ABHINAV
International Monthly Refereed Journal of Research In Management & Technology
ISSN – 2320-0073 Volume II, December'13

COST AND RETURN OF RESOURCE USE EFFICIENCY AMONG THE BENEFICIARY CROP FARMERS OF NATIONAL FADAMA II PROJECT IN ADAMAWA STATE, NIGERIA

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ABSTRACT

Cost and returns studies are backbone in the field of research in agricultural economics which is quite evident of the fact that all systematic research in our discipline started with cost studies not only in Nigeria but at abroad also. These studies went through various stages and were refined every time with the experience, looking to the nature and limitations of fadaman II project in Adamawa State. Multistage method was adopted and the data were collected from 160 farmers. Taking into consideration the importance of the cost and return studies for farm planning and policy decisions at the micro level, the present study was conducted to analyze the Resource use efficiency among the beneficiary crop farmers during the fadama II project in Adamawa State.

Keywords: Cost, Return, Efficiency, Resource Use, Fadama II, Adamawa State and Nigeria

INTRODUCTION

Agriculture serves as the mainstay of most developing countries. It is the only means of livelihood of members of the rural communities in those countries, especially in Nigeria. According to NBS, (2011) agriculture contributes about 56.8% to GDP and a source of food nutrition for Nigerian households which decline in 2012 to 36.2%. The sector's performance could probably have been better but for a combination of factors, with the flooding crisis which was experienced in the year accounting for the decline in its contributions to the GDP. Agriculture is a key factor that can affect majority of Nigerians since over 60% of its population is involved in farming (Aturamu and Daramola, 2005). Unfortunately, agriculture alone can no longer provide a reliable livelihood for the growing populations in these countries (Mhazo, et al, 2003). Alternative or additional income generating opportunities are needed to support the millions of poor families who can no longer support their livelihoods from the land alone (Simalenga, 1996). In Nigeria, incomes and productivity in rural areas is low hence rural population remain poor. Poverty is not only a state of existence but also a process with many dimensions and complexities (Khan, 2000). Recent statistics from the National Bureau of Statistics indicate a worsening poverty statistics in the country and a cause for concern (Ayanwale and Alimi, 2004). The report of the 2006 Nigerian Core Welfare Indicator (CWI) on the poverty profile in the country stated that the dependency ratio, which was defined as the total number of household members

aged 0-14 years and 65 years and above to the number of household members aged 15-64 years, was 0.8 (CBN, 2005).

This indicated almost a one-to-one dependency ratio, and reflected the high population growth rate in the country. There is also large income inequality with the top 10% of the income bracket accounting for close to 60% of total consumption of goods and services (Ayanwale *et al*, 2004).The concern about the threat posed by poverty has led the Nigerian government to devote considerable attention to alleviating its scourge through various aid programmes, some of the time in collaboration with the civil society and donor agencies. Some of these programmes include: Agricultural Development Programme (1975), Operation Feed the Nation (1986), National Directorate for Employment (1987), National Fadama Development Programme I (1992), Family Support Programme (1996), National Poverty Eradication Programme (2001), Special Programme on Food Security (2001), National Fadama II Programme (2004), Community and Social Development Project (2009) among others.

Despite all these programmes, the percentage of the population living below the poverty line in Nigeria is still a subject of concern to government and donor agencies this is indicated by NBS, (2011). 67.38 % of population in Nigeria is living below the poverty line. However, the Second National Fadama Development Project (NFDP- II) was developed as a poverty reduction projects designed to sustainably increase the incomes of the Fadama users through expansion of farm and non-farm activities with high value added output, and to improve the living conditions of the rural poor, contribute to food security as well as increased access to rural infrastructure. Simonyan et al, (2012) shows that, the income of the beneficiary farmers in Fdama II project has increased significantly more than before the project and also more than the non-beneficiaries' income.

This study therefore was designed to assess the National Fadama II facility in Adamawa State on the beneficiaries in terms of their income, access to necessary enabling facilities and general well-being on the premise that there were a relationship between poverty and productivity and that the Fadama II facilities benefitted in Adamawa State has increase the income and wellbeing of the beneficiaries. If this facility achieved the envisaged objective(s), the welfare of the rural farming households would be improved with the attendant multiplier effect in the state and the country as a whole.

Consequently, the appraisal study was structured to provide answers to the following questions:

1. What were the socio- economic characteristics of fadama II participants in Adamawa State?
2. What were the optimum quantities of inputs and output for profit maximization in fadama crop production?

HYPOTHESES

Ho: The socio- economic characteristics of fadama II participants does not affect food crop production in the study area.

Ho: There was no relationship between optimum quantities of inputs and outputs and profitability of fadama II participants in food crop production.

METHODOLOGY

The study was carried out in Adamawa State with Ten (10) out of the Twenty One (21) local government areas that participated in Fadama II project. The state has a tropical climate with maximum temperature reaching to as high as 40^{o}C between December and January (Adebayo , 1999). The fadama land in the state lies along the basins of major rivers, streams, lakes and dams, which are located in the state. These are: Benue, Gongola, Yedzaram, Gerio, Mayo-Ine, Mayo-Belwa, Kilange, Kiri, Song, Wandu, Digil, Chochi, Faro and Mayo-Hesso. The state has 923-registered fadama user's associations (FUA's) that are into crop production with each comprising of 10 to 30 members (ADSFDO, 2006). Multistage stratified random sampling and purposive sampling techniques were used in the selection of respondents. In the first stage, the state was stratified into four according to the Adamawa Agricultural Development Programme (ADADP) zones . In each of the zone, participating local government areas in fadama crop production was purposively selected in proportion to the existing number of Fadama User Associations (FUA).In line with this, four local government areas in Zone II and one each in Zones I, III and IV were selected. In all, a total of seven local government areas were sampled. One hundred and sixty (160) food crop farmers were randomly selected in the FUA groups in the seven selected local government areas in proportion to their number in each local government. The membership of each FUA ranges from 10 – 30.

Conceptual and Analytical Framework

The linear programming was used to determine the combination of enterprises that maximizes the enterprises' total gross margin (TGM) subject to the production constraints associated with the available resources. The model equation is given as:

$$MaxZ = \sum aiXi \qquad (3.12)$$

Subject to:

$\Sigma b_i \leq G$

Where:

Z = TGM to be maximized as the objective function

a_i = Gross margin (GM) of the i^{th} enterprise/ha

x_i = Farm size of the i^{th} crop enterprise (ha)

b_i = Factor requirement of the i^{th} enterprise

G = Available resources for the factor requirements of the i^{th} enterprise

The LP was used for each of the identified enterprise.

The Gross Margin (GM) per hectare is therefore expressed as:

$$GM = \sum QyPy - \sum XiPxi \qquad (3.13)$$

Where:

Q_y = Output of food crop (Kg/ha)

P_y = Unit price of the output (in naira) per 100Kg bag

Q_yP_y = Total revenue from food crop produced (in naira) per ha

X_i = Quantity of the i^{th} input used in Kg/ha

P_x = Price per Kg of the i^{th} input

X_iP_{xi} = Total cost associated with the i^{th} input per hectare

Σ = Summation sign

The empirical probit model was estimated using E-view software, version 5 to determine the probability of technical efficiency indices of farmers and farm size and output levels. Mesike and Okoh (2008) reported that probability was given as index which was un-observable. The un-observable index was a linear combination of observable explanatory variable expressed as production function postulated for crop farmers in the study area is presented by:

$$Y = Bo + BiXi = ei \qquad (3.14)$$

Where: Y = dichotomous dependent variable taking the value of 1 or 0. However, to meet this requirement a slight modification was made:

Y = technical efficiency indices of respondents if TE $\leq 0.50 = 0$; if TE $>0.50 = 1$. It is on this basis that the probit analysis was run.

B_0 = intercept, B_i = regression coefficients that explain the probability of technical efficiency influencing farm size and output level and X_i are the independent variables (i = 1 to 2, and e_i = error term

RESULTS AND DISCUSSION

Profitability Analysis

The gross margin analysis used as a proxy for profitability estimation is presented in Table 1 and 2 the result has shown that there are six different enterprise combinations that are associated with food crop production by beneficiaries of Fadama II facility in the study area. The enterprises are sole rice, sole maize, maize/rice, vegetables, maize/vegetables and maize/rice/vegetables. The gross margin per hectare from these enterprises ranged from ₦41,715. 86 for sole maize to ₦75, 071.84 for sole rice. Sole maize had the lowest total variable cost per hectare of ₦ 26,869.80, followed by maize/vegetable enterprise of ₦ 33,348.00. However, vegetable enterprise had the highest total variable cost per hectare of ₦ 47,712.43 followed by sole rice with ₦ 44,352.64. The percentage of the expenditure on hired labour in all the enterprises tend to be higher than expenditure on other inputs, and this may be attributed to labour requirement in agricultural activities. This is followed by expenditure on inorganic fertilizer. Maize and vegetables dominated most of the combinations due largely to the high demand of the commodities during the dry season. The domination of most activities by vegetable production is similar to the work of Jema(2007) who reported profitability of vegetable production in Kenya. Maize is roasted and sold as a delicacy, while vegetables are part of the normal diet.

Table 1. Cost and Returns from Food Crop production among Fadama Farmers

Crop Enterprise	Variable Input	Variable Cost (₦)	% Share in Total Variable Cost	Returns (₦)
i. Sole Rice				
	Agro Chemicals	129,600.00	9.35	TR: 3,732,015.00
	Inorganic Fertilizer	444, 500.00	32.07	TR/ha:119,424.48
	Hired Labour	600,450.00	43.32	**GM/ha:75,071.84**
	Water Cost	118,000.00	8.51	
	Seeds	28,175.00	2.03	
	Other Cost (Transport, Sacks and baskets)	62,295.00	4.71	
	TVC	1,386,020.00	100	
	TVC/ha	44,352.64		
ii. Sole maize				
	Agro Chemicals	510,000.00	15.12	TR: 8,607,500.00
	Inorganic Fertilizer	643,650.00	19.09	TR/ha:68,585.66
	Hired Labour	1,455,700.00	43.17	**GM/ha:41,715.86**
	Water Cost	223,000.00	6.61	
	Seeds	272,250.00	8.07	
	Other Cost (Transport, Sacks and baskets)	267,560.00	7.93	
	TVC	3,372,160.00	100	
	TVC/ha	26,869.80		
iii.Maize/ Rice				
	Agro Chemicals	954,400.00	21.42	TR: 9,776,240.00
	Inorganic Fertilizer	676,580.00	15.18	TR/ha:82,674.33
	Hired Labour	1,630,300.00	36.59	**GM/ha:44,991.29**
	Water Cost	329,100.00	7.39	
	Seeds	225,000.00	5.05	
	Other Cost (Transport, Sacks and baskets)	665,640.00	14.94	
	TVC	4,456,020.00	100	
	TVC/ha	37,683.04		

Source: Field survey, 2011

Table 2. Cost and Returns from Food Crop production among Fadama Farmers

Crop Enterprise	Variable Input	Variable Cost (₦)	% Share in Total Variable cost	Returns (₦)
iv. Vegetable				
	Agro Chemicals	110,400.00	25.01	TR: 1,106,925.00
	Inorganic Fertilizer	47,000.00	10.65	TR/ha:119,667.57
	Hired Labour	189,000.00	42.82	**GM/ha:71,955.14**
	Water Cost	45,500.00	10.31	
	Seeds	24,360.00	5.52	
	Other Cost (Transport, Sacks and baskets)	25,080.00	5.68	
	TVC	441,340.00	100	
	TVC/ha	47,712.43		
v. Maize / Vegetable				
	Agro Chemicals	36,000.00	8.64	TR: 1,061,824.00
	Inorganic Fertilizer	124,250.00	29.81	TR/ha:84,945.92
	Hired Labour	177,250.00	42.46	**GM/ha: 51,597.92**
	Water Cost	32,000.00	7.68	
	Seeds	27,600.00	6.62	
	Other Cost (Transport, Sacks and baskets)	20,000.00	4.80	
	TVC	416,850.00	100	
	TVC/ha	33,348.00		
vi. Maize/ Rice / Vegetable				
	Agro Chemicals	34,400.00	10.52	TR:776,680.00
	Inorganic Fertilizer	81,000.00	24.77	TR/ha:103,557.33
	Hired Labour	125,300.00	38.32	**GM/ha: 59,957. 33**
	Water Cost	26,100.00	7.98	
	Seeds	28,000.00	8.56	
	Other Cost (Transport, Sacks and baskets)	32,200.00	9.85	
	TVC	327,000.00	100	
	TVC/ha	43,600.00		

Source: Field Survey, 2011

Efficiency Estimation

The maximum likelihood estimates (MLE) for the stochastic production function used in explaining the influence of production inputs on the output of food crop among beneficiaries of Fadama II, and also in determining the effect of farmer specific characteristics on technical inefficiency is presented in Table 4.10. The parameters were estimated simultaneously using frontier 4.1c developed by Coelli (1996).

The results shows that the coefficients of farm size(X_1), inorganic fertilizer (X_3), hired labour (X_5) and expenses on ploughing (X_6) were found to be positive and significantly affect food crop output of the respondents as revealed by the computed t-values. This implies that any increase in the use of these production inputs would bring about increase in food crop output. The findings is in line with Olayiwola (2013) in a research conducted on Technical

efficiency of Soybean Production in Ijebu-Ode Local Government Area of Ogun State, Nigeria

The value of the sigma squared (δ^2) is 0.6548 and is statistically significant at 1% level. This indicates a good fit and correctness of the distributional form assumed for the composite error term in the model. The variance ratio (γ) is 0.88 and also statistically significant at 1% level, implying that 88% of the variation in crop output of the respondents is due to differences in their technical efficiencies. This explains the reason why the ordinary least squares (OLS) estimates will not be adequate in explaining inefficiency differentials among the farmers. All the estimated coefficients are less than one, indicating that input allocation is in stage II of the production function.

The estimated coefficient for farm size is positive, which conform to *a priori* expectation and significant at 1% level. The magnitude of the coefficient (0.24) indicates that the output of food crop is inelastic to changes in the level of cultivated land area. Therefore, this implies that a 1% increase in cultivated land area, ceteris paribus, would lead to an increase of 0.24% in the output of food crop, and vice versa. This further suggests that land is a significant factor associated with changes in food crop output among the beneficiaries. Fadama land is usually scarce and also limited in size, having superior fertility status over other agricultural lands (Kyuma, 1999); thus, increase in output is guaranteed with additional increase in area under cultivation. This result is in accord with Udoh (2005) who identified land as a critical factor in agricultural production.

The production elasticity with respect to inorganic fertilizer is positive as expected and statistically significant at 5% level. This stems from the fact that fertilizer is a major land augmenting input which improves the productivity of existing land by increasing yield per unit area. Though Fadama lands have superior fertility status, but increase in the quantity of fertilizer used in food crop production would further increase the fertility of the existing land resulting in higher output. This study is consistent with the findings of Umoh (2006) that fertilizers increase crop yield.

The magnitude of the coefficient of hired labour, which is 0.13, indicates that output in food crop production in the Fadama lands is highly inelastic to changes in the amount of hired labour used. Thus, a 1% increase in the mandays of hired labour used would induce an increase of 0.13% in the output of food crop, and vice versa. Farmers who have the main objective of income maximization in food crop production would tend to allocate scarce resources more efficiently, including the allocation of hired labour (Amaza and Gwary, 2000). On the other hand, farmers whose main objective is household food security would be more concerned with output maximization per unit of resources used, especially family labour; that is, they tend to emphasize on technical efficiency.

The estimated coefficient for expenses on ploughing is positive and statistically significant at 1% level, indicating that food crop output among the respondents is inelastic to changes in the expenses on ploughing. A 1% increase in the expenses on ploughing would bring about 0.05% increase in the output of food crop.The returns to scale which is the sum of elasticities reveals that food crop production among Fadama II beneficiaries is inelastic (0.663) and is in stage II of the production surface. Thus, additional input would bring about increase in output but at a decreasing rate although it is the rational stage of production.

The inefficiency parameters were specified as those relating to farmers' specific socio-economic characteristics. Three out of the five variables used in the model are significant

and also have apriori expected signs. A negative coefficient indicates that the variable increases efficiency in food crop production and vice versa; hence, education, extension contact and age increase the efficiency in food crop production in the study area.

CONCLUSIONS AND RECOMMENDATIONS

The study reveals that, the gross margin per hectare from these enterprises for sole maize and sole rice enterprises indicates profitability in the short run. This can be seen from the net increase of ₦186,585.09 (99%) from the survey which was far above the goal of 20% of Fadama II Project and that recorded during the impact assessment study conducted in the state. The result of the LP paradigm revealed that only two of the six enterprises entered the programme, these enterprises were sole rice and vegetables enterprises. The potential to expand output is simple if government and other related institutions pay more attentions to agriculture sector. Government must find solution to problem of land fragmentation through embarked on effective policies that will militate against this problem. Also, adequate farm inputs like agro- chemicals must be made available at cheap price to the farmers and government must follow a clear cut linkage supply system of inputs. The socio- economic backwardness of farmers in the study area is a major obstacle in acceptance of the improved technology .it is suggested that frequency of extension visits should be increased to encourage wider spread and adoption of farm technology. In addition, intensive advisory services activities on effective resource allocation, utilization and other ways of increasing farmers' beneficiary income and to also develop a renewed interest by the government in dry season production by strengthening support and public-private partnership so as to boost production and win niche markets with a challenge of making better markets for farmers, while at the same time ensuring that production technologies adopted is more environmentally sustainable.

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