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RESOURCE USE EFFICIENCY AMONGST SELECTED SMALL SCALE YAM FARMERS IN RIVERS STATE, NIGERIA

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ABSTRACT

This study was carried out in Rivers State Nigeria with the objective of determining the efficiency of resources used in Yam production among Small Scale Farmers. The specific objectives were to examine the socioeconomic characteristics of the farmers, determine Technical and Allocation efficiency as well as return on investment. Also certain constraints militating against yam production were identified. Data for the study were collected through purposive sampling techniques. One hundred (150) yam farmers who were registered with the State Ministry of Agriculture, under the umbrella body "All Farmers Appex Association of Nigeria (AFAAN) were selected from six local Government Areas. Primary information gotten through a well structured questionnaire. Descriptive statistics like percentages, frequencies as well as stochastic frontier production function were used to achieve the objectives. The results showed an average age of 50.0, years and 22.0 years of experience, 60% of the farmers were male, 51% had at least primary education, 60% cultivated between 1-2ha with mean household size of 9 persons. The stochastic frontier analysis showed a mean technical efficiency of 49.8%, the range of efficiency is from 19.4%-99.9%, the allocative efficiency showed an elasticity of 3.0264 which indicates underutilization of resources. The major determinants of efficiency were size of farm, level of education, years of experience. Major constraints includes lack of finance, high cost of inputs, insecurity of rural areas, lack of access

to credit facilities, high cost of labour, etc. therefore, Government direct intervention, credit (loan scheme), adequate security/policing of rural areas, establishment of large farm by the Government are hereby recommended.

INTRODUCTION

Yam is a root tuber crop botanically known as (Dioscrea spp). There are six most important species Identified in West Africa. Yam crop is arguably the most important crop grown in parts of South East and South-South Nigeria. Hence it is often regarded as the King of crops due to its nutritional, economic as well as socio-cultural and religious importance as indicated by Okoye etal (2010). In West Africa, the leading yam producing country is Nigeria. The Country produces about 75% of world total output (manyong 2001). The production of yam in Nigeria is under taken in the forest/ derived Savanna areas due to its rich soil requirements. This includes areas around cross-Rivers, Imo, Rivers, Abia, Ondo , Benue, Taraba States, etc. the production of yam in Nigeria is very important therefore enormous amount of resources has been committed to its cultivation. The consumption of yam is relatively high in the urban areas in spite of the competition from other staple foods like, Rice, Maize and Cassava etc. Continuous reliance on traditional method of yam production by small-scale yam farmers in Nigeria production by small-scale yam farmers in Nigeria (Rivers State) has been part of the reason for the present low level of production as against the increasing rate of population and the accompanying high rate of food demand, inspite of various efforts made by the government to increase food production and reduce hunger and poverty in the country. The problem of low productivity in production arise from inefficient use of resources (Nyenke 2010). However, Udo and Etim, (2007) had explained that inefficient allocation of resource can seriously jeopardize and hamper food production, availability and security, therefore it becomes very important to know how technical efficient, yam farmers are in Rivers State. The study focused on determining the efficiency of yam farmers in Rivers State, examine the factors that influenced the level of efficiency and inefficiencies as well as identify the constraints of yam production in Rivers State, Nigeria.

METHODOLOGY

The study was carried out in Rivers State Nigeria. Rivers State is regarded as the treasure base of the country, it is one of the six states that makeup the South-South Geo-political zone of Nigeria with a population of about 5,198,716 (over five million people) according to the 2006 census the state has a land mass of about 11,077km^2 and located at longitude 4'45 and 6;50^{oE}. The major occupation of the people is fishing and farming The State is endowed with natural resources with an array of tropical rain forest and arable land. The State enjoys the presence of multi-national companies like the Nigerian liguified Natural Company Gas (NLNG) at Bonny, the Petro-chemical Company, INDORAMA Company, Eleme Refinery, Oil and Gas free zone at Onne, etc. Rivers State also plays host to the Niger Delta Development Commission (NDDC) with is headquarters in Port Harcourt. Six Local Government Areas within the up-land areas which forms the major agricultural zones were selected purposively, out of which twenty five (25) rural yam farmers were selected from each of the six Local Government areas, which gave us a population of 150 respondents purposively selected from amongst the yam farmers registered with the State ministry of Agriculture, under the umbrella body "All farmers Apex Association of Nigeria (AFAAN). Data collection was through a well structured questionnaire and personal interview as well as records from the Ministry of Agriculture Rivers State. Information collected were analyses using both descriptive statistics like frequencies and percentages as well a maximum likelihood regression analysis of the stochastic frontier production function. Model Specification: Maximum likelihood Estimation and Stochastic Frontier production function analysis, employing Cob-Douglas production function as defined by Coelli (1994). This model has also been proposed by Battase et al (1996 and written as follows;

$Y = bo + b_1X_1+b_2X_2+b_3X_3 + b_4X_4 +...b_nX_n + (Vi-Ui)$

Where Y = Quantity of yam produced in Kgh^{a-1}

X_1 = Area cultivate with yam (ha)

X_2 = Planting Materials (Seed yam)Kgh^{a-1}

X_3 = Labour used (Man-day h^{a-1})

X_4 = Fertilizer quantity used (Kgh^{a-1}

X5 = Other agro-chemicals used (kg/ha)

bo, b_1;bn = Regression co-efficient

Vi = Random variables assumed to be independent of Ui

Ui = Non-negative random variables assumed to account for the technical in-efficiency also assumed to be independent of Vi

Marginal Analysis : Efficiency of resources used was determined by the ratio of marginal value product (MVP) to marginal factor cost (MFC) based on the report of Rhaman and Lawal (2003) it was stated as follows;

$R = \frac{MVP}{MFC}$

Thus, r = 1 : This indicated efficient use of resources

r >1 : Indicates under the utilization of resources

r < 1 : Show over under utilization of resources

therefore, MVP = MPP.P_y = $\beta_1 \frac{\bar{y}}{\bar{x}} . P_y$

MFC =

RESULT PRESENTATION AND DISCUSSION

1.0 Socio-Economic Characteristics of Yam Farmers in Rivers

Table 1.1 The Socio-economic Characteristics of Yam Farmers in Rivers States.

A			
Gender	**Frequency**	**%**	**Mean**
Male	90	60	
Female	60	40	
Total	**150**	**100**	
Age			
15-25	0	0	
26-35	8	5.33	
36-45	20	13.33	
46-55	85	56.67	
56-65	37	24.67	
Total	**150**	**100**	**40.5**
Marital Status			
Married	135	90	
Single	5	3.33	
Divorced	0	0	
Widow	10	6.67	
Total	**150**	**100**	
Household size			
0-5	15	10	
6-10	100	66.67	
11-15	30	20	
16-Above	5	3.33	
Total	**150**	**100**	**10.5**
Educational Status			
Non-Formal	20	13.33	
Primary Education	77	51.34	
Secondary Education	45	30	
Tertiary Education	8	5.33	
Others	0	0	
Total	**150**	**100**	
Years of Experience			
1-5yrs	0	0	
6-10yrs	7	4.67	
11-15yrs	20	13.33	
16-20yrs	80	53.33	
21-Above	43	28.67	
Total	**150**	**100**	

Source of Finance		
Personal Savings	136	90.67
Friends/Relations	9	6.00
Co-op. Societies	0	0
Bank Loan	5	3.33
Money Lenders	0	0
Total	**150**	**100**
B		
Mode of Farming		
Full Time	128	85.33
Part Time	22	14.67
Total	**150**	**100**
Source of Land		
Family Inheritance	103	68.67
Purchased	4	2.67
Leased Hold	5	3.33
Rented Land	38	25.33
Total	**150**	**100**
Type of Planting Material		
Seed Yam	80	53.33
Yam Sett	70	46.67
Total	**150**	**100**
Source of Planting Material		
Previous Harvest	85	56.67
Purchase From Market	65	43.33
From Government	0	0
Agencies		
Friends & Relatives	0	0
Others		
Total	**150**	**100**
Area Cultivated		
Below 1 Ha	52	34.67
1-2 Ha	90	60.00
3-4 Ha	8	5.33
5-6 Ha	0	
Above 6 Ha	0	0
Total	**150**	**100**
Fertilizer Usage		
Yes	60	40
No	90	60
Total	**150**	**100**
Agro-Chem.Usage		
Yes	52	34.67
No	98	65.33
Total	**150**	**100**
Type of Labour Used		
Skilled Labour	0	0
Unskilled Hired	104	69.33
Family Labour (Adult)	40	26.67
Family Labour (children)	6	4.00
Total	**150**	**100**

Source: Field Survey, 2020.

Table 1 Showed the Socio-Economic Characteristics of Yam Farmers

The result revealed that 60% were male, while 40% female. This is in line with others scholars, who reported that more population of yam farmers were male. In the same vein, Nlerum (2006) concluded that yam farming

in Rivers State was dominated by men, hence it is men's occupation. However, Nwike *et al* (2016), Etim *et al* (2013) noted that even though yam production was dominated by men, the female folks also played prominent significant roles in yam farming, therefore the importance of women cannot be over emphasized. The result also showed age range of 26-65years with a mean age of 50 years, Ekunwe (2018) reported a mean age of 41years in Tai-Local Government area of Rivers State, on the other hand, Tiku *et al* (2012) reported average age of 55 and 52years respectively, this implies that the farmers were at the peak of their active and productive age. About 90% of the farmers were married, this agrees with Tayinde *et al* (2014) who reported 85% farmers were married Verter *et al* (2014) stated that those engaged in yam farming in Benue State were mainly matured married families. The table 1 also showed that 67% had household size between 11-15 with an average family 10 years, this is in line with Ekunwe (2018) who stated that yam production is labour intensive and as such, family size is necessary variable, it guarantees the farmer a reasonable source of labour supply. About 51% of the farmers had at least Primary education, while 30% had Secondary education. This is in line with the findings of Henri-Ukaoha *et al* (2011), Amaza (2002), who confirmed that, moreover, that the level of education enhances efficiency. The result still showed that 53% had between 16-20years experience with an average of 13years experience in South-East have. Reasonable years of experience. About 91% financed their farming from personal savings, 6% from friends and Relations while 3% through Bank loans, in line with this Eniola (2015), Reuben and Barau (2012), Reuben and Barau (2012) had stressed the challenges faced by rural farmers due to lack of finance for labour and other inputs. Size of farm land revealed that 60% cultivated on 1-2 hectares, while 35% had below one hectare of farms, this is in line with Shehu *et al* (2009) Ekunwe et al (2018) who reported that most rural yam farmers had fragmented small size farms less than 2 hectares. This result also showed that majority of farmers about 69% got their land through family inheritance, while only 25% rented their farms, this agrees with the findings of Donye *et al* (2012), Tiku et al (2012) who stressed that majority of rural farmers in developing countries have challenges due to land tenure system where communal land tenure does not allow individuals to own large farms.

Table 2.0 Maximum Likelihood Estimation of the Stochastic Frontier Production Analysis of Yam Farmer in Rivers State.

		Rivers State		
Production Factor	**Parameters**	**Coefficient**	**Std. Error**	**t-ratio**
Constant	β	1.822	0.284	6.422***
Area Cultivated (farm Size)	X_1	0.025	0.011	2.211**
Planting Materials (Setts)	X_2	0.040	0.063	0.640
Labour in Mandays	X_3	-0.058	0.164	-0.355
Fertilizer	X_4	-0.032	0.019	-1.738*
Agro. Chemicals	X_5	-0.007	0.009	-0.704
Inefficiency Effect				
Constant	δ	-0.292		-0.312
Gender	GEND	-0.609		-0.800
Age	AGE	0.027		0.357
Marital Status	MSTATU	1.284		1.768*
Household Size	HSIZE	0.275		0.635
Level of Education	LEDU	0.606		2.816***
Years of Experience	YEXP	-0.059		-1.732*
Sources of Finance	SFIN	-0.269		-1.090
Sources of Land	SLAND	-0.152		-0.644
Diagnostic Statistics				
Sigma Squared	σ^2	0.167	0.068	2.465**
Gamma	γ	1.000	0.000	11677.707***
Log Likelihood Function		-58.734		
LR test		53.316		

If the t-ratio value is greater than 2.576 then it is significant at 1%, if it lies from 1.96 to 2.576 then it is significant at 5%, it if lies from 1.640 to 1.960 it is significant at 10% level. *** Significant at the 0.01 level, ** at the 0.05 level, * at 0.1 level

Source: Computed output from Frontier 4.1 version, 2020.

The results of Stochastic Frontier production function estimates in table 2.0, showed that the estimated co-efficient for the Sigma square (δ^2) was 0.167 with t-ratio of 2.465, all figures were positive and significant at 5% level. Thus the result showed that there were inefficiency effects present amongst the various variables and also significant amongst the respondents. The Gamma (γ) co-efficient value of 1.00, with t-ratio 11.677. This result reveals a very high value which implies that greater percentage of the variations in yam output among farmers were due to differences in their technical efficiencies. The positive sigma squared (δ^2) values indicated the goodness of fit of all parameters included in the model, this is in line with Abdullahi (2015) who also reported positive co-efficient values. The frontier and significant, while others shows negative signs though significant at some levels. This implies that some inputs had direct relationship with resource use efficiency, while those with negative signs had inverse relationship with resource use efficiency and yam output, whereas farm size, planting materials (yam sett) were positive and have direct relationship with output, it means that an increase will also result to increase in output, on the other hand labour, fertilizer and Agro-chemical not increased output. However, look at the inefficiency effects, showed that level of education, age of farmers, marital status and Household size all enhanced inefficiency while Gender, years of experience, source of finance, and source of land enhances efficiency and reduces in efficiency of the farmers. This result is in contrast with the findings of Rahman and Umar (2010), Abdullahi (2015), who reported positive co-efficients for labour, also Oladele *et al* (2014) reported positive relationship between quantity of fertilizers and increase output, which is not the same with our finding. However, Sani *et al* (2010) agrees with our findings, hence most of the farmers said that fertilizer is not a major problem to them, because their soil is still fertile due to some local practices like bush fallow/land rotation system which they adopt. Agro-chemical usage was near zero, which agrees with

Fatuase et al (2015) who reported that agro-chemical was not a major factor. The results showed a co-efficient of 1.284 for marital status, and significant at 10% level, this implies that yam farming is gender sensitive, labour intensive and most of the rural farmers are married and they tend to use their children as labour thereby enhancing inefficiency.

Table 3.0 Maximum likelihood estimates of the Stochastic Frontier cost analysis

Cost Factor	Parameters	Coefficient	Std. Error	t-ratio
Constant	β	0.910	0.08	11.416***
Cost of Seed	X_1	0.005	0.000	5.394***
Cost of Land	X_2	0.010	0.007	1.428
Cost of Fertilizer	X_3	-0.029	0.007	-4.406***
Cost of Agro-Chemical	X_4	-0.001	0.001	-0.849
Cost of Land Preparation	X_5	0.002	0.001	1.459
Cost of Planting	X_6	-0.022	0.028	0.800
Cost of Staking	X_7	-0.006	0.010	0.676
Cost of Weeding	X_8	0.009	0.023	0.378
Cost of Harvesting	X_9	-0.004	0.005	-0.774
Cost of Transportation	X_{10}	0.004	0.002	1.953*
Inefficiency Effect				
Constant	δ	14.299	0.953	14.997***
Gender	GEND	-0.049	0.015	-3.283***
Age	AGE	-0.744	0.758	-0.981
Marital Status	MSTATU	1.347	0.758	1.850*
Household Size	HSIZE	-1.100	0.507	-1,198
Level of Education	LEDU	-1.937	0.868	-2.231**
Years of Experience	YEXP	0.233	0.766	0.305
Sources of Finance	SFIN	-0.479	0.785	-0.611
Sources of Land	SLAND	-0.246	0.692	-0.355
Diagnostic Statistics				
Sigma Squared	σ^2		0.018	17.393***
Gamma	γ		0.000	0.000
Log Likelihood Function				
LR test				

If the t-ratio value is greater than 2.576 then it is significant at 1%, if it lies from 1.96 to 2.576 then it is significant at 5%, it if lies from 1.640 to 1.960 it is significant at 10% level. *** Significant at the 0.01 level, ** at the 0.05 level, * at 0.1 level

Source: Computed output from Frontier 4.1 version, 2020.

Maximum likelihood estimates (MLE) of the Stochastic Frontier Cost analysis and inefficiency effects of yam farmers in Rivers State as presented in Table 3.0. the results shows positive Co-efficient (0.308) for Sigma square (δ^2) and Gamma (γ) was (1.0000) it was significant at 10% level. This confirms the goodness of fit of the model and correctness of the specific parameters included in the model. More over the Gamma Co-efficient of (1.000) implies that about 100% of the variation in cost of production among the farmers are attributed to differences in their level of Technical Efficiencies. This result reveals that there were cost inefficiencies among the yam farmers. This is in line with the position of Fatuese et al (2015), Ani *et al* (2014) who also reported positive Gamma Coefficients. The results on Table 3.0 shows that the following variables, cost of seed yam, cost of land and preparation, Cost of planting, staking, weeding, transportation were all positive and have direct relationship with overall cost of production, therefore resulted to increase in the cost of yam production. This agree with the opinion of Ekunwe *et al* (2018), Ike and Inoni (2005) who identified cost of planting materials (yam setts), weeding, Staking as major problems in yam production. On the other hand fertilizer and Agro-chemicals had negative values, this is because most of the yam farmers in Rivers State do not use fertilizers and Agro chemicals was not a major challenge in yam production. Level of Education, Age, Gender, Size of family, source of finance and source of land were all negatively signed and leads to reduction of cost inefficiencies, this is true, it is expected that, the more educated the farmer, the more they will be able to adopt modern techniques of farming that are cost of effective and more efficient as stated by Ugwumba and Omojola (2012), Abdullahi (2015). It is also opined that age affects productivity of yam farmers and increases their level of experiences in yam production, Umoh, (2006). In the same vein Okoye *et al* (2010), identified family size as an important index in the improvement of production efficiency, while Zaknayiba and Tanko (2013) reported that access to finance reduces, cost inefficiencies, which agrees with the result of this study.

Table 4 Technical Efficiency Range among yam farmers

	Rivers State	
Technical Efficiency Range	**Frequency**	**Percentage**
0.11-0.20	1	1
0.21-0.30	41	27
0.31- 0.40	47	31
0.41- 0.50	2	1
0.51-0.60	3	2
0.61-0.70	16	11
0.71-0.80	21	14
0.81-0.90	10	7
0.91-1.00	9	6
Total	**150**	**100**
Mean Efficiency	0.822	
Minimum	0.524	
Maximum	0.998	

Source: Computed output from Frontier 4.1 version, 2020.

Table 4.1 shows the distribution of Technical efficiency indices for production among yam farmers in Rivers State. According to Coelli (1996), the established rule is that efficiency estimates have values ranges between zero (0) and (1). Whereas (1) indicates a fully efficient firm, and zero (0) indicate fully inefficient firm. It means that any value less than one (0 < 1) or greater one (1<) shows some levels of inefficiencies. The results on table 4.0 shows the range of technical efficiency between 19.4% - 99.9%, with a mean of 49.8%, this implies that there is a very wide gap between the most efficient farmer and the least showing significant differences in technical efficiency level among yam farmers. Therefore the least efficient farmer requires 80.6% adjustment/improvement to attain full efficiency while an average level yam farmer in Rivers State requires 50.2% improvement to attain full efficiency. This result agrees with Ekunwe (2018) who also reported a wide range or variation in technical efficiency in Tai, Local government area of Rivers State.

Table 4.2 Technical Efficiency Indices for Cost Estimates

	Rivers State	
Technical Efficiency Range	**Frequency**	**Percentage**
1.00-1.99	91	61

2.00- 2.99	53	35
3.00 – 3.99	6	4
Total	**150**	**100**
Mean Efficiency	1.757	
Minimum	1.000	
Maximum	3.006	

Source: Computed output from Frontier 4.1 version, 2020.

The result presented on table 4.2, shows the technical efficiency distribution estimates on cost of yam farming in Rivers State. Cost efficiency ranges between 1.00 – 3.99, the minimum efficiency was 1.000 and maximum was 3.006 with mean cost efficiency of 1.757. The result revealed that about 61% of the respondents had cost efficiencies ranging between (1.00 – 1.99) while 35% had cost efficiencies range between (2.00 – 2.99). This implies that only 61% of yam farmers operated very close to the cost frontier, which lies around the axis of (1) this shows there were cost inefficiencies among yam farmers in Rivers State.

Table 5.1 Estimated Allocative Efficiency of Yam Farmers

Variables	MPP	APP	EP	MVP	Px	AE1
Area Cultivated	1836.48	3382.659	0.5429	918240	20,000	45.912
Planting Materials	1102.385	1881.999	0.5857	551192.50	180	3,061.18
Labour	4460.803	6594.693	0.6764	2230401.50	1500	1,486.93
Fertilizer	1480.83	1922.244	0.7704	740415	280	2644.33
Agro-Chemical	4666.07	10343.850	0.4510	2333035	140	16,664.53
Returns to Scale			**3.0264**			

Source: Field Survey, 2020.

Allocative efficiency estimates of yam farmers in Rivers state as presented on table 5.1 shows on marginal value product (MVP) of 918240, 551192.50, 2230401.50, 740415.50, 2333035, and value of marginal physical product (MPP) of 1836.48, 1102.38, 4460.80, 1480.83, 4666.07 for various inputs farm size (land area), planting materials (seed yam), labour, fertilizer and

agro- chemicals respectively. In line with Coelli (1996) allcoative efficiency is achieved when marginal value product (MVP) = p× (price of input). Therefore (A = 1), however, the above result shows that (A ≠ 1), MVP of all the inputs were greater than one with high value of elasticity, this indicates inefficient resource allocation and under utilization of inputs resources. Some under utilization of inputs like labour, planting materials (seed yam), farm land etc. have been reported by Onyenweaku (2000), Izekor (2014), Shehu *et al* (2010) respectively. The table 5.1 above revealed that sum of combined elasticity of production (EP) of all inputs is (3.0264) this indicates an increasing marginal returns which implies that the yam farmers were operating at stage I of the production curve, this however, is not a rational stage of production, resources were being underutilized.

Table 6.0 Costs and Returns of Yam Production in Rivers State

Items	Unit	Qty (kg)	Unit Price (₦)	Cost/Value (₦)
Gross Revenue:				957,000,000
Yield		1,914,000	500	-
Physical Cost:				
Yam Setts		777923		82,680,000
Fertilizer		11820		1,655,300
Agro-Chemical		45		293,000
Transportation Cost				3,673,000
Total				8,8301,300
Labour Cost				
Land Preparation				7633,000
Yam Planting				5447,000
Yam Staking				8,038,000
Weeding				8280,000
Harvesting				4,944,500
Total Labour Cost				**34,342,500**
Total Variable Cost				**122,643,800**
Fixed Cost				
Cost of Land		163.6ha		7,232,000
Total Cost				**129,875,800**
Gross Margin (TR-TVC)				843,356,,200
Net Farm Income (NFI)=TR-TC				827,124,200

Return on Investment: $\frac{GM}{R}$	0.871,24,200
Gross Margin Percentage: $\frac{GM}{R}\ x\ 100$	87.18%

Source: Field Survey, 2020.

Gross margin analysis as presented on table 6.0 above showed a gross revenue of 957,000,000, variable cost (TVC) of 122,643800 and total fixed cost (TFC) .7,232,000. The total cost (TC) 129, 875,800. This means 94.43% and 5.57% variable and fixed cost respectively. Therefore only a small portion of fixed cost are involved in yam production. This was also reported by Olorunsanya *et al* (2009). The result also showed a gross margin of 834,356,200, this is an evidence of high gross margin, which implies that yam production is profitable in Rivers State, this agrees with Maikasuwa *et al* (2012) who reported that yam production was profitable, the value of return on investment is 87.18%, this implies that for every one naira investment in yam production, there is a return or profit of 87.18% profitability in yam production had earlier been reported by Omojola (2014), Simpa and Nmadu (2014), Ibitoye *et al* (2013).

Table 7.0 Four Point Likert Scale, showing the Problems of Yam Farming in Rivers State.

		Very Serious Problem	Serious Problem	Not Serious Problem	Not a Problem	Total	Mean	R/mark
S/N	**CONSTRAINTS**	**4**	**3**	**2**	**1**			
1	High Cost of Seed yam/Planting Materials	100	50	0	0	550	3.66	V.SC
2	Inadequate provision of fertilizer	10	70	60	10	380	2.53	C
3	Lack of access to Credit facilities	35	115	0	0	485	3.23	S.C
4	High cost of Agro-Chemicals	20	118	12	0	458	3.05	S.C
5	Inadequate land for farming	0	60	70	20	340	2.36	NSC
6	Problem of Pest and Diseases	25	90	35	0	440	2.93	SC
7	Problem of Poor Finance	140	10	0	0	590	3.93	V.SC
8	Poor Quality of soil due to oil/exploitation	15	60	70	5	325	2.56	C
9	Problem of Insecurity in rural areas	50	85	15	0	485	3.23	VSC
10	Problem of flooding of the Soil	0	15	80	55	260	1.73	NC
11	Migration of Youths to the cities	30	75	35	10	425	2.83	C
12	Inadequate extension service	10	100	25	15	395	2.63	C
13	Inadequate storage facilities	45	70	30	5	455	3.03	V.SC
14	High cost of Labour	135	15	0	0	585	3.90	V.SC

Source: Field Survey, 2020.

The various challenges and constraint encountered by yam farmers in Rivers State were presented in table 7.0 above. The result showed that inadequate finance and high cost of labour were the most serious problems. This agrees with Gbegeh and Akubuilo (2013), Izekor and Olumese (2010), who indentified high cost of labour and lack of finance as major constraints to yam production. The second group were cost of seed yam, lack of access to credit, problems of insecurity, inadequate storage, high cost of agro- chemical, these all posed significant challenge/problem. In line with this Zaknayiba and Tanko (2013) earlier reported negative impacts of lack of access to credit, inadequate storage facilities on yam production. In the same vein poor quality of soil due to the activities of oil exploration companies, this resulted to soil degradation and pollution. Zaknayiba *et al* (2013), Ibitoye and Allah (2002) identified negative effects of pollution and environmental factors to yam production.

Hypothesis Testing

Table 8.1 correlation co-efficient analysis of the relationship between cost of production and total output of yam in Rivers State.

Model	R	R-Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square	F	df1	df2	Sig. F Change
1	776a	.602	.588	3199955.742	.602	43.589	5	144	.000

a. Predictors (Constant), Agro. Chemical Materials, Fertilizer, Area Cultivated, Labour in Monday

ANOVA[a]

Model		Sum of Square	df	Mean Square	F	
1	Regression	2231695788291189.500	5	446339157658237.900	43.589	.000[b]
	Residual	1474519211708811.000	144	10239716747977.854		
	Total	3706215000000000.500	149			

a. Dependent Variable: Revenue
b. Predictors (Constant), Agro, Chemical, Planting Materials, Fertilizer, Area Cultivated, Labour in Manday.

Coefficients [a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Constant	560404. 352	736766.423		761	448
Area Cultivated	427039.602	818030.301	-066	.522	.602
1 Planting Materials	-142.940	178.322	-088	-802	.424
Labour in Manday	38096.996	11158.163	.599	3.414	.001***
Fertilizer	5283.770	3574.148	.139	1.778	.142*
Agro. Chemical	847134.711	824913.517	.098	1.627	.306*

a. Dependent Variable: Revenue

Hypothesis "1" there is no significant relationship between cost of inputs used and yam output in Rivers State. The relationship between cost of inputs and total output of yam in Rivers State as presented in table 8.1 above, the result showed an (R^2) R- squared value of 0.602. This implies that 60% of variation in yam production in Rivers state were due to changes in cost of inputs, land, yam setts, labour, fertilizers and agro- chemicals. The "f" value of 43.58 shows the level of significant exhibited among variables in the model. The 't' statistics values were positive except for planting materials (seed yam) which was negative. This indicates some levels of significant relationship between these variables cost of labour and yam production with 'r' value of 3.414 significant at 1% level, while fertilizer and agro- chemicals were all significant at 10% level with 't' value of 1.778 and 1.627. Given this result, therefore, the null hypothesis is hereby rejected and we accept the alternative, that cost of inputs affects significantly the total output of yam in Rivers State.

Table 8.2 correlation co-efficient analysis of the relationship between socio-economic characteristics of yam farmers and profitability.

Model	R	R-Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square	F	df1	df2	Sig. F Change
1	570[a]	.324	.286	42131818.179	.324	8.466	8	141	.000

a. Predictors (Constant), Agro. Chemical Materials, Fertilizer, Area Cultivated, Labour in Monday

ANOVA[a]

Model		Sum of Square	df	Mean Square	F	
1	Regression	120258182635595953.500	8	1503227282294494.200	43.589	.000[b]
	Residual	2503633173644047.000	144	17756263642865.582		
	Total	3706215000000000.500	149			

a. Dependent Variable: Revenue
b. Predictors (Constant), SLAND, YEXP, GENDER, M,STATU, HSIZE, AGE, LEDU.

Coefficients [a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-6432959.113	5228992.048		-1.230	.221
GENDER	-2930709.955	806433.712	-288	- 3.634	.000*
AGE	220001.293	110679.215	.314	-1988	049*
MSTATU	-28880.291	499090.627	-004	-058	954
HSIZE	-62047.781	245569.444	-039	-253	.801
LEDU	5845.392	119765.597	.005	049	.961
YEXP	-117757.903	84377.833	-211	-1.396	.165
SFIN	2754708.603	855503.444	244	3.220	.002*
SLAND	2420900.255	553229.114	343	4.376	000*

a. Dependent Variable: Revenue

Hypothesis 2: There is no significant relationship between socio- economic characteristics and profitability of yam producers in Rivers State.

Table 8.2 show that value of R- square was (0.324), which implies that about 32% of variations in yam production were attributed to differences in socio- economic characteristics of the respondents, further more the value of 'f' statistics of 8.466 also shows over all significant of the parameters included in the model. The result shows that four variables, gender, age, source of finance and source of land were all positive at 1% level this shows that, there is significance relationship between these variables and profitability. We therefore reject the null hypothesis and accept the alternative that socio- economic characteristics have significant relationship with profitability of yam production in Rivers State.

Conclusion

The study revealed a very wide range of technical efficiency among yam farmers in Rivers state. It ranges between 19.4% and 99.9%, with mean efficiency 49.8%. The allocative elasticity index (AEI) were all greater (1) (AEI>1) which implies under utilization of resources (inefficiency). However, marginal analysis shows that there was positive returns on investment (87.18%).this means that for every one naira spent on yam production, there will be an 87.18% returns (profit), even though yam farmers were operating at stage 1 of the production frontier, with increasing returns to scale, none of the inputs were optimally allocated, some major constraint indentified includes, inadequate finance, high cost of labour, planting materials, insecurity of rural areas etc. which could have been responsible for the under utilization/inefficient use of production resources in the state. We therefore, recommend that cultivated area should be balanced with seed yam (planting materials), there should be improvement in labour and quality of seed yam, government should subsidize cost of inputs, finances should be provided through banks loan, co-operative societies, there should be improvement in the socio- economic characteristics of the finances to enable them adopt modern and proved techniques of farming, efforts should be made by all stake holders to reduce the level of insecurity village heads and local vigilante should work in collaboration with the government agencies to achieve stable security in various communities.

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