PROFITABILITY POTENTIAL OF RAINFED LOWLAND RICE PRODUCTION IN SOME SELECTED LOCAL GOVERNMENT AREAS OF SOKOTO STATE, NIGERIA

B. I, Yusuf[1], A. L., Ala[2], M.A., Maikasuwa[2], Y. Hassan[3]

[1]Department of Agricultural Science, Shehu Shagari College of Education, Sokoto, Nigeria
[2]Department of Agricultural Economics, Usmanu Danfodio University, Sokoto, Nigeria
[3]Department of Agricultural Science, College of Education, Maru, Zamfara State, Nigeria

ABSTRACT

The study assessed the profit potential of rainfed lowland rice production system in Sokoto state, Nigeria. Using a multistage random sampling technique, 300 farmers were randomly selected from six purposively selected Local Government Areas of the State. The data collected were analysed using descriptive statistics and farm budgeting model. The costs and returns analysis revealed a gross margin of N40,887.50 per hectare and a net farm income of N38,288.50 per hectare. The Rate of Return on Investment (RRI) showed that each rainfed rice farmer earned N34.30 as profit for every N100 invested in rainfed lowland rice production. The major problems identified were scarcity and high cost of inputs, pests and diseases, insufficient capital and seasonal floods. The study recommends timely provision of inputs, credit facilities and efficient extension services to farmers.

Keywords: Rice; Profitability; Costs and returns

INTRODUCTION

Of all the staple crops, rice (*Oryza sativa L.*) has risen to a position of prominence (Akande, 2002). Rice is a source of food for people, feed for livestock, employment for the farmers and a source of raw materials for a variety of industries. About half of the world's population (more than 3 billion people) depends on rice for their staple food (West Africa Rice Development Association (WARDA), 2003). Rice provides about 20% of direct human calorie intake worldwide, making it the most important food crop (FAO, 2002).

Rice is cultivated in virtually all the agro-ecological zones of Nigeria. Despite this the area devoted to the cultivation of rice still appears small (Akande, 2002). Nigeria, along with many countries across the world, have ecologies that are suitable for different rice varieties and that can be harnessed to boost rice production to meet domestic demands/food security requirements and produce surplus for export (Anonymous, 2002). The country has a potential land area for rice production of between 4.6 and 4.9 million ha. However, only 1.7 million ha (35%) of the total land is used for rice cultivation (WARDA, 2003). The

cultivable land for rice is spread over five major ecologies – rainfed-upland, rainfed-lowland, irrigated rice, deep water or floating rice, and tidal mangrove. Rainfed rice constitutes about 80 % of Nigeria's rice land and 75 % of total annual output (Bamire *et al*., 2007).

Despite the importance of rainfed agriculture dependent populations, research efforts aimed at utilizing rice production for food security have been limited. Instead, irrigated ecosystems have been the focus of rice research because of their leading role in rice production (a yield of 2 to 4 tons/ha in irrigated rice systems as against 0.8 to 2 tons/ha in rainfed rice (WARDA, 2003; Bamire *et al*., 2007). Research has been less successful in producing technologies that will improve the profitability of rainfed systems (Roberts *et al.,* 2006). Even though these farmers are very poor, it is important to keep in mind that, for most, without rice, they would have no livelihood at all.

The ever-increasing demand for rice as a result of population growth and the continous decline in rice supply (FAO, 2002) signified the need for more researches to identify problems associated with domestic rice production from meeting its domestic demand. This will influence government's intervention in rice production. An analysis of the costs and returns in rice production among small scale rainfed farmers is necessary to provide baseline information to policy makers on the potentials of rainfed rice production system. The findings of the study might also be useful to potential investors willing to invest in rainfed rice production.

MATERIALS AND METHODS

Study Area

The study was carried out in Sokoto state. Sokoto State is located between latitude 13° 03' N and longitude 5° 14' E with a land area of 28,232.37 Square kilometers. It is bordered in the north by Niger Republic, Zamfara State to the east and Kebbi State to the south and west (SOSG, 2009). In terms of vegetation, the State falls within the sudan savannah zone. Rainfall starts late May and ends late September or early October with an annual mean rainfall ranging between 500mm and 700m (SOSG, 2009). According to NPC (2008), Sokoto state has a population of 3,696,999 million people made up of two major ethnic groups namely, Hausa and Fulani. Over 80% of the inhabitants of Sokoto State practice one form of agriculture or the other (SOSG, 2009). They produce such crops as millet, guinea corn, rice, cassava, potatoes, groundnuts and beans for subsistence, and wheat, cotton, and vegetables for cash.

Sampling and Data Collection

The sampling frame was established by obtaining a list of all rainfed rice producing Local Governments Areas and the respective rainfed rice producing villages from the Ministry of Agriculture and Sokoto Agricultural Development Project, Sokoto. There-after, the names of all rainfed lowland rice producing farmers in the respective villages were obtained from the village heads and leaders of cooperative associations. This provided the bases for sampling. A 3-stage multi-stage random sampling technique was used to draw the sample. The first stage involved a purposive selection of six leading Local Government Areas noted for rainfed rice production in the state; these included Wurno, Goronyo, Rabah, Kware, Kebbe and Silame Local Government Areas. The second stage involved a

random selection of two rainfed rice producing villages in each of the selected Local Government Areas. The third stage was a random selection of 25 rainfed rice farmers from each of the sampled villages. A total of 300 rainfed rice farmers were sampled and interviewed. Data were collected from both primary and secondary sources. Primary data were collected using a designed interview schedule administered by trained enumerators, while secondary data were sourced from text books, journals, CBN bulletins, past project works, and other relevant materials. Type of data collected included socio-economic characteristics such as age, farming experience, level of education and household size, and production data such as farm size (ha), quantity and cost of utilized production inputs, output quantity and price.

Data Analysis

The tools of data analysis used were descriptive statistics and farm budgeting model. The farm budgeting model used was the Net Farm Income (NFI) which is the difference between gross farm income and total farm cost. Other profitability ratios were also estimated to measure the economic performance of rainfed lowland rice production. The models are specified below:

Net Farm Income (NFI) = GI – TC …….…..…………………………………… (1)
Profitability Index (PI) = NFI/GI……………………………………………... (2)
Rate of Return on Investment (RRI) (%) = (NFI/TC) X 100..….…………….. (3)
Rate of Return to Variable Cost (RRVC) (%) = (GI – TFC/TVC) X 100.…… (4)
Operating Ratio (OR) = TVC/TR …….……………………………………... (5)
Where: NFI = Net Farm income (₦/ha),   GI = Gross income (₦/ha)
          TC = Total cost, TVC = Total variable cost, TFC = Total fixed cost (₦/ha)

RESULTS AND DISCUSSION

Socio-Economic Characteristics

The result of the socio-economic characteristics of the rainfed rice farmers are presented in Table 1. The result shows that rainfed lowland rice production in the study area was dominated by middle aged (31-40 years) and ageing males (41-50 years). Yunusa (1999) observed that farmers between the ages of 31 and 40 years are usually self motivated and innovative. The farmers had a family size of between 6 and 10 members. The result also shows that majority (66.33 percent) of the rainfed rice farmers had non-formal (Qur'anic) education and only 33.67 percent had formal education. This finding is in line with that of Yusuf *et al.* (2009) who reported that 62 percent of farmers in the rural areas had no formal education. New innovations should hence be introduced to the farmers through Arabic language or Ajami to facilitate easy understanding and adoption. Responses on farming experience shows that 41 percent of the rainfed rice farmers in the study area had been cultivating rice for a period of 16 - 25 years. This implied that rainfed rice farmers in the study area have been in farming profession for quite some period of time and are not novices in rainfed rice farming. The result further shows that majority (51.67 percent) of the rainfed rice farmers were non-members of any cooperative society. This finding may be attributed to a minimal or absence of awareness campaign and sensitizations on the importance of cooperative societies to farmers in the study area. Abubakar *et al.* (2009b)

suggested the need for more public enlightenment on the importance of cooperative societies by both government and non-governmental organizations. Result of the study also shows that majority (55.33 percent) of the farmers had no contact in whatever form with agricultural extension agents. In support of this finding, Abubakar *et al.* (2009a) observed that continuous, regular and timely extension contact is needed to explain new technology to farmers and teach them how to increase their production and improve their profit potentials.

Cost and Returns

The results of analysis of the costs and returns (Table 2) showed that the total revenue realized from rainfed lowland rice in the study area was N120,050 per hectare. This was sourced from sales of harvested rice which accounted for 118,200 per hectare (98.46 %) and sales of residue which contributed N1,850 per hectare (1.54 %). The result shows that the total cost of production incurred by the rainfed rice farmers was N81,761.50 per hectare. The total variable costs (TVC) dominated the production costs with 96.84 % of the total cost while the total fixed costs (TFC) accounted for the remaining 3.18 % of the total production cost. This is in agreement with the findings of Baba and Wando (1998), Baba and Alhassan (2000), Tsoho (2005) and Kaka (2007) who also reported that total variable costs (TVC) dominated the total fixed costs (TFC) in their respective studies. With regards to the total costs, labour cost alone accounted for 66.54 % of the total cost of production. This could be explained by the labour intensive nature of rice production. Hence, the cost of labour dominated, due to the imputed cost (opportunity cost) of unpaid family labour. The cost of family labour, although not directly incurred by the farmers, was imputed on its opportunity cost. Table 2 further revealed that the average gross margin and the net farm income (NFI) per hectare earned by the rainfed rice farmers was N40,887.50 per hectare and N38,288.50 per hectare, respectively.

Table 1: Socio-economic characteristics of the rainfed rice farmers

Variable	Frequency	Percentage
Age (Years)		
20 – 30	30	10
31 - 40	89	29.67
41 - 50	91	30.33
51 - 60	52	17.33
61 Above	38	12.67
Household size		
1 – 5	58	19.30
6 – 10	154	51.40
Above 11	88	29.30
Education		
Non-formal	199	66.33
Formal	101	33.67
Farming Experience (Years)		
6 – 15	75	25.00
16 – 25	125	41.67
26 – 35	49	16.33
36 Above	51	17.00
Membership of Coop-society		
Members	145	48.33
Non-members	155	51.67
Contact with Extension Agents		
Contacted	134	44.67
Not contacted	166	55.33

Source: Survey Data, 2010

Profitability Indices

Some economic and profitability ratios were estimated to measure the economic performance of rainfed lowland rice production in the study area (Table 3). The Profitability Index (PI) was 0.26, indicating that out of every N100 earned, N26 was returned to the farmer as net income. The Rate of Return on Investment (RRI) was 34.3 % indicating that the farmer earned N34.30 profit on every N100 invested in rainfed rice production in the study area. Estimate on the Rate of Return to Variable Cost (RRVC) indicated that every N1 cost incurred on variable inputs generated about N1.35. This could mean that improving rice profitability in the study area requires efficient utilization of the variable inputs used. Therefore, RRVC could be higher when farmers utilize their resources efficiently. An Operating Ratio (OR) of less than 1 indicate a good, efficient and profitable business, hence an operating ratio of 0.72 shows higher revenue over variable costs. It is possible for rainfed rice farmers in the study area to achieve lower operating ratio through efficient use of resources.

Table 2: Average costs and return in rainfed lowland rice production

Item	Total (N/ha)	Percentage
Gross income	(120,050)	(100)
Yield of rice	118,200	98.46
Residue	1,850	1.54
Total Variable Cost (TVC)	(79,162.50)	(96.82)
Cost of inputs	(19,820)	(24.245)
Seeds	4980	6.09
Fertilizer	10,880	13.31
Agro-Chemicals	3,960	4.84
Cost of labour	(54,402)	(66.54)
Land preparation(Manual)	11792	14.42
Land preparation (Tractor)	1,692	2.07
Planting	7546	9.23
Weeding	11770	14.40
Fertilizer application	1111	1.36
Spraying	1379	1.71
Harvesting	7122.5	8.71
Beating, threshing & bagging	7342.5	8.98
Beds scaring	4647.5	5.68
Transportation	2600	3.18
Empty Sac	2340	2.86
Total Fixed Cost (FC)	(2,599)	3.18
Depreciation	99	0.12
Rental value of owed land	2500	3.06
Total Cost (N81,761.50)		
Gross Margin (N40,887.50)		
Net Farm Income (N38,288.50)		

source: Survey Data, 2010

Table 3: Profitability indices of rainfed rice production

Ratio	Per hectare
Profitability Index	0.26
Rate of Return on Investment (%)	34.30
Rate of Return to Variable Cost (%)	135.30
Operating Ratio	0.72

Source: Survey data, 2010

Profit Level of the Respondents

    The distribution of the rainfed rice farmers according to level of profit is presented in Table 4.

Table 4: Distribution of rainfed rice farmers according to level of profit (naira/farmer)

Level of Profit	Frequency	Percentage
Less than 20,000	51	17.00
21,000 – 40,000	99	33.00
41,000 – 60,000	37	12.33
61,000 – 80,000	45	15.00
81,000 – 100,000	30	10.00
101,000 – 120,000	8	2.67
121,000 – 140,000	11	3.67
141,000 – 160,000	7	2.33
161,000 – 180,000	3	1.00
181,000 – 200,000	4	1.33
201,000 and above	5	1.67
Total	300	100

Source: Survey data, 2010

Table 4 revealed that 33% of the rainfed rice farmers made a profit of between N21000 and N40,000 each and 50 % realised 41,000 and above. This variation in profit was largely due to differences in farm size and access to production inputs. This revelation had substantiated the profit potential of rainfed rice production system in the study area. Comparably, in a study on crop-livestock farming in Sokoto State, Ala (2005) reported lower profit level of between N21,000 and N30,000 earned by farmers in cereal crops (sorghum and millet) production activities and between N11,000 and N20,000 in livestock production activities.

Problems Experienced by the Rainfed Rice Production Farmers

The most commonly encountered problem was the high cost of inputs particularly fertilizer as reported by 65% of the rainfed rice farmers. The problem of scarcity and high cost of inputs became serious because of non availability of inputs coupled with absence of inputs production companies in the rural areas, poor inputs distribution, and poor implementation of government policies (particularly subsidy on fertilizer) among others. Other frequently encountered problems were the problems of pests and diseases, insufficient capital and seasonal floods as reported by 50%, 48.33% and 45% of the rainfed rice farmers, respectively (Table 5).

Table 5: Problems of rainfed rice production reported by the rice farmers

Problem	Frequency*	Percentage
Flood problem	135	45.00
Birds, pests and diseases	150	50.00
Weeds	35	11.67
Insufficient capital	145	48.33
High cost of inputs	195	65.00
Draught	50	16.67
Non availability of pumps/tube-wells	15	5.00
Poor pricing	30	0.00

Source: Survey data, 2010   * Multiple response

CONCLUSION

The socio-economic characteristics revealed that middle-aged and energetic people dominated the rainfed rice farmers in the study area. The farmers were also characterized by high level of farming experience, low education and a household size of between 6 and 10 persons. Average gross margin and net farm income (NFI) earned by the rainfed rice farmers were N40,887.50 per hectare and N38,288.50 per hectare, respectively. The return on every N100 invested was found to be N34.30. The study demonstrates that rainfed rice production in the study area is profitable, and all the farmers made profit. Effort should therefore be intensified by the government in laying more emphasis on the best methods of assisting rainfed rice farmers to adopt new production technologies and to ensure timely provision of inputs, credit facilities and efficient extension services in order to enhance their yields and profitability.

REFERENCES

Abubakar, B.Z., A.H. Danmusa and P.G. Kughur (2009a). The role of extension for sustainable maize production in Danmusa Local Government Area of Katsina State. *Proceedings of the 23rd Annual Conference of the Farm Management Association of Nigeria, pp*: 261-265

Abubakar, B.Z., D.H. Yakubu, F.J. Yelwa and S.A. Abubakar (2009b). The role of cooperative society in community development: A case study of Agae Local Government Area, Niger State. *Proceedings of the 23rd Annual Conference of the Farm Management Association of Nigeria, p*p: 211-215.

Akande, T. (2002). *An Overview of the Nigerian rice economy*. Nigeria Institute of Social Economic Research (NISER). *http://www.unep.ch/etb/events/2002/05AprilAgri/nigeria.pds*. Accessed 5th july, 2011

Ala, A.L. (2005). Economics of Crop-Livestock Production System in Sokoto State, Nigeria. *Ph.D Thesis,* Department of Agricultural Economics and Extension, Usmanu Danfodio University, Sokoto.

Anonymous (2002). Research highlights. In: *Nigeria Agricultural Research Project (NARP), World Bank Assisted 2002,* Annual Report, pp: 3-12

Baba, K.M. and M.A. Alhassan (2000). Impact of animal traction on agricultural production and farm income in Sokoto State, Nigeria. *Journal of Agriculture and Environment,* 1(1): 9-19

Bamire, A.S., O. Oluwasola, and A.J. Adesiyan (2007). Land use and socio-econmic determinants of technical efficiencyof rice farms in Osun State, Nigeria. In: Haruna, U., Jibrin, S.A., Mancha, Y.P. and Nasiru, M. (eds). *Consolidation of Growth and Development of Agricultural Sector. Proceeding of the 9th Annual National Conference of the Nigerian Association of Agricultural Economics,* 5th – 8th November held at Tafawa Balewa University, Bauchi, Nigeria, pp27-35

FAO (2003). *Declaration on World Food Security*. World Food Summit, Food and Agricultural Organisation (FAO), Rome.

NPC (2008). *Population Census Report of the Federal Republic of Nigeria*. National Population Commission (NPC), Abuja, Nigeria.

Robert. S. Z., A. Dobermann, and M. David (2006). *Rice Science: Key to Food Security and Environmental Health in a Changing World.* International Rice Research Institute (IRRI). *www.irri.org*. Accessed 5th july, 2011

Sokoto State Government (2009). Sokoto State Diary. Sokoto State Government Printing Press, Sokoto, Nigeria

Tsoho, B.A. (2005). Economics of tomato-based cropping system under small scale irrigation in Sokoto State, Nigeria. *M Sc. Thesis*, Department of Agricultural Economics and Farm Management, University of Ilorin, Nigeria. 112p

WARDA (2003). *Strategy for Rice Sector Revitalization in Nigeria*. Project Report; West African Rice Development Association (WARDA), Abidjan, Cote d'Ivoire.

Yunusa, M.B. (1999). Not farms alone: A study of rural livelihood in the middle belt of Nigeria. *DAREASE Working Paper* 38.

Yusuf, B.I., K.M. Baba, I. Mohammed and H.M. Bello (2009). Impact of inflation on farm families in Sokoto. *Proceedings of the 23rd Annual Conference of the Farm Management Association of Nigeria, Sokoto*. Pp98-103