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Resource Use Efficiency in Onion Production among Participating and Non-Participating Farmers in Hadejia Valley Irrigation Project, Jigawa State, Nigeria

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Abstract: *The study xamine the resource use efficiency in onion production among participating and participating farmers in Hadejia Valley Irrigation Project. Multi stage sampling technique was used in the study in which Hadejia Valley Irrigation Project and six villages in the project area were purposively selected, In each village 10 onion producers each among participating and nonparticipating farmers were selected using simple random sampling technique, making a total sample size of 120 respondents, however two nonparticipation farmers were unable to return their questionnaire making the sample size to be 118 respondents. The data were collected using structured questionnaire and were analyzed using descriptive statistics andproduction function models. The result of the analysis revealed that majorityof participating farmers (56.57%) and non-participating farmers (58.63%) had only one contact with extension agents in a cropping season. The result of the semilog production function model revealed that the R^2 value of 0.910 (91.0%) and 0.885 (88.5%) were recorded for participating and non-participating farmers, respectively.. The F-values of 109.88 and 80.223 both significant at $P<0.01$ were obtained participating and non-participating farmers respectively. On the variables included in the model, only farm size and fertilizer showed significance for participating farmers. Both were significant at ($P< 0.001$) for non-participating farmers. Fertilizers and labour were used below economic optimum level while seeds and chemicals were used above economic optimum level by participating farmer. Seed, fertilizers and labour were underutilized while farm size was used above economic optimum level by the non-participating farmers.Resource adjustment is therefore recommended among both group of farmers.*
Key Words: *Resource Use. Efficiency, Onion, Production, Farmers*

I. Introduction

Onion (AlliumCepa) is an important vegetable crop which is a complimentary product to tomato and is of major commercial importance throughout the world. According to USDA (2009), approximately 200 million tons of dry bulbs onions are produced in 2009 in the world of which 74.9 million tons were produced in America alone leaving Asia, Europe and Africa with 125.1 million tones.

Onion production in Nigeria is mainly in the northern part of the country in both seasons of the year. Onions are cultivated and marketed throughout the Northern Nigeria in places such as Kebbi, Kano and sokoto states and it is marketed to the southern part of the country and for export.It is ranked second to tomatoes in importance and consumed in green state and as mature bulbs (Alabi and Adebayo 2008,). The major producing states in the country include Kano, Bauchi, Sokoto, Kaduna, Borno, Yobe, Jigawa, Kebbi, Zamfara, Katsina states. Onion is being produced in large quantity in Jigawa State under the Hadejia valley irrigation project which is under Hadejia-Jamaare River Basin Development Authority. The Hadejia valley irrigation project was conceived in 1978 with the objectives of harnessing, the water resources of Auyo, Kafin Hausa, Jahun and Hadejia Rivers and the vast arable land in the area for irrigation agriculture all year round (FMWR, 2005). In Auyo local government area alone, about 7000 hectares of irrigable land was developed (FMWR, 2005). Considering the enormous financial and human resources needed in irrigation agriculture, effort must be made to ensure that the project is harnessed by farming populace at the project site. According to Kura (2002), Hadejia valley irrigation project (HVIP) since its inception in 1995, low performance of irrigation has been observed and cropping intensity was as a low as 9%. This makes policy makers and researchers to ask several questions about the return on investment as well as resource use efficiency among the participating farmers, so as to ascertain the worthiness of the venture. However, to explore more about the benefits of the project and its viability comparison must be made on the resource use efficiency in onion production among participating and non-participating farmers in the project area in which onion was selected as it is widely produced in the area. It is against this backdrop that this research was undertaken to find out the effect of the project among the farmers participating in the project by comparing the resource use efficiency of participating farmers and that of nonparticipating farmers.

II. Methodology

The Study Area

The study was conducted at Hadejia Valley Irrigation Project (HVIP) area which lies between longitude 9.5^0E and 10.5^0E and latitude 12^0N and 13^0N, the vegetation characteristics of the area is that of Sudan savanna with annual rainfall of about 490mm and an average temperature of 32^0C (HVIP, 2009). The total population of the inhabitants in the area was 1,256,926 (NPC, 2006). It covers 46% (69,000ha) of the estimated 150,000ha of Fadama lands in Jigawa state, of which 10% (6900ha) of Fadama land of the project area have been developed and put under irrigation farming (FMWR, 2005). The soil type is light and generally loamy due to continuous cultivation and presently the project has developed 700ha of irrigable land (FMWR, 2005).

III. Sampling Technique and Sample Size

Multi stage sampling technique was used in the study in which the Hadejia valley irrigation project was purposively selected. Six villages were selected purposively because of high onion production and high HVIP activities. In each village 10 participating from the list of obtained from Water Users Associations and 10 non-participating onion producers from the list generated in each village were selected using simple random sampling technique, making a total sample size of 120 respondents.

IV. Data Collection Procedure

The data were collected using a structured questionnaire. The information solicited from the respondents include socio-economic characteristics of respondents, production inputs, prices of production. The totals of one hundred and eighteen questionnaires were retrieved out of the one hundred and twenty questionnaires distributed. Two non -participating farmers fail to respond.

V. Data Analysis

The data were analyzed using descriptive statistics (such as frequency, percentages, mean and standard deviation) and multiple regression models.

VI. Production Function Analysis

The production function analysis was used to determine the relationship between the dependent and independent variables. The production function estimates was used to estimate the resource use efficiencyand the nature of returns to scaleamong participating and non- participating farmers under the Hadejia Valley irrigation Project.

The data were subjected to the following production functions including linear, semi-log and double log. The model that best fit the data was selected based on sign and magnitudes of the coefficients, the magnitude of R^2, t- statistics and f- statistics (Rahman, 2003). The models are specified as follows.

The linear production function model can be specified as follows:

$Y = a_o + b_1x_1 + b_2 x_2 + b_3 x_3 + b_4 x_4 + b_5x_5 + \mu$……………………………………1

The semilogproduction function model can be specified as follows:

$Y = a_o + b_1\log x_1 + b_2\log x_2 + b_3\log x_3 + b_4 \log x_4 + b_5\log x_5 + \mu$ ………………………2

The cobb – Douglass (or Double log) production function is expressed as

$\log y = \log a + b_1 \log x_1 + b_2 \log x_2 + b_3 \log x_3 + b_4 \log x_4 + e + b_5\log x_5 + \mu$ …………3

Where:

Y = output of onion (kg)

X_1 = Farm Size (Ha)

X_2 = Seed (Kg)

X_3 = Fertilizer (Kg)

X_4 = Chemicals (Kg)

X_5 = Labour (Man hours)

U = error term (stochastic or noise, or disturbance term)

$b_0 – b_5$ = regression coefficients

The regression coefficient estimates were used to calculate the marginal value product of inputs used in production and it is expressed as;

MVP= MPP. Py

Where; M

MVP = marginal value product of ith resources

Marginal physical product(MPP) = regression coefficient of ith resources

Py = unit price of output (₦)

The marginal factor cost (MFC) was also estimated. It can be expressed as

MFC = Px_i…….
MFC = marginal factor cost
Px = unit price of ith input
The MVP/MFC ratio was used in calculating resources use efficiency.
r = MVP/MFC
Decision rule;
If r = 1 resource is efficiently utilized
r> 1 resource is under utilized
r< 1 resource is over utilized
Where MVP = MFC Economic optimum takes place

VII. Results and Discussion

Contact with Extension Agents

The distribution of respondents according to contact with extension agents is shown in Table 1. The result revealed that majority (56.57%) of participating farmers and 58.63% of non-participating farmers had only one contact with extension agents in a cropping season. This shows low level of extension delivery among the farming groups. However the participating farmers had more contacts with extension agents than the nonparticipating farmers implying that participating farmers had more access to extension services than their counterpart. Extension education is an important way of disseminating new techniques and technology to farmers as it helps in acquisition and adoption of new methods of production which will raise productivity and standard of living of the rural farmers.

Table 1: Distribution of Respondents According to Contact with Extension Agents per Cropping Season

	Participating Farmers		**Non-participating Farmers**	
No of Contacts	Frequency	Percentage	Frequency	Percentage
1	34	56.57	34	58.62
2	21	35.00	11	18.96
3	4	6.66	-	-
No Contact	1	1.66	13	22.41
Total	60	100	58	100

Source: Field Survey (2009)

3.2Production Function Analysis

To determine the level of influence the production inputs have on the productivity of onion in the study area, production function analysis of the variable inputs were carried out. Three production function models were tried and the model that best fit the data was selected as lead equation. Semi-log was chosen as the lead equation, having given the best fit based on a priori expectation namely: significance of the regression coefficients, magnitude of the coefficient of multiple determinations (R^2) and the sign of the coefficients

.The result of the semi log production function is presented in Table2. As indicated in the Table, the R^2 value of 0.910 (91.0%) and 0.885 (88.5%) were recorded for participating and non-participating farmers, respectively. This showed that 91% and 88.5% of variations in onion output for the different groups of farmers was as result of the variables included in the model. The F-values of 109.88 and 80.223 both significant at $P<0.01$ were obtained respectively, indicating that the regresses adequately explained the joint variations in output. On the variables included in the model, only farm size and fertilizer showed significance for participating farmers. Both were significant at ($P< 0.001$) for non-participating farmers. The rest variables indicated non-significant for both group probably due to multi-linearity considering the value of their standard errors. This result can be attributed to the low level of education and technical skills of the farmers in the study area.

Variables		Participating Farmers				Non - participating Farmers
	Coefficient	Standard error	T - value	Coefficient	Standard error	T- value
Constant	61.025 NS	44.049	1.385	-38.436	54.236	-0.709
Farm size	95.836 ***	12.89	7.435	42.087***	10.329	4.074
Labour	-4.06 NS	14.716	-276	30.833 NS	21.891	1.408
Chemicals	-11.423 NS	9.998	-1.143	-17.208 NS	7.791	-2.209
Seeds	-1.405 NS	7.969	-0.176	16.955 NS	7.241	2.342
Fertilizers	3.611**	8.593	3.0562	20.777NS	10.06	2.065
R^2 value = 0.910						R^2 value = 0.885
R^2 Adjusted = 0.902						R^2 adjusted = 0.874
F - value = 109.088						F - value = 80.223***
***p<0.01						
**P<0.05 NS: Not Significant						

VIII. Resource Use Efficiency Analysis

The estimate of the resource use efficiency in onion production among participating and non-participating farmers is presented in Table 3.

Table 3: Estimate of Efficiency of Resource Use

Variables	Participating Farmers			Non-participating Farmers		
	MVP	MFC	MVP/MFC	MVP	MFC	MVP/MFC
Farm Size	3712.69	₦3000	1.24	1590.47	₦3000	0.53
Seed	-54.43	₦1600	-0.09	640.73	₦1600	1.07
Fertilizers	1185.87	₦64.00	18.54	785.16	₦64.00	12.27
Chemicals	-442.54	₦1200	-0.37	-650.29	₦1200	-0.54
Labour	157.28	₦78.15	2.01	1165.18	₦78.15	14.91

From the table above the ratio of MVP to MFC of farm size, fertilizers and labour for participating farmers was greater than 1, implying that these resources were used below economic optimum level by the participating farmers. This agrees with Aminu (2009) who reported underutilization of farm land by fadama rice farmers in Adamawa State. This means that if these resources were increased there would be the possibility that the output of the farmers would increase and efficiency or optimal utilization of resources attained. Also, the participating farmers were over utilizing or using seeds and chemicals above economic optimum level as their MVP/MFC ratios were less than 1. This as well suggests that if they reduce the amount spent on these resources in their production process their profit will increase.

On non-participating farmers, the MVP to MFC ratios for seed fertilizers and labour were greater than 1, indicating underutilization or use of these resources below economic optimum level. The situation can be attributed to poor access to credit on the side of the farmers. The MVP to MFC ratio for farm size, and chemicals were less than 1. The farm size over utilization was because the non-participating farmers had low level of output of onion compared to participating farmers. From the above, it can be observed that groups were not allocating resources efficiently which affected their productivity, national food security and welfare of the farmers. If the underutilized resources were optimized and the over utilized resources were reduced to optimal level, possibly their output and profit would increase.

Resource Adjustment for Optimal Allocation

Resource adjustment is the relative amount of a resource needed to optimize an inefficiently allocated resource.The resource adjust needed for optimal allocation among the participating and non- participating farmers is presented in Table 4 The result indicated that , the participating farmers need to increases the resources by 19.4%, 94.61% and 50.25% for farm size, fertilizer and labour respectively for \optimal allocation and decrease .seed and chemical by 1011.11% and 170.2% for optimal allocation.

Non-participating farmer, on the other hand need to increase production resource by 91.85% and 93.29% for fertilizers and labour, respectively for optimal allocation while reducing farm size, seeds and chemicals by 88.67%, 6.4% and 85.20%, respectively for optimal allocation.

Table 4: Resource Adjustment in Onion Production in Hadeja Valley Irrigation Project

Variables	Absolute value of adjustment (%)	
	Participating Farmers	Non-participating Farmers
Land	19.35	88.67
Seeds	1011.11	6.54
Fertilizers	94.61	91.85
Chemicals	170.2	85.20
Labour	50.25	93.29

IX. Conclusion and Recommendations

Both group of farmers were inefficient in utilizing their resources as the theyunder-utilizedcertain resources while over utilized others. The inefficiency of the farmers may be directly or indirectly linked to access to key resources most especially the non -participating farmers.

Improvement in the efficiency among the farmers is the responsibility of both farmers and government therefore it is recommended that both groups should adjust their resource use for a profitable farming enterprise, the non- participating farmers should participate in the project and both group of farmers should form strong cooperative association The provision of improved rural infrastructures, promotion of rural household education, better access to credit facilities through improving rural financial markets and providing enabling polices (such as making available all agricultural input required at the right time and affordable prices) among others are required in order to enhance efficiency..

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