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MOBILIZING AGRICULTURAL RESEARCH TOWARDS ATTAINING FOOD SECURITY AND INDUSTRIAL GROWTH IN NIGERIA

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COMPARATIVE ECONOMIC ANALYSIS [illegible] AND NON-COOPERATIVE FARMERS IN BOSSO LOCAL GOVERNMENT AREA, NIGER STATE, NIGERIA

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ABSTRACT

The study attempted to examine yam production activities of cooperating and non-cooperating farmers in Bosso LGA, Niger State, Nigeria during the 2009 cropping season. Farm-level data were collected from a sample of 100 yam farmers selected randomly and used for the analysis. Data were analyzed using gross margin analysis and ordinary least squares multiple regression analysis. The results showed that a typical cooperating and non-cooperating farmer realized gross margin per hectare value in the sum of ₦97,548.14 and ₦56,790.00, respectively, indicating that the latter realized higher income. The two groups of farmers were not efficient in allocating existing resources and recommends mobilization of farmers for accelerated agricultural and rural development through strengthening cooperative organizations and local institutions.

Key words: Cooperatives, allocation, existing resources, production, economic analysis

INTRODUCTION

Cooperatives all over the world are instruments of social and economic transformation (Ijere, 1992). A co-operative is an association or business voluntarily organized, operating at cost which is owned or capitalized and controlled by member patrons as users sharing risks and benefits proportional to their participation. Oladeji and Oyesola (2000) affirmed that in consideration of the impact of cooperative societies in agricultural production in developed economies, farmers in developing countries had been encouraged to organize themselves into cooperative societies.

Nigerian farmers are faced with numerous problems that hinder them from attaining their full potential in food production. They operate small and fragmented farm lands, use crude implements and methods of production thereby compelling them to operate sub-optimally. They encounter high input price, low mechanization, high transportation cost, declining soil fertility, pests and diseases, inadequate fund, unstable government policies and general poverty to grapple with. In spite of the potential benefits co-operatives have in improving the livelihoods of farmers and reducing the incidence of undesired poverty, skepticism is still lurking in the air as studies have shown that some farmers feel reluctant to subscribe to its membership (Oladeji and Oyesola, 2000).

Modern technology adoption require both social organization of people into groups and their ability to create, form and enforce an idea into the society Iwuagwu (2002). Cooperatives serve as informal financial institutions mostly preferred by farmers due to easy accessibility, smallness of scale and informal nature of transactions.

Nigeria is a country comprising largely of farming communities blessed with resources upon which an agricultural revolution can take place. The establishment of cooperatives among other organizations and lately the Agricultural Development Project (ADP) to revive the declining fortunes of agriculture in the nation was based on the premise that a combination of fortunes such as appropriate technology, effective extension services, access to physical inputs, adequate market and infrastructure facilities are essential to getting agriculture transformed by improving productivity and raising living standards of rural farmers (Iwuagwu, 2002). The introduction of cooperatives in Nigeria has awakened the need for both professionals and business men to join their efforts so as to meet the increasing demand, spread agricultural risks and ultimately make profits. Iwuagwu (2002) affirmed that despite concerted efforts aimed at raising the productivity of cooperating farmers in the use of resources, it appear there is no difference in the production activities among the two groups. Even where cooperative societies exist, most of them are borne out of selfish motives by their initiators, the result of which is improper management of their resources.

Akpabio (1998) observed that although resources have been pumped into agriculture on a massive scale through Cooperative Banks, ADP and other

government agencies, the impact on agricultural [illegible] has not been commensurate to the efforts. The panacea to this trend has become a thing of concern. The objective of this study was to investigate the gross margins realized from yam production as well as compare the efficiency in resource utilization of co-operating and non-co-operating farmers in Bosso Local Government Area, Niger State Nigeria.

Hypothesis

Ho: Farmers who belong to co-operative societies are more efficient in the allocation of resources than farmers who do not belong.

METHODOLOGY

Area of Study

Bosso Local Government Area (LGA) is in Niger State, Nigeria. It is located between longitudes 06^0 and 28^0 East and latitudes 09^0 and 41^0 North of the equator. The LGA has a total population of 147,359 (National Population Commission, 2006). The vegetation is of Guinea Savannah type and has an annual rainfall that range between 1100mm-1200mm and peaks around the months of July and August. The temperatures range between 15.22°C to 36.5°C with relative humidity of between 60 percent at noon to 80 percent at late nights. Farming is the predominant occupation. The people grow crops such as guinea corn, maize, yam, rice, cassava etc.

Sampling Procedure

A total of 100 yam farmers were randomly selected from five villages in the study area. Bosso LGA was purposively selected because of the preponderance of yam farmers in the area. From each of the five villages, 20 yam farmers were randomly selected comprising of 10 yam farmers who belonged to cooperative societies and 10 yam farmers who did not belong. The villages are *Bosso, Beji, maikunkele, Maitumbi* and *Garatu*.

Method of data collection

Primary data were mainly used for this study. The primary data were collected from farmers through personal interviews and well structured questionnaire. Data elicited include information on age, sex, educational background, marital status, house-hold size, source of land, experience etc. as well as input-output data such as farm size, labour requirement, capital inputs, fertilizer, output of yam.

Method of data analysis

Descriptive statistical analytical tools such as means, percentage distributions were used. Other analytical tools used include gross margin analysis as well as multiple regression analysis.

Gross Margin Analysis

Gross Margin is the difference between the gross returns and total variable costs.

It is expressed algebraically as:

$$GM = \sum GFI - \sum TVC \quad \ldots\ldots(1)$$

$$GM = \sum_{i=1}^{n} Pi\,Qi - \sum_{i=1}^{m} Pj\,Qj \quad \ldots\ldots(2)$$

Where: GM=Gross Margin, GFI=Gross farm income (from sales of product), TVC=Total Variable Cost, $\sum$=Summation sign, P_i=Price of unit of i^{th} output, Q_i=Quantity of i^{th} output, P_j=Price of unit of i^{th} input, Q_j=Quantity of j^{th} input, n=Number of output, m=Number of inputs.

The Empirical Model

The implicit form of the empirical model for each farmer group is specified as:

$Y = f(X_1, X_2, X_3, X_4, X_5, e)$ ---------- (3)

Where Y=Output of yam (kg), X_1=Farm size (ha), X_2=Labour input (man-day), X_3=Fertilizer (kg), X_4=Other inputs (seeds, agrochemicals, staking material, etc valued in monetary terms ₦), X_5=Capital inputs (depreciated value of hoes cutlasses, etc, rent on land, interest etc), e=error term.

Measurement of Resource use Efficiency

An aggregate production function was specified for each farmer group and estimated using ordinary least square (OLS) multiple regression analysis.

The explicit forms of the models are specified as follows:

Linear: $Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + e$ ------- (4)

Cobb-Douglas: $\ln y = \ln b_0 + b_1\ln X_1 + b_2\ln X_2 + b_3\ln X_3 + b_4\ln X_4 + b_5\ln X_5 + e$ ------- (5)

Semi-log: $Y = \ln b_0 + b_1 \ln X_1 + b_2 \ln X_2 + b_3 \ln X_3 + b_4 \ln X_4 + b_5 \ln X_5 + e$ ------- (6)

Exponential: $\ln Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + e$ ------- (7)

Where Y=Output of yam (kg), X_1= Farm size (ha), X_2 = Labour input (man days), X_3 = Fertilizer (kg), X_4 = Other inputs (seeds, agrochemicals, staking material, etc) (₦), X_5= Capital inputs (depreciated value of hoes cutlasses, etc, rent on land, interest etc), e=error term, ln=natural logarithm, b_1-b_5=regression coefficients to be estimated, b_o=constant term. Four functional forms, namely, the linear, double log, exponential and semi logarithmic were fitted to the data for each farmer groups and the model adjudged to be the best was chosen as the lead equation for further analysis. The allocative efficiency of resources was examined by

equating MVP_{xi} to P_{xi} and computing the allocative efficiency index (K).

If $MVP_{xi} / P_{xi} = 1$, it implies efficient resource utilization; If $MVP_{xi} / P_{xi} > 1$, it implies under-utilization; If $MVP_{xi} / P_{xi} < 1$, it implies over utilization of the i^{th} input.

RESULTS AND DISCUSSION

Socio-economic characteristics of respondents

The results indicated that most (i.e., 65%) of farmers who belonged to cooperative societies fell between the age range of 30-46 years while those that did not belong to any cooperating group fell between within the age of <30 years old. Majority of the cooperative members (i.e., 95%) were male and (5%) were female while 96% of non-members were male while only 4% female. Results also indicated that majority of the respondents (i.e., 70%) were married. About 50% of the farmers that attained up to tertiary level of education belonged to cooperative societies while 40% of non-members had no formal education. About 60% of non-cooperating farmers cultivated less than 1ha, while about 82% of cooperating farmers cultivated 1.5-2.0ha.

Gross margin analysis

The gross margins of cooperating and non-cooperating farmers are presented in Tables 1. Results in Table 1 indicated that the total variable cost/ha for all cooperating farmers in the sample was ₦1,688,593 while the average gross margin/ha (for a typical farmer) was ₦97,548.14. The results also show that improved yam seed accounted for 34.09% of the total variable cost of production for cooperating farmers. This is closely followed by fertilizer, which accounted for 24.62%, and herbicides 17.27%. A typical cooperating farmer realized an average gross margin per hectare of ₦97,548.14 indicating that the enterprise is viable. This value is higher than the amount realized by non cooperating farmers with an average gross margin/hectare value of ₦56,790.00. This underscores the role membership of cooperative plays in boosting the production activities of the respondents. Agricultural cooperatives provide a platform for small scale farmers who over rely on household resources to pool their resources thereby consolidating their holdings. One of the economic obligations of members of the society is saving. The savings are given as loan to needy members who are expected to pay back within a specified period of time.

Production Function Analysis

A summary of the regression estimates of the factors affecting yam production for cooperative and non-cooperative farmers is presented in Tables 2 and 3.

Results in Tables 2 and 3 indicated that the lead equations for cooperating and non-cooperating farmers were the linear and Double-log functional forms, respectively based on the normal economic, econometric and statistical criteria.

Resource use efficiency

The marginal value products (MVP_s) were compared with the acquisition costs of production inputs and are presented in Tables 4 and 5. The results in Table 4 showed that all the resources were inefficiently utilized. Farm size with an allocative efficiency index of (0.0017) and fertilizer (0.0146) were over-utilized, while other inputs (3.5177) were under-utilized. Farm size. with a percentage deviation from optimality value of 99.98 was farthest from optimality and therefore the most inefficiently allocated of all the resources. Therefore, the farmers need to increase the use of resources that are under-utilized and reduce the level of employment of the input that was over-utilized so as to optimize the production goal of output maximization and or cost minimization. The allocative efficiency indices for non-cooperating farmers were computed and summarized in Table 5. The results in Table 5 showed that all the resources were inefficiently utilized. Farm size has an efficiency index of (0.00008), labour (0.0004) and other inputs (0.0029). They were all over utilized being less than 1. Therefore, the farmers should reduce the level of employment of these resources in other to maximize output. Farm size was observed to be overutilized by the two groups of farmers. This stems from poor management of existing resources to optimize production goals. On technical stand, small holder farmers cultivated small portions usually in scattered locations which makes them operate sub-optimally and attain higher production levels as opposed to consolidating scarce resources to necessitate increased production.

Test of hypothesis

The hypothesis states that farmers who belong to cooperative societies are more allocatively efficient in the allocation of resources than farmers who do not belong. Results indicate that the two groups of farmers were not efficient in allocating their resources. We hereby reject the null hypothesis and accept the alternative that the two farmer groups were not efficient in allocating their resources.

CONCLUSION AND RECOMMENDATIONS

This study underscores the role membership of cooperative plays in boosting agricultural production activities of farmers. Cooperatives help in consolidating farmers' resources. Both groups were not efficient in allocating existing resources. There exists a wide scope for improvement in the optimal allocation of existing resources. The following recommendations are made in the light of the findings. Appropriate policies and programmes that would strengthen the existing agricultural cooperative structure should be further strengthened. Government should sustain agricultural input subsidies. The non-cooperating farmers through advocacy efforts, education, awareness campaigns, seminars and other enlightenment programmes need to be encouraged to belong to cooperative groups so as to facilitate increased access to production inputs to boost production. This is in addition to proper coordination of extension research in order to promote easy flow of improved technology, innovation and information that will greatly enhance farmers' productive capabilities. Mobilization of farmers for accelerated agricultural and rural development through cooperative organizations, local institutions and communities is paramount. Resource mobilization and the promotion of group action are the thrust of cooperative activities. This is to take advantage of group dynamics, with its concomitant mutual guarantee, as a strategy for agricultural development so as to maximize the services which cooperatives can render including the administration of government incentives to agriculture, such as in supply, credit delivery and retrieval, commo marketing, and the pursuit of democratic ideals, in v of the democratic principles embedded in t operations.

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Table 1: Gross margins of cooperating and non-cooperating farmers

Item	Cooperating farmers		Non-cooperating farmers	
	Variable cost/ha	Percentage	Variable cost/ha	Percentage
Fertilizer	415,690.00	24.62	317,500.00	20.73
Herbicide	291,550.00	17.27	126,800.00	8.28
Insecticide	92,953.00	5.50	289,900.00	18.94
Improved yam seed	675,600.00	34.09	468,100.00	30.57
Labour	312,800.00	18.52	328,700.00	21.47
Total Variable cost/ha	1,688,593.00	100.00	1,531,000.00	100.00
Average gross margin/ha	97,548.14		56,790.00	
Total gross returns/ha	6,566,000.00		2,839,500.00	

Source: computed from Survey Data, 2009.

Table 2: Regression estimates of factors affecting yam production activities of- cooperating farmers

Variable	Linear	Cobb-Douglas	Semi-Log	Exponential
Constant	255.384	3.029	-978.094	5.869
	(6.387) ***	(4.593)	(-2.223***	(69.718)***
X_1	113.703	0.058	125.188	0.101
	(3.078) ***	(0.665)	(2.170)**	(1.305)
X_2	0.321	0.269	132.931	0.000
	(4.251)***	(3.685)***	(2.731)***	(3.116)***
X_3	0.148	0.152	71.351	0.000
	(0.628)	(2.511)**	(1.764)*	(0.437)
X_4	0.002	0.056	32.904	5.22E-006
	(0.586)	(1.566)	(1.376)	(0.866)
X_5	0.008	0.071	28.759	1.34E-005
	(2.092)**	(2.400)**	(1.451)	(1.639)
R^2	0.008	0.661	0.652	0.616
R^2 Adj	0.777	0.623	0.612	0.573
F-Value	35.201***	17.188***	16.483***	14.133***

Source: computed from Survey Data, 2009. ***, **, and * implies statistically significant at 1%, 5% 10% levels. Figures in parentheses are the respective t-ratios.

Table 3: Regression estimates of factors affecting the output of yam for non cooperating farmers Bosso Local Government Area, Niger State, 2009.

Variable	Linear	Cobb-Douglas	Semi-Log	Exponential
Constant	14.385	2.246	-3327.866	5.728
	(0.053)	(0.960)	(-0.939)	(25.305)***
X_1	871.056	0.439	640.883	0.544
	(4.087) ***	(1.849)*	(1.782)***	(3.062)***
X_2	-0.627	0.160	-90.100	0.000
	(2.841)***	(1.034)	(-384)	(-0.819)
X_3	-3.194	0.067	-430.397	-0.001
	(-1.838)	(2.321)**	(-1.355)	(-0.388)
X_4	0.241	0.593	840.889	0.000
	(2.517)**	(2.762)***	(2.583)**	(1.519)
X_5	-0.256	-0.187	8.680	0.000
	(-1.841)*	(-1.404)	(0.043)	(-2.034)**
R^2	0.619	0.501	0.379	0.153
R^2 Adj	0.576	0.494	0.309	0.457
F-Value	14.319***	8.833***	5.376***	9.264***

Source: completed from Survey Data, 2009, other annotations as in Table 2.

able 4: Resource use efficiency indices for cooperating farmers

Variables	Acquisition cost (MFC) (₦)	Elasticity (b)	MVP b.py	Allocative efficiency index (K_i) =MVP/MFC	% Deviation from optimality (1-K_i) X 100
Farm Size	1800.000	0.439	3.073	0.0017	99.980
Fertilizer	32.000	0.067	0.149	0.0146	98.540
Other Input	1.180	0.593	4.510	3.5177	-2.518

Source: Computed from Survey Data 2009.

Table 5: Allocative efficiency indices for non-cooperating farmers.

Variables	Acquisition cost (MFC) (₦)	Elasticity (b)	MVP b.Py	Allocative efficiency index K_i =MVP/MFC	% Deviation from optimality $(1-K_i) \times 100$
Farm Size	1800.00	0.194	1.364	0.0008	99.90
Labour	5.50	0.340	2.385	0.0004	99.90
Capital input	1.18	0.004	0.034	0.0029	99.70

Source: computed form survey data, 2009