PROFITABILITY AND RESOURCE USE EFFICIENCY IN MAIZE PRODUCTION IN KONTAGORA LOCAL GOVERNMENT AREA, NIGER STATE, NIGERIA

BY

Jirgi, A.J[1].,Ibrahim, F.D[1].;Tanko,L[1];and Lawal,M[2]

[1] Department of Agricultural Economics and Extension Technology,
Federal University of Technology, P.M.B. 65, Minna, Niger State, Nigeria

[2] Niger State Agricultural Development Project ,
Zone III, Kontagora, Niger State, Nigeria.

E-mail for correspondence:

ABSTRACT

The study examined profitability and resource-use efficiency in Maize Production in Kontagora Local Government Area of Niger State, Nigeria during 2007 cropping season. Primary data were collected and analyzed using farm budgeting techniques and Production Function Analysis. Results indicated that farmers realized and average farm income and gross margin of ₦242, 114.00 and ₦ 269,862.78 respectively whose equivalents in US Dollars stood at US $2,029.80 and US $2,262,43 respectively as at the time this study was carried out. The result of the allocative efficiency index indicated that farm size , labour and fertilizer were over utilized, while other inputs and capital inputs were under utilized. It is recommended that surplus labour should be channeled into other income generating ventures during off-peak periods of labour demand. .

Key words: Maize, Farm Budgeting Analysis, Resource-use Efficiency

INTRODUCTION

Maize (*Zea Mays*) is a cereal plant of the tribe *Maydeas* , of grass family *Graminae* . The production of maize has been more dramatic than other crops cultivated in Nigeria. Until recent years , the bulk of maize grains produced in Nigeria were from Southwest zone. Ogunbodede and Olakojo (2001) reported that western Nigeria generally produced about 50 per cent of Nigeria's green maize, the remaining 50 per cent being split between the Northern and the Eastern states.

Although large proportion of the green maize is still principally produced in the south –western part, there has been a dramatic shift of dry grain production to the savanna, especially, the Northern Guinea savanna. This can now be regarded as the maize belt of Nigeria.

Increase in maize demand coupled with the Federal Government imposed ban on importation of rice, maize and wheat, have resulted in increase in maize production to meet the demand for direct human consumption, live stocks feeds and other industries (Iken and Amusa, 2004).

However, studies have shown that there is a gap between actual and potential yields. There is an over riding need to urgently seek to bridge the yield gap given the increasing national population and the increasing pressure on land. Studies have also

revealed that resources are inefficiently utilized in small holder agricultural production in the country. (Tanko *et al* 2007, Ogundari *et al* 2006, Ojo, 2000) Currently production costs are rising, it is becoming increasingly necessary to ensure judicious utilization of production inputs.

Nigerian maize farmers are characterized by the use of traditional tools such as hoes and cutlasses to produce maize in small quantities that only allow them to generate low income (Jibrin, 2006). In order to achieve optimum production level, available resources must be utilized efficiently. Successful and result- oriented farm planning and policies require the knowledge of productivities of farm resources to know the resources whose quantity or rate of use should be increased or decreased . This paper therefore investigates the costs and returns and resource allocation in maize production in Kontagora Local Government Area, Niger State Nigeria with a view of making recommendations on resource adjustment where necessary.

METHODOLOGY

The study was carried out in Kontagora Local Government Area of Niger State, Nigeria. Niger State lies between latitude 9° 36/ North and between longitude 6° 22/ The state covers a total land area of 83,266,779 square kilometers which represents 8 per cent of the total land area in Nigeria. About 85 per cent of the land is arable. According to the 2006 Population Census , Niger State has a population of 3,421,581 people.

There are two distinct seasons, the rainy and the dry seasons respectively. The temperature ranges between 21°C to 37°C. The average annual rainfall is 1,100mm in the northern part of the state to 1,600mm in the southern parts. Farming is the primary occupation. The farming system in the area is mostly sole maize, maize/cowpea inter cropping, sole millet and sole groundnut etc. Livestock are also reared to some extent.

Sampling Technique and Data Collection Procedure:

Data for this study were collected from Kontagora Local Government Area of Nigeria in 2007. The Local Government Area was purposively selected based on high concentration of maize farmers in the LGA. Multi staged random sampling technique were used for this study. Ten villages were selected from the two districts of the Local Government Area,(i.e five villages from each of the two district) namely Alasuga,Udara, Kafanin waya, Magauta, Rijiyan Nagwatse,Madagyan, Rafin Gora, Madara, Usalle and Utachu. From each of the villages, 10 Maize farmers were selected using simple random sampling procedure at each sampling stage . A total of 100 sole maize crop farmers were interviewed using enumerator administered questionnaire. Information relating to input, output and their prices were collected.

Analytical Technique

The data were analyzed using descriptive statistics, farm budgeting and ordinary Least Square (OLS) multiple regression analysis. The production function model employed is presented in implicit form as:

$Y=f(X_1,X_2,X_3,X_4,X_5,e)$. . ..(1)

Where: Y= Output of Maize (No. 100 kg of bags produced) _ _ _ (1)

X_1=Farm Size (in hectares)

X_2= Labour Inputs (in Man days)

X_3= Fertilizer input (Kg)
X_4=Seeds (Kg)
X_5=Capital Input. (Depreciation on fixed cost items, such as hoes, cutlasses, axes etc, rent on land, interest charges on borrowed capital etc)(₦).
E= Error term which is assumed to be normally and independently disturbed with zero mean and constant variance.

Various functional forms such as the linear, semi-log, exponential and double log were tried and on the basis of the explanatory power of the model (R^2), magnitude of estimated coefficients, conformity of signs with a priori expectation and the F –ratio , i.e the normal economic and statistical criteria, the exponential functional form was chosen as the lead equation and was used for further analysis.
Consequently, elasticity was computed using the following formula:

$e=b_i . \bar{X}_i$

where e=Elasticity of output of input X_i
b_i= estimated regression coefficient of input X_i
$\bar{X}_i$= The geometric mean of Input X_i

The Marginal Factor Cost (MFC) is the addition to total cost resulting from using an extra unit of input. To examine the efficiency of resources utilization, the ratio of MVP to MFC was computed. A firm maximizes its profit with respect to an input if the ratio of MVP to MFC is one (Kay, 1981).
A ratio less than unity, indicates under utilization of the input and increasing the rate of use of that input will increase the level of profit of the farm. Allocative efficiency is concerned with choosing optimal sets of inputs . it is the ability to maximize profit by equating the MVP of resources to their respective unit prices. The MFC of an input is the cost of acquiring an additional unit of a factor of production.

$NFI = TR-TC$ --- (2)

$= TR – (FC + VC)$ --- (3)

$= GM – FC$ --- (4)

$GM = GI – TVC$ --- (5)

$$GM = \sum_{j=1}^{m} P_jQ_j - \sum_{i=1}^{n} P_iX_i \quad \text{--- (6)}$$

Where, NFI = Net Farm Income, TR = Total Revenue, TC = Total Cost, VC = Variable Cost, FC=Fixed cost, GM=Gross Margin; Q_j=Quantity of j^{th} Output; P_j=Price of unit of j^{th} output; X_i=Quantity of the i^{th} variable input; P_i=Price of a unit of i^{th} Variable input. N = Number of inputs used in production, M = Number of enterprises and $\sum$ = Summation.

RESULTS AND DISCUSSION

Socio-economic characteristics.
The result indicates that the mean age of farmers is 44 years. The mean house hold size is 6. A typical farmer sampled had 22 years farming experience. About 54 percent of the farmers belong to a cooperative society, while 27 per cent are not members of any organized farm group. About 94 percent of the respondents have acquired one form of

formal education or the other. The result also indicates that 22 per cent of the farmers had access to credit. The average farm size was 4.39 hectares.

Cost and Returns in Maize Production

The profitability of any business can be deduced from the relationship between the costs incurred in running the farm business and the returns accruing to it (Adegeye and Dittoh,1985). The costs and returns associated with maize production in Kontagora Local government area is presented in Table 1.

The result of the farm budgeting analysis indicate that capital items and the cost of other inputs (such as seeds ,agrochemicals etc) constitute 38.00 % and 37.97 per cent respectively of the total cost of production of maize enterprise in the study area. The result showed that a typical farmer realized a gross margin of ₦ 269,862.78 and a net farm income of ₦242,114.00.

Table 1: Costs and Returns in Maize Production in Kontagora Local Government Area, Niger State,2007

Items	Value (₦)	Percentage
Variable Costs (VC)		
Fertilizer	17,550	24.00
Other inputs(Labour, Agrochemicals, seed, transport etc	27,733.22	37.97
Total Variable Costs	45,283.22	
Fixed Costs (FC)		
Capital Items	27,748.93	38.00
Total Cost (TVC+TFC)	73,032.15	
Total Average Revenue (TR)	315,146.00	
Gross Margin/Farmer =TR-TVC	269,862.78	

Source: Field Survey data,2007.
Note:TR=Total Revenue,TC=Total Cost

Resource use Efficiency.

The result of the estimated production function is presented in Table 2. The exponential function was chosen as the lead equation. It has an R^2 value of 0.65. This implies that about 65 per cent of the variation in the output of maize is explained by the independent variables. (X_1-X_5) included in the model while the remaining 35% is a result of errors in estimation and non inclusion of some important explanatory variables. The F-statistic was statistically significant at 1 % level which implies that the independent variables included in the model adequately explained the dependent variables.

For an Exponential Production Function, the regression estimates are not direct elasticities and were thus computed. The results of the computations are presented in **Table 3**. The results in Table 3 revealed that all the resources were inefficiently utilized. The allocative efficiency index of farm size was found to be 0.00106 which is less than 1 indicating that farmers in the survey area are over utilizing farm size, this is

similar to the findings of Tanko,*et al* (2007) in their study on the analysis of farm labour utilization in Maize Production in Zaria Local Government Area of Kaduna State.

In the case of fertilizer, the allocative efficiency index value is 0.00039 which is less than 1 and indicates over utilization. This is however contrary to a priori expectation considering the high cost of fertilizer and the bottlenecks associated with fertilizer procurement and distribution in the country. The over utilization of fertilizer in the study area could probably be due to the fact that most of the farmers do not apply fertilizer at the right time and in the recommended quantities.
The allocative efficiency index of other inputs and capital inputs is found to be 5.199 and 5.537 respectively. This indicates that the resources were under utilized . Furthermore, from the analysis in Table 2, farm size, and fertilizer were closest to optimality with values of 99.89, and 99.96 respectively. The resource with a value farthest from optimality is other inputs and capital input with -453.7 respectively,

CONCLUSION AND POLICY RECOMMENDATIONS

The findings indicate that maize farmers were not efficient in resource utilization. Farm size, labour and fertilizer were found to be over utilized. Farmers should therefore decrease the use of these resources. Labour should be channeled into other income generating ventures during off-peak periods of labour demand, while fertilizer application method, timing and quantity applied should be done as recommended by research findings as suggested by extension agents.More of other inputs and capital inputs should be employed to enhance profit.This may necessitate the introduction of subsidized credit as small holder farmers over rely on the usage of their meager household resources.

Table 2: Regression Estimates of Maize Production Factors in Kontagora LGA, 2007.

Variables	Linear	Semi log	Double log	Exponential
Constant	21.872	-315.929	.462	3.301
	(1.363)	$(-3.969)^{888}$	(.508)	$(21.217)^{888}$
X_1(Farm size)	-.667	-21.915	6.427E-02	1.165E.02
	(-.328)	$(-1.696)^{8}$	(.411)	$(3.590)^{888}$
X_2 (Labour)	1.939 E-02	29.608	6.936 E-02	1.585E-04
	(.790)	$2.581)^{8}$	(.474)	(.666)
X_3 (Fertilizer)	3.728E-02	21.3161.	.288	3.869E-04
	$(2.092)^{8}$	$(2.238)^{8}$	$(2.112)^{8}$	$(2.239)^{8}$
X_4 (Other inputs)	2.414E-04	11.483	3.405E-02	5.710E-06
	(.602)	(1.342)	(.350)	(1.468)
X_5 (Capital inputs)	6.878E-04	.611	.117	6.240E-06
	$(4.526^{)888}$	(.159)	$(2.341)^{8}$	$(4.233)^{888}$
R^2	.459	.280	.416	0.652
R^2 Adjusted	.400	.237	.352	0.544
F-ratio	7.807^{888}	6.535^{888}	6.541^{888}	9.275^{888}

Source: Computed from field survey data, 2007.

Note: ***, ** and * implies statistically significant at 1%, 5% and 10% levels respectively.
Figures in parenthesis are the respective t-ratios.

Table 3: Allocative Efficiency of Small-scale Maize Production in Kontagora LGA, Niger State, 2007.

Variables	MFC (Acquisition cost) (₦)	Elasticity (b:)	MVP= bi. py	K=MVP/MFC	Percentage deviation from optimality (1-ki)x100
X_1 (farm Size)	1500	0.00511	15.854	0.00106	99.89
X_5(capital inputs)	1	0.00173	5.367	5.53670	-453.7

Source: Computed from field survey data, 2007.
Note P_y=₦3100 = Price of unit of output= one 100kg bag of Maize.

REFERENCES

Adegeye, A.J. and Dittoh, I.S. (1985). *Essentials of Agricultural Economics*. Impact Publishers Nigeria Ltd, Ibadan pp251.

Iken, J.E. and Amusa, N.A. (2004). Maize research and production in Nigeria. *African Journal of Biotechnolog,* Vol.3(6).Pp302-307

Jibrin,S.(2006). The influence of Extension and Education on Maize production in Chanchaga Local Government Area, Niger State". Unpublished Undergraduate Project Report, Presented to the Department of Agricultural Economics and Extension Technology, Federal University of Technology, Minna.

Kay, R.D. (1981). *Farm Management Planning, Control and Implementation.* M.C. GrawHill-New York pg 154-170.

Ogunbodede, B.A. and Olakojo, S.A. (2001). Development of *Striga asiastica* tolerant hybrid maize (Zea mays L.) varieties: *Tropical Agricultural Research and Extension* 4 (1): 2001.

Ogundari, K., Ojo, S.O. and Ajibefun,I.A. (2006). Economics of scale and cost efficiency in small -scale maize production: empirical evidence from Nigeria. *Journal of Social Sciences*, 13 (2): 131-136.

Ojo,S.O.(2000). Factor productivity in maize production in Ondo State, Nigeria. *Applied Tropical Agriculture*, 15 (1):57-63.

Tanko,L.;Ezeakor,E.U. and Jirgi, A.J.(2007). Analysis of farm labour utilization in maize production in Zaria Local Government Area, Kaduna State, Nigeria. In: Proceedings of the Conference of Agricultural Society of Nigeria ,Edited by O.O.Olufajo, D.F.Omokore,G.N.Akpa and S.A.Sanni(ASN), 22nd-26th October 2007; Institute for Agricultural Research, Ahmadu Bello University, Samaru-Zaria pg. 514-516