 150.3 million people in America (Biyi, 2005). According to Jones, (1995), rice is the second most important cereal in the world after wheat in terms of production; while Nigeria ranks the highest as both producer and consumer of rice in the West Africa sub region. Rice is an increasingly important crop in Nigeria. It is relatively easy to produce and it is grown for sale and for home consumption. In some areas there is a long tradition of rice growing, but for many, it is considered a luxury food for special occasion only. With the increased availability of rice, it has become part of the everyday diet of many in Nigeria. There are many varieties of rice grown in Nigeria; some of these are traditional varieties while others have been introduced into the country. Rice is grown virtually in all the agro-ecological zones in Nigeria (Akande, 2003). This is because, Nigeria have ideal climatic conditions which is akin to that of South East Asia where the crop is produced for export. Although rice production in Nigeria has boomed over the years, there has been a considerable lag between production (supply) and demand level with imports making up the shortfall. According to the Nigerian Agricultural Policy document (Federal Republic of Nigeria, 1989) specific objective of agricultural sector policies is the attainment of self-sufficiency in basic food commodities with particular reference to those food commodities which consume considerable shares of Nigeria's foreign exchange and which can be produced locally within the country. In this regard therefore, Nigeria will aim to be more than self-sufficient in the production of all cereals except wheat, most roots and tubers, most grain

ISSN 2053-5805(Print), ISSN 2053-5813(Online)

legumes, most oil seeds and nuts, most vegetables and fruits and most vegetable oils. Going by this policy scenario therefore production of rice in Nigeria is bound to expand for several reasons: Rice import consumes considerable share of Nigeria's foreign exchange; the proportion of rice in the food basket of Nigerians has continued to rise and Nigeria has the capacity for the expansion of rice production.

In Nigeria, rice grown on 1.77 million hectares ranks fifth after sorghum (4.0m ha), millet (3.5m ha.), cassava (2.0m ha) and yam (2.0mha), but if placed on a social scale, it can well be ranked first because it is no longer just a mere festival meal as in the past, but the staple of most homes in urban, and rural area (Longtau, 2003). Nigeria is endowed with favourable ecologies for rice cultivation. Virtually all the rice growing ecologies (the upland irrigated, inland valley swamp, deep water floating and tidal mangrove swamp) abound in Nigeria.

The study will be of immense importance to all the agencies like Rice Farmers Association of Nigeria (RFAN), Agricultural Development Programme (ADP), Fadama Project, Federal Ministry of Agriculture and Rural Development etc. involved in rice production as the most technically efficient way of combining different rice inputs for maximum rice production for policy formulation and decision making.Technical efficiency and allocative efficiency are two important concepts relating to production function. Technical efficiency refers to the ability of producers to obtain a certain level of outputs, while allocative efficiency is the ability to choose the level of inputs that maximizes profit, given factor cost (Olayide and Heady, 1982). According to Umoh and Yusuf (1999), productivity is generally measured in terms of the efficiency with which factor inputs, such as land, labour, fertilizer, herbicides, tools, seeds and equipment*etc* are converted to output within the production process. Resource use is a concept to designate the allocation of resources such as land, labor, capital and management in their various forms between competing alternatives (Olayide and Heady, 1982). They further defined agricultural productivity as an index of the ratio of farm output to the value of the total inputs used in producing the output. They also agreed that resource productivity is definable in terms of individual inputs or a combination of them. They opined that maximum resource productivity would imply obtaining the maximum possible output from minimum possible set of inputs. Thus optimal productivity of resources implies an efficient utilization of resources in production process. This implies that productivity and technical efficiency are synonymous. The objectives of the study include to:

i assess the socio-economic characteristics of rice farmers in the region
ii determine the costs and return associated with rice production systems
iii measure the allocative efficiency of resource-use in rice production in the study area;

MATERIALS AND METHODS

The study was carried out in the Niger Delta Region of Nigeria. This region is a densely populated region sometimes called the Oil Rivers because it was once a major producer of palm oil. The Niger Delta, as defined by the Nigerian Government, covers over 70,000km^2 and makes up 7.5% of Nigeria's land mass (Wikipedia, 2010). Historically and cartographically, it consists of present day Akwa-Ibom, Abia, Bayelsa, Cross-River, Delta, Edo, Imo Ondo and Rivers states. The South-South Niger Delta includes Akwa-Ibom, Bayelsa, Cross River, Delta, Edo and Rivers States; South-East includes Imo and Abia states while Ondo state constitutes the South West Niger Delta State.

ISSN 2053-5805(Print), ISSN 2053-5813(Online)

A representative sample was selected for the study using a multistage sampling technique. Three states, Abia, Ondo and Imo States were purposively selected because of their relative strength in rice production. Two Local Government Areas from each of the state, Abia (Arochukwu and Bende LGAs), Imo (Okigwe and Ihitte-Uboma LGAs), Ondo (Akoko North and Odigbo LGAs) were purposively selected based on their rice production intensity making a total of six Local Government Areas (LGAs). In each LGA selected, a list of rice producing communities was compiled through the assistance of Agricultural Development Programme's staff. From this list, five communities were selected randomly giving a total of thirty communities. In each of the selected communities ten rice farming households were randomly selected giving a total of fifty (50) farmers per LGA and hence a total of three hundred rice farmers. This technique gave every rice farmer in each community an equal opportunity of being part of the study.

Data for this study were collected from both primary and secondary sources. Primary sources include information that was obtained from oral interview, observations and interview schedule. Two sets of interview schedule were used: the village level and farmer household level.Structured interview schedule was utilized in gathering primary data.Secondary source of information include journals, text books, internet search, websites, published and unpublished materials relevant to the study.

Objective 1 was analysed using descriptive statistics while objectives 2 and 3 were analysed using profitability and allocative efficiency models as shown in equations 1 to 7 respectively
The profitability model used in the analysis of profitability in rice production in the study area as given by Odii, (1998): is given as:-

GM = TR – TVC _____equ 1

NFI = TR – ((TFC + TVC) + Inventory Adjustment (IA))_____equ 2

Return on Investment = Net Income/ Total Cost_____equ 3

% rate of return on investment (% RRI) = (Net Income/ Total Cost) x 100_____equ 4.

Where:
GM = Gross Margin
TR = Total Revenue
TVC = Total Variable Cost
NFI = Net Farm Income
TFC = Total Fixed Cost
TC = Total Cost = (TFC + TVC) and
I.A = Inventory Adjustment.

Allocative Efficiency Model

The allocative efficiency model was used to achieve objective iii, which is to determine the efficiency of resource-use in rice production. This was used to estimate the level at which farmers can allocate resource inputs to maximize profit. The Marginal Value Product (MVP) is obtained by multiplying the Marginal Physical Product (MPP) and the unit Price (P) per kilogramme of (paddy) rice produced:

MVPi = P x Q (MPPi) _____equ 5

Again, the Marginal Value Product is equated to the Marginal Factor Cost, which is the unit price of each input. A ratio of one (1) indicated that rice farmers are allocatively efficient in

ISSN 2053-5805(Print), ISSN 2053-5813(Online)

the use of that input, deviation from one indicate inefficiency in the use of that input. The model is thus expressed by:

MVPi = MFCi_____equ 6

MVP / MFC = 1= Allocative efficiency

1 - (MVP/MFC) = Allocative inefficiency_____equ 7.

The import of the model is that, a ratio of less than unity shows over utilization of the resource and profit would be increased by decreasing the quantity used of that input. Underutilization of these resources is indicated by a ratio greater than unity. An increase in the rate of use of that input will increase the level of profit of the fir

RESULTS AND DISCUSSION

Table 1presents the socio-economic characteristics of the respondents

Socio-economic characteristics of respondents	Percentage (%)	Mean
Age:		
25 – 35	10.33%	49years
36 – 45	27.67%	
46 – 55	35.00%	
56 – 65	17.33%	
66 – 75	9.69%	
Marital Status:		
Single	9.33%	
Married	70.00%	
Divorced	10.00%	
Separated	1.00%	
Widowed	9.67%	
Gender:		
Male	64.33%	
Female	33.67%	
Participation:		
Part time farming	61.00%	
Full time farming	39.00%	
Educational attainment		6- 10 years
Years of experience in rice farming		17 years
Farm size		2.32 (ha)
Farmers household size		6

Source: Field Survey Data, 2012.

Table 1 presents the mean of the socio economic characteristics of rice farmers in the study area. The table showed that most of the respondents fell within the age group 36 – 55years which was about 62.66% of the total sample, with a mean of 49years. This implied that rice farming is being practised by middle age farmers. This finding is consistent with the findings of Ibitoye*et. al*., (2012), who found that the mean age of rice farmers in their study area, was 45years. This showed that rice farmers belong to the middle age classes, who are physically fit to withstand the stress and risks involved in rice production, and are more mentally alert to embrace new techniques of rice production. Also, rice production in the study area was

ISSN 2053-5805(Print), ISSN 2053-5813(Online)

dominated by male farmers who comprised of 64.33% of sampled farmers. This is in contrast with Ibitoye, *et al.,* (2012) who found out that there were more female rice farmers than males in their study area. The result also showed that 69% of rice farmers were part time farmers and 70.00% were married, this implied that rice farmers were people with high responsibility who needed income from other sources to meet up with their financial obligations. The table also showed that rice farming has been a long time practice amongst the farmers in the study area which on the average was 17 years. The level of education attained was (6 – 10 years) on the average and the experience attained over the years will assist the farmers to be able to adopt new technologies. Lastly, the result showed that farmers in the study area were small – scale farmers (2.32 hectare) and this small farm size make mechanization difficult thereby limiting output of rice to subsistence level leaving little for commercial. Also,Ibitoye*et al.,* (2012) confirmed that (53.00%) of rice farmers in Ibaji cultivated between 1-3 hectares.
Table 2 presents the costs and return of (paddy) rice production in the study area.

Item	**Unit price (₦)**	**Total Unit/ha**	**Value (₦)/ ha**
1. Rice revenue (TR)	**138.75/kg**	**4713.25kg**	**₦653,963.44**
2. Variable costs			
a. cost of seed	60.00/kg	63.45kg	₦3,807.00
b. Fertilizer cost	120.00/kg	48.68kg	₦5,841.60
c. Herbicide cost	250.00/kg	2.42kg	₦ 605.00
d. Labor costs			
i. Family labor cost	2000.00/MD	107.22MD	₦214,433.00
ii. Hired labor cost	2000.00/MD	55.12MD	₦110,230.00
Total labor cost (TLC)			**₦324,663.00**
Total Variable Cost (TVC)			**₦334,916.60**
Gross Margin (GM) = TR – TVC			**₦319,046.84**
4. Fixed cost			
a. Investment cost			₦6,975.00
b. Land rent			₦10,000.00
Total Fixed Cost (TFC)			**₦16,975.00**
Total cost (TC) = TFC + TVC			**₦351,891.60**
5. Inventory Adjustment (I.A) (Assumed)	**200/kg**	**10kg**	**₦2,000.00**
Net Farm Income (NFI) = TR – (TC + I.A)			**₦300,071.84**
Return to Management (RTM)	**12% of NFI**		**₦36,008.62**

ISSN 2053-5805(Print), ISSN 2053-5813(Online)

Net Return (NR) = NFI – RTM **₦264,063.22**

Rate of Return (RoR) = (NR/TC) X 100 **80%**

Source: Field Survey Data, 2012.

The planting periods of (paddy) rice according to the rice farmers was 103 – 120 days. Table 2 showed the production costs and return per hectare of rice produced in the study area for the year 2012 planting season. Average total value of output (paddy rice) was ₦653, 963.44K per hectare obtained from 4713.25kg of paddy rice. Total operating cost amounted to₦334,916.60 or 95.18% of the total cost of production, out of which labor cost was ₦324,663.00 or 96.93% of total production cost while fixed cost (₦16,975.00) accounted for 5.07% of the total cost of production. The percentage labor cost of the total cost of production was contrary to the findings of Nlemadim, (2002) who found that labor accounted for 83% of total cost in rice fields. She also opined that farmers were likely to make quick returns on investment based on the high value (1.1) of rate of return on investment she got. According to Olayide and Heady (1982) labor is the second most important resource in farm production and constitutes a serious limiting input in the production process. When variable inputs were disaggregated, it was observed that labor cost constituted the highest cost component (₦324,663.00) while fixed cost was identified as the least (₦16,975.00) cost component. The net farm income of rice farmers in the study area was ₦300,071.84 which indicated that rice production is profitable. Rice farmers on the average made a net return of **₦264,063.22** per hectare that resulted in a return of ₦0.80k for every one naira invested. This result is in conformity with the findings of Ibitoye,*et.al., (*2012) who found that benefit/cost ratio of rice enterprise in Ibaji was1.95 which implied that everyone naira invested in rice farming generated revenue of ₦1.95k, indicating that rice farming in that area was viable. The average gross margin of rice enterprise as found in the study was **₦319,046.84;** this positive gross margin showed that rice enterprise is profitable.This result showed that rice production is viable and highly profitable if the farm is well managed. The economic implication of these findings is that loans granted to farmers for rice production were of benefit to both lenders and borrowers since returns were high enough to repay such loans and the accrued interest.

Table 3 presents values of marginal value product and marginal input cost of respondents in the study area.

Parameters	Marginal value product	Marginal input cost	MPV/MIC
Land (X_1)	209.26	4,700.00	0.05
Seed input (X_2)	69.60	74.40	0.94
Family labor (X_3)	31.90	40.00	0.80
Hired labor (X_4)	30.86	80.00	0.39
Fert.Appl (X_5)	33.59	97.20	0.35
Herb.Appl (X_6)	278.35	1,947.50	0.14

Source: Field survey data: April December, 2012.

From table 3 it was observed that MIC is greater than MVP in all the variables observed, there is no case where MVP is equal to MIC. This implied that, rice producers in the area did not attain optimal allocative efficiency. The table also showed that seed input (0.94) has the highest allocative efficiency, followed by family labor input (0.80). Hired labor (0.39), fertilizer application (0.35), and herbicide application (0.14) came in that order respectively, while land

ISSN 2053-5805(Print), ISSN 2053-5813(Online)

input (0.05) was the least allocative efficient input. Onyenweaku, (1994) opined that absolute or maximum allocative efficiency was achieved with respect to a particular resource if MVP/MIC=1, the resource was over utilized if MVP/MIC < 1 and underutilized if MVP/MIC >1. Hence, land resource (X_1), seed input (X_2), family labor input (X_3), hired labor input (X_4) fertilizer application (X_5) and herbicide application (X_6) were all over utilized. Therefore for profit to be optimized and to attain allocative efficiency in rice production in the study area, inputs $X_1 – X_6$ should be reduced from their current level. The above result agrees with Upton (1979), which stated that if: MVP<MIC, there is no economic efficiency, it pays the farmer to reduce the level of resource use. Profit maximization is highest in seed input and lowest in land input. For maximum allocative efficiency to be achieved input X_1 (land resource) should be reduced by 95%, X_2 (seed input) by 6%, X_3 (family labor input) by 20%, X_4 (hired labor input) by 61%, X_5 (fertilizer input) by 65% while X_6 (herbicide input) by 86%.

CONCLUSION AND RECOMMENDATIONS

Emergent from the findings of this study, it was concluded that rice farmers inNiger Delta Region of Nigeria were technically inefficient in the use of farm resources. This may be as a result of high cost of fertilizer, seeds, labour herbicides and land rent. This implies that technical efficiency in rice production in the study area could be enhanced through better use of such inputs. To ensure efficiency in the use of resources in rice production in the area, concerted efforts from the individual farmers, government and research institutions is highly imperative. The individual farmers should make efforts to embrace improved version of rice production while the government should ensure that farmers' participatory extension service delivery for rice farmers. In addition, the government should ensure that farm inputs are made available to the farmers at the right time and at subsidized prices. Finally research institutions should intensify research efforts on rice in order to have improved varieties that give high farm yield within a short time.

REFERENCES

Akande, T. (2003): "An Overview of Nigerian Rice Economy" Monography published by the Nigerian Institution of Social and Economic Research (NISER), Ibadan.

Biyi, D. (2005). Government Policies and Competitiveness of Nigerian Rice Economy.Paper represented at the "workshop on Rice Policy and Food Security in sub-Saharan Africa" organized by WADA, Cotonon, Republic of Benin, November 07 – 09, 2005.

Federal Republic of Nigeria (1989).Agricultural Policy for Nigeria. Federal Ministry of Agriculture, Water Resources and Rural Development.Abuja, 65 p.

Ibitoye, S.J., Orebiyi, J.S. and Shaibu, U. M (2012) Economic Effect of Inorganic Pesticide Use on Fadama II Rice Farming in Ibaji Local Government Area, Kogi State, Nigeria. International Journal of Agric. and Rural Development, SAAT, FUTO.Vol 15 (2): Pg. 1063 – 1070.

Jhingan, M.L. (2007). Micro Economic Theory (6th Edition). India, Vrinda Publications Ltd.

Jones, M.P. (1995) The Rice Plant and its Environment West African Rice Development Association (WARDA) training Guide 2. Pp 1 – 16.

Koutsoyiannis, A. (1979). Modern Micro-Economics Macmillan. London: Pp 1 – 581

ISSN 2053-5805(Print), ISSN 2053-5813(Online)

Longtau, S.(2003). Rice Production in Nigeria.Literature Review. Multi-agency partnerships in West African Agriculture. A review and description of rice production system in Nigeria pp. 98.

Niger Delta Development Commission (2010): Massive Rice Production and Processing Programme. A Paper Presented to NDDC for massive rice production in Niger delta, by Deen Construction Nig. Ltd.

Odii, M.A.C.A. (1998): Modern Farm Management Techniques. Alphabet Nigeria Publishers, Owerri, Nigeria.

Olayide, S.O. and E.O. Heady (1982) Introduction to Agricultural Production Economic: Principles and Application. AGITAB Publishers Ltd. Zaria, Nigeria.

Umoh and Yusuf (1999): In David, T.A and Terwase, S, (2011): "Efficiency of resource Use in Rice Farming Enterprise in Kwande Local Gogernment Area of Benue State, Nigeria. International Journal of humanities and Social Science, Vol 1, No 3.

Wikipedia, (2010): Niger Delta (www.en.wikipedia.org/wiki/Niger_Delta)

ISSN 2053-5805(Print), ISSN 2053-5813(Online)