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Resource Use Efficiency in Yam Production in Ondo State, Nigeria

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Abstract: This study delve through the resource-use efficiency in yam production among randomly selected sample of 150 yam producers in 5(out of 18) purposively selected Local Government Areas (L.G.As) in Ondo State, Nigeria. The production function analysis revealed inefficiency in the use of land, hired labour, family labour and investment on seed yam. The Marginal Value of Products (M.V.Ps) for inputs used in production were N97, 804 per hectare, N3, 349 for hired labour, N122: 50 for family labour and N156:10 for seed yam (for additional unit of input).Also the M.V.P of the inputs were higher than the corresponding Marginal Factor Costs (M.F.Cs), signifying input under-utilization. In this connection, an increase in allocation of land, hired labour, family labour and investment on seed yam will surely raise the output of yam. Also there is need for improved dissemination of information on Miniset-technique of raising seed yam.

Key words: Resource-use, efficiency, yam production

INTRODUCTION

The supply of agricultural products from any nation to satisfy human wants and the resources used in their production are very vital, due to their limited supply and stiff competition for them by many enterprises. Nigeria has a total land area of 98.3 million hectares, out of which only 71.2 million hectares are cultivable, while 34.2 million hectares (about 48% of the cultivable area) are actually being cultivated and less than 10% of the arable land is irrigated[1]. Agriculture belongs to the real sector of Nigerian economy and it is characterized by multitude of small-scale farmers scattered over wide expanse of land area, with small holdings ranging from 0.05-3.0 hectares per farm land, rudimentary farm systems, low capitalization and low yield per hectare[2] Yam is an important agricultural crop in Nigeria, although its importance in the diets of the various tribes in the country differs. Research has revealed that out of the total world yam production of about 37.5 million tonnes, Nigeria alone produces almost 75 per cent[3-6] and also the countries within the "yam zone"_ Nigeria, Benin, Togo, Ghana and Cote d' Ivorie together produce more than 90 per cent of World yam production[7,8]. Nigeria's output of yam is composed of production from various states in the country with Ondo State being one of the major producers. Yam production in Ondo State is of great importance to the people due to the amount of resources committed to its production and the proportion of their income which it represents. Traditionally, the tuber can be cooked, fried or roasted. Alternately, it can be processed into pounded-yam, yam flour, yam chips or porridge). Yam also acts as a substitute for bread in breakfast menu because it complements egg i.e it reduces egg glut in its season[9]. Yam is also presented in marriage ceremonies and birth rites. Nweke[10], observed that yam is preferred to cassava and highly prized for its taste. It is an industrial source of diosgenin, the primary precussor of corticosteroids and anabolic drug and a better source of proteins, fat and vitamins than cassava. Although yam has a high income potential and the tuber is on high demand, the production is declining.

A recent study on yam has shown that the absolute level of production in West Africa and the world globally have remained static for the last three decades[11]. This static or declining trend may not be unconnected with productive resources, which are not being efficiently utilized, leading to low productivity. Inefficient resource allocation could limit the level of returns to an enterprise and in turn affect its attractiveness for resource allocation[12]. Parikh[13], in a study carried out discovered that inefficiency in developing country agriculture is as a result of the subsistence needs, socioeconomic and demographic characteristics of the farmers. According to him, other factors are experience, accessibility to information, supervision contact and credit availability to the farmers. This study seeks to estimate the farm production function of yam, with a view to deriving the Marginal Value Productivity of the resources used and therefore compare these with their opportunity costs, so as to determine the economic efficiency of resource utilization in yam production.

MATERIALS AND METHODS

Akoko and Owo areas of Ondo State being major producers of yam and given that this study interest is in

yam production, purposive sampling technique was used` in selecting 5 Local Government Areas (LGAs) -- Akoko North-West, Akoko North-East, Owo, Okitipupa and Irele out of 18 in Ondo-State. Five villages from each LGA and six yam farmers from each village were randomly selected at another sampling stage. In all 150 yam farmers were interviewed using enumerator –administered structured questionnaire, out of which 142 copies of the questionnaire were adequately completed and found suitable for analysis.

Information collected from the respondents border on their Socio-economic characteristics, input availability and allocation, cropping pattern, production costs, produce marketing and production constraints. The inputs examined included land, hired labour, family labour and capital (expenditure on seed yam). Homogeneity of the component products, uniform farm land quality, equal managerial ability and non-use of fertilizer among the farmers were assumed. The production function technique was used and this tool is preferred because the Marginal Value Productivity (MVP) of the inputs can be computed from the coefficients (estimated) of the production function and can be tested statistically for reliability. The technique fitted three functional forms namely: linear, semi-log and Cobb-Douglas, to the data collected in order to select the lead equation for analysing resource allocation efficiency.

The explicit forms of the fitted functions (Linear, Semi-log and Cobb-Douglas) are given below:

$$Y = b_{0+} b_1 X1 + b_2 X2 + b_3 X3 + b_4 X4 + U \quad (1)$$

$$Y = \ln b_0 + b_1 \ln X1 + b_2 \ln X2 + b_3 \ln X3 + b_4 \ln X4 + \ln U \quad (2)$$

$$\ln Y = \ln b_0 + b_1 \ln X1 + b_2 \ln X2 + b_3 \ln X3 + b_4 \ln X4 + \ln U \quad (3)$$

*[1]Where

Y = Output of yam (kg)
X1 = Farm size (ha)
X2 = Hired labour (N/labour-days)
X3 = Family labour (N/labour-days)
X4 = Seed yam (N)
U = error term which as assumed to be normally distributed with zero mean and constant variance.
Bí = Regression coefficient of resource Xß

The a priori expectation is that b1, b2, b3 and b4 > 0. From the data collected, Ordinary Least Square (OLS) regression estimates of bis, multiple coefficient of determination (R^2), standard errors of estimated coefficient and their t-values were obtained. The lead equation chosen out of the three fitted equations was the Cobb-Douglas production function. The choice was based on economic theory, statistical and econometric criteria.

*For the Linear, Semi-log and Double-log forms,

$$MVP\ X\beta = b\beta\,(Py),\ \frac{(b\beta\ Py)}{\overline{Xi}},\ \frac{(b\beta\ \overline{Y}\ Py)}{\overline{Xi}},$$ respectively.

Where:

Y = mean yam output in kilogram
Xß = mean of the variable input Xß
Py = price of a kilogram of yam
bß = estimated parameter of input Xß

The deviation of MVPxi for double-log form i.e ., $(bí\ \frac{\overline{Y}}{\overline{Xi}}\ Py)$, is explained by the fact that the coefficients of the inputs in the model are the elasticities of production (Ep) of the inputs considered i.e., Epxi = bi.

It is the ratio of the proportional change in output to the proportional change in input.

$$Epxi = \Delta Y/\Delta Xi \div \Delta Xi/Xi = \Delta Y/\Delta Xi \times Xi/Y$$

From the above, $\Delta Y/\Delta Xi = Epxi\,(Y/Xi) = biY/Xi = MPPxi$

So, MVPxi = MPPxi . Py =biYPy/X.

but because evaluation is done at a point on the model i.e the mean values of the variables are used because they lie on the model, $MVPxi = \frac{(bí\ \overline{Y}Py)}{\overline{Xi}}$

MVP of each input indicates the expected change in output (negative or positive) from the use of an additional unit of output, the level of other input being held constant.

The productivity of an input is determined by the quantity of the input already in use and other inputs with which it is combined. According to[14], the estimates with the widest application are those derived at geometric mean of inputs, especially with Cobb-Douglas production function. So MVPs for this study are derived at the geometric mean of the inputs and the output i.e.,

Xí and Y are geometric mean values of the variables

For resource use efficiency, Marginal factor costs (MFCs)/ opportunity costs of inputs were compared with their respective MVPs. Market prices (unit factor costs) of the inputs during the production season was used. For example, the market price of labour is the current wage rate which is N830 per labour-day. The market price of land is the cost of leasing one hectare of farmland per annum which was N1290. In the study area, Maize, Cassava, Cocoyam and Vegetables were intercropped with yam(the major crop) so the opportunity cost of land is a joint cost

for the crops and this was prorated based on the proportion of total land area put to yam which was about 50-60%. It was therefore estimated that about 55% (average land area) of rent on land be put to yam. So rent per annum on land was imputed to be 0.55 i.e.,, opportunity cost for land put to yam is N1290 * 0.55 = N709.5. The opportunity cost of seed yam is the current market price at the time of study which is N80:00 per Kilogram, while the price of yam is N65:00 per Kilogram. The current rate of interest on agricultural loan is about 20%, so the Marginal Factor Cost (MFC) is the unit of measurement for inputs plus the opportunity cost of capital which is N8:00 plus 20% i.e., for seed yam, MFC is N9.60. MVPs and MFCs of the resources used and their ratios were calculated in order to decide on their efficiency of use. When MVP is greater than MFC, there is resource under utilization and its increased utilization would increase output. When MVP is less than MFC, resource is over-utilized and reduction in its usage would bring about profit maximization, but efficiency of resource-use is upheld when the ratio of MVP to MFC is unity.

RESULTS AND DISCUSSION

It was observed in the study area that yam is being cultivated in mixed cropping with other crops like Cassava, maize, Cocoyam, Vegetables and pepper. The socio-economic and demographic characteristics of the farmers were analyzed and the result shows that 37 per cent of the respondents were above 50 years of age, signifying the need to encourage and empower the youths into farming. The respondents have considerable experience in yam production, as justified by 94% of them having at least 10 years experience. Large proportion of the farmers were not educationally sound as 21% could not read or write and another 49% had primary elementary education. On gender 81% of the respondents were male due to drudgery and labour intensive nature of yam production and therefore the need for simple labour saving technology. Although 54 per cent of the respondents have family size of between 5-7, specifically, the mean family size of the farmers was 5. The sources of fund available to yam farmers in the study area were informal, majorly from personal savings, friends and cooperatives in preferential order. The inaccessibility (2.6%) to formal credits may affect adoption of innovations because informal sources have limitations. Land used in yam cultivation was majorly inherited (67%) or leased (28 per cent). Land allocated to yam ranged between 0.18 and 3.50 hectares. Hired labour was the major source of labour (63%) due to the drudgery of operations coupled with the age of the farmers. Average labour use and capital investment on seed yam per hectare was 78 labour-days and N59,790, respectively with a corresponding output of about 7.43 tonnes per hectare.

Table 1: Socio-economic and demographic characteristics of respondents in the study area

Age (Years)		
Less than 30	10	6.7
30 – 40	39	26.0
41-50	45	30.0
Greater than 50	56	37.3
Total	150	100
Farming Experience(years)		
Less than 10	09	6.0
10-20	39	26.0
21-30	78	52.0
Greater than 30	24	16.0
Total	150	100
Educational Status		
No formal education	31	20.7
Elementary\Primary School	74	49.3
Secondary School	39	26.0
Tertiary Institution	06	04.0
Total	150	100
Gender		
Male	122	81.3
Female	28	18.7
Total	150	100
Family Size		
Less than 2	08	5.3
2-4	35	23.3
5-7	81	54.0
Greater than 7	26	17.3
Total	150	100
Sources of Fund		
Personal Savings (P. S)	24	16.0
P.S +Friends & Relatives +Cooperatives	06	04.0
P.S + Cooperatives	40	26.7
P.S + Friends & Relatives	63	42.0
Cooperative Society	13	08.7
Bank	04	02.6
Total	150	100
Type of Land Acquisition		
Inheritance	101	67.3
Lease	41	27.3
Borrowed	08	05.3
Purchace	--	--
Total	150	100
Source of Labour Use		
Hired Labour only	95	63.3
Family + Hired Labour	55	36.7
Total	150	100

Source: Field survey, 2004

The regression analysis result for the three functional forms are presented in Table 2.

Based on the economic, statistical and econometric criteria, the Cobb-Douglas function was selected as the lead equation. In the lead equation (Cobb Douglas), the estimated coefficients of farms size, hired labour and seed yam are significantly different from zero at the 5% level. Although the coefficient of family labour is not significantly different from zero at 5% level, it is significant at the same level in linear function. The independent variables of land, hired labour, family labour and seed yam explained 78% of the total variation in yam output, thus attesting to goodness of fit of the lead equation. The Cobb-Douglas estimates were used in the computation of MPVs of the various inputs and the results are shown in Table 3.

Table 2: Multiple regression results for yam producers in ondo state

	Estimated parameters and statistics						
Functional form	Constant term b_0	Farm size b_1	Hired labour b_2	Family labour b_3	Seed yam b_4	R^2	F value
Linear	- 289	7.16	0.67*	42.30*	0.56*	0.75	61.05
	(-0.49)	(3.10)	(2.02)	(3.74)	(7.23)		
Semi-log	4.17	0.09	0.0006	0.0008*	0.0009*	0.61	42.35
	(9.79)	(2.19)	(3.01)	(4.06)	(5.23)		
Cobb-Douglas	2.88	0.79*	0.31*	0.24	0.36*	0.78	69.77*
	(7.43)	(7.99)	(2.48)	(3.33)	(3.89)		

Source: Field survey 2004. *Coefficient significant at 5% level. Values in parentheses are T- statistic.

Table 3: Marginal analysis of input use by yam farmers in ondo state

	MVP	MFC	Ratio of MVP and MFC	T. Ratio
Land N/ha	97,804.00	1289.91	75.82	3.25*
Hired labour N/ Manday	3,349.00	830.10	4.03	0.99
Family labour N/ Manday	122.55	42.70	2.87	1.38
Seed yam (N)	156.10	9.60	16.26	2.64*

Source: field survey 2004. Values significant at 5%

The MVPs for farm size, hired labour, family labour and seed yam were greater than their MFCs, implying under utilization of inputs. Also the MVP, MFC ratios of the various inputs which were not equal to unity confirm the existence of resource-use disequilibria and in this scenario, yam farmers could have increased output and raised profit by increasing their average farm size, labour use and expenditure on seed yam. The analytical tool used assumed profit maximization as the major aim of the farmers, but this has been disproved by the findings in this study. This also explained the reason(s) for under utilization/investment in inputs. The farmers consideration of family food security is an underling factor in resource allocation, as demonstrated in the practice of mixed cropping (Land is used for production of mixed crops). Many other crops needed for family subsistence (Cassava, Maize, Cocoyam, Pepper and Vegetables) are produced along with yam thereby competing for land, signifying under -allocation of land for yam production.

Also seed yam was majorly used (which is very expensive) as against planting materials obtained from Mini-set technique. The farmers given their meager capital base may not be able to expend so much on seed yam signifying under-investment. Reason for under-utilization of family labour in the study area was the farmer's desire to educate their children. Less than 20% of the farmers' children were ready to assist their parents after school hours and weekends because of the tedious operations involved in yam production. Also less than 5% of the respondents used little quantity of fertilizer in growing yam due to lack of awareness and non-availability at appropriate time.

CONCLUSION

Finding in this study revealed that expected increases in yam output due to additional use of one unit of land, hired labour, family labour and seed yam are N97,804, N3,349, N122.55 and N156.10 , respectively, given that the Marginal Factor Costs are N1289.91, N830.10, N42.70 and N9.60, respectively. Given this scenario in yam production in Ondo State, there is need for improved dissemination of information on Mini-set technique of raising yam planting materials, since this will reduce cost. Yam farmers in the state need credit assistance for hiring labour and purchasing seed yam. Since yam production is labour intensive, there is need for simple labour saving devices or technology.

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