ISSN No:-2456-2165

Resource Efficiency and Profitability in Yam Production amongst Small Scale Yam Farmers in IMO State, Nigeria

IROEGBU I. OKIDIM I.A., NEKABARI B.D & AGBAGWA C.

Abstract:- The study was carried out to examine the resource use efficiency and profitability of small scale yam farmers in Imo State Nigeria. The objectives includes, identifying the socio-economic characteristics of the yam farmers and examine the level or range of technical allocative and economic efficiency of yam farmers as well as identify constraints militating against yam production in Imo State. Secondary and primary data were collected from 150 respondents, through a well-structured questionnaire, journals, CBN bulletins and reports etc. Data analysis was done using descriptive and inferential statistics tools. Stochastic frontier production function analysis and other marginal analysis were carried out. Results revealed a wide range of technical efficiency with mean efficiency of 82.2%. About 70% of the respondents were male 53% had at least secondary education, which may have influenced their relatively high technical efficiency. Allocative elasticity index (AEI>I), marginal value product (MVP>Px). Hence (AEI≠ 1), (MVP≠ Px) this implies that yam farmers were allocatively inefficient. However, gross margin analysis (GM) showed that yam production was profitable in Imo State, with a return on investment of 88.37%, certain constraints such as, high cost of planting material, poor or inadequate finance, lack of access to credit, insecurity in rural areas etc. Recommendations, such as subsidizing cost of inputs, access to loans, improvement of socio-economic variables, through provision of essential amenities, adequate collaboration and synergy between community heads, local vigilante and security agencies to check insecurity and encourage youths to go in to farming.

I. INTRODUCTION

Yam is botanically called "Dioscorea specie". It is an annual tuber crop, with over 600 species out of which there are about six most important species identified in terms of economic as well as medicinal value as reported by Arnau et al (2010), Andres *et al*, (2017). These species includes Dioscorearotundata (white yam), DioscoreaCayenensis (yellow yam), Dioscoreaalata (water yam), Dioscoreaesculenta (lesser yam), Dioscoreabulbitfera (aerial yam) cultivated for the bulbils, DiscoreaDimentoriam (Tri-foliate yam) popularly called three leaf yam. These species are grown by small scale or small-holder farmers throughout the tropics. Yam is arguably the most important tuber crop in many parts of Nigeria, hence it is referred to as the king of crops due to its nutritional, economic as well as socio-economic and high socio-cultural or religious significance, especially in the south-east and south-south geopolitical region of Nigeria, (Stuart 2005). In his opinion Onwueme (1978) observed that no other crop in Nigeria has taboos and festivity associated with it than yam. Nigeria produces about 75% of world's total yam output (Manyong 2001). The production of yam is under taken within the rain forest/derived savanna areas due to its rich soil requirements. Some of the states producing yam in Nigeria includes, Ondo, Benue, Taraba, Cross River, Rivers, Imo and Abia. There are many compelling reasons for encouraging the cultivation of yam for sustainable food production in Nigeria and Africa at large. The tuber is a good source of energy, it is low in fat and protein, has some vitamin C, but very rich in carbohydrate, however, of recent some pharmacologically active substances like dioscorine, saponin have been reported (Eka 1985).

The production of yam in Nigeria is very important as a result huge amount of resources are committed to it, (IITA 2001, FAO 2001). The consumption of yam is relatively high in many urban areas and cities inspite of the competition from other staple crops like Rice, Maize and Cassava. However, the predominant reliance on traditional methods of planting by Nigeria small scale yam farmer have partly been responsible for the present low level of production, against an increasing population rate and high food demand, inspite of government effort to increase food production and reduce hunger and poverty in the country. The problem of low productivity results from inefficient use of resources (Nyenke 2010). Farmers in Nigeria are poor in resource endowment, therefore inputs needs to be efficiently utilized. To this end it becomes very important to know how efficient small-scale yam farmers in Imo State are in yam production. The study will therefore focus on examining the socio-economic characteristics of the yam farmers, determine the efficiency of small-scale yam farmers in Imo State Nigeria and also identify if any the constraints against yam farmers in Imo State, Nigeria.

II. METHODOLOGY

A. The Study Area:

This study was carried out in Imo State, Nigeria. Imo State is in the south-eastern geo-political region of Nigeria created out of the then east central state. The state lies within latitudes 5.4°N and 60° 6.75°E, longitude 6° 35°N and 9° 3°E. Imo State has a land mass of about 7,480k_m^2. There are 27 local government areas in Imo State with a total population of 3,939,899 people, according to the 2006 population census. Imo state shares boundaries with Rivers State at the west, Abia state by the East and Anambra at the North. The state is predominantly an Igbo speaking state, the major towns includes, Owerre, Okigwe, Orlu, Oguta, Ohaji/Egbema, Mgbidi, Mbieri, Akokwa, Izombe, Amaigbo,

ISSN No:-2456-2165

Awo-mmama, Ngor-Okpala, Añara etc. The major occupation of the people is farming, fishing and petty trading. The vegetation of the state is mainly tropical rainforest with slightly acidic, altisoil and clayey hydro-morphic soil. Also there are alluvial, lithasols, and farraliticomedium soil, according to (ISMANR 1986).

B. Sampling Procedure

Multi-stage sampling was adopted, first a purposive sampling technique was used to select six (6) local government areas from the three agricultural zones in the state. These are Oguta, Ohaji/Egbema, Ngor/Okala, AbohMbaise, Okigwe and Ehime Mbano. From this (6) L.G.A's , 25 respondents were randomly selected from the registered yam farmers in each of the local government area. This gave us a total of one hundred and fifty (150) respondents. This procedure permitted reasonable fraction of the farmers to participate according to OLadele and Chah (2014).

C. Data Collection

Primary data was collected through awell structured questionnaire as well as scheduled interview with leadership of the yam farmers association in the state. Secondary data was obtained from journals, CBN bulletins and periodicals.

D. Analytical Techniques

Analysis of data was done using descriptive and inferential statistics. Mean and percentages were used to analyze the socio-economic characteristics of small scale yam farmers in the area, while stochastic frontier production function using maximum likelihood estimate (MLE) to determine level of technical efficiency of the farmers, gross margin analysis proved the profitability of yam production in Imo State.

E. Model Specification

Cobb-Dauglas production function as defined by Coelli (1994) recommended by Batteseet *al*, (1996) written as follow:

Y = bo + bixi + b2x2 + b3x3 + b4x4…….bnxn+(vi-Ui)

Where: Y = Quantity of yam produced in kg/ha
X1 = Area cultivated with yam in kg(ha)
X2 = Planting materials (seed yam) kgh^{a-1}
X3 = Labour used (mandays) h^{a-1}
X4 = Fertilizer quantity used (kgh^{a-1})
X5 = Other agro-chemicals used (kg/h^{a-1})

bo, b1, bn = Regression co-efficient
Vi = Random variables assumed to be independently of Ui
Ui = non-negative random variables assumed to account for technical inefficiencies also assumed to be independent of Vi

The farm frontier production function was specified as:

$$yi = f(xijP) + Vi - Ui$$

Where: $yi =$ the output of the i^{th} firm

xij =the vector of actual j^{th} farmer
β= vector of the production co-efficient to be estimated
Vi = the random variability in the production that cannot be influenced by the farmer extraneously
Ui= the deviation from maximum potential output attributable to resources use efficiency.

The corresponding cost function is as follows:

$$C = y(P_i y_i y) + (V_i + U_i)$$

Budgetary analysis –based on gross margin and net farm income was used assess the profitability of yam production in Imo State.

Gross Margin (GM) which is the difference between the total value product (TVP) and total variable cost (TVC);

Therefore, GM = TVP - TVC
NFI = GM – TFC

If GM >O, then the firm is profitable.

Efficiency is determined by the ratio of marginal value product MVP to MFC according to Rhaman and Lawal (2003).

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

Thus: r = 1 indicates efficient use of resources
r> 1 indicates under utilization of resources
r< 1 indicates over utilization of resources

Therefore:

MVP = MPP. Py = $\beta_I \frac{\bar{y}}{\bar{x}} . p_y$
MFC = P_{x1}

Where: r = coefficient ratio
MVP = marginal value product
MFC = marginal factor cost
P_{x1} = Unit price of input x
MPP = marginal physical product
β = regression co-efficient
P_y = unit price of output
$\bar{y}$ = mean output of the farm
$\bar{x}$ = mean value of resources

ISSN No:-2456-2165

III. RESULTS PRESENTATION AND DISCUSSION

Socio-economic characteristics of small scale farmer in Imo State

A	Imo State			
Gender	**Frequency**	**%**	**Mean**	**Remarks**
Male	105	70		
Female	45	30		
Total	**150**	**100**		
Age				
15-25	0	0		
26-35	10	6.67		
36-45	25	16.67		
46-55	95	63.33		
56-65	20	13.33		
Total	**150**	**100**	**40.5**	
Marital Status				
Married	125	83.34		
Single	0	0		
Divorced	5	3.33		
Widow	20	13.33		
Total	**150**	**100**		
Household size				
0-5	8	5.33		
6-10	95	63.33		
11-15	40	26.67		
16-Above	7	4.67		
Total	**150**	**100**	**10.5**	
Educational Status				
Non-Formal	15	10		
Primary Education	45	30		
Secondary Education	80	53.33		
Tertiary Education	10	6.67		
Others	0	0		
Total	**150**	**100**		
Years of Experience				
1-5yrs	0	0		
6-10yrs	5	3.33		
11-15yrs	25	16.67		
16-20yrs	65	43.33		
21-Above	55	36-67		
Total	**150**	**100**		
Primary Occupation				
Yam Farming	25	16.67		
Mixed Farming	95	63.33		
Civil Servant	10	6.67		
Others	20	13.33		
Total	**150**	**100**		
Forms of training	**Frequency**	**%**	**Mean**	**Remarks**
Traditional	140	93.33		
Formal	0	0		
Workshops/Seminars	10	6.67		
Others	0	0		
Total	**150**	**100**		
Source of Finance				
Personal Savings	138	82.00		
Friends/Relations	7	4.67		
Co-op. Societies	5	3.33		
Bank Loan	0	0		
Money Lenders	0	0		

ISSN No:-2456-2165

Total	**150**	**100**
Mode of Farming		
Full Time	115	76.67
Part Time	35	23.33
Total	**150**	**100**
Source of Land		
Family Inheritance	103	68.67
Purchased	6	4.00
Leased Hold	9	6.00
Rented Land	32	21.33
Total	**150**	**100**
Type of Planting Material		
Seed Yam	60	40
Yam Sett	90	60
Total	**150**	**100**
Source of Planting Material		
Previous Harvest	40	26.67
Purchase From Market	110	73.33
From Government Agencies	0	0
Friends & Relatives	0	0
Others	0	0
Total	**150**	**100**
Area Cultivated		
Below 1 Ha	59	39.33
1-2 Ha	85	56.67
3-4 Ha	6	4.00
5-6 Ha	0	0
Above 6 Ha	0	0
Total	**150**	**100**
Fertilizer Usage		
Yes	40	26.67
No	110	73.33
Total	**150**	**100**
Agro-Chem.Usage		
Yes	33	22
No	117	78
Total	**150**	**100**
Duration Before Harvesting		
6-8 Months	12	8.00
9-10 Months	8	5.33
12 Months & Above	0	0
Total	**150**	**100**
Type of Labour Used		
Skilled Labour	0	0
Unskilled Hired	95	63.33
Family Labour (Adult)	45	30.00
Family Labour (children)	10	6.67
Total	**150**	**100**

Table 1: showing socio-economic characteristics of small-scale yam farmers in Imo State

Source: field survey, 2022

Results from table 1.0 above revealed that 70% of the yam farms were male and 30% female. Tiku*et al* (2014) had earlier reported that more population of yam farmers were male. However, Nwike*et al* (2016) noted that the female folks still play significant role in yam production. Majority of the farmers fell between ages 36 – 55 with a mean age of about 41 years, this shows that most of the farmers were still within their active and productive age, whereas Tayinde*et al* (2014), Tiku*et al* (2012) reported average age of 51, 52 respectively. About 87% were married, this also is in line with Ekunwe*et al* (2018), who reported 85% married yam farmers, and Bamire*et al* (2005) reported 75% were married farmers. About 63% of the farmers have household size between 6 -10 persons while 27% are between 11 – 15 persons with mean number of 11 persons due to the labour intensive nature of yam farming, this fact had also been stressed by Ekunwe (2018).

About 53.3% of the yam farmers had at least primary education and 30% had secondary education, which means

ISSN No:-2456-2165

that the farmers had one form of education or the other as reported by Henri-Ukaoha*et al* (2011), Iroegbu*et al* (2021). The result also showed that 43.3% had 16 – 20 years of experience, 37% had above 21 years of experience in yam farming, which indicate that farmers had reasonable years and acquired experiences on how to improve their performances. Mode of financing revealed that 82% financed their farm through personal savings with only 3.3% from co-operative society, 5% from friends and relations, this explains the fact that finance is a major challenge/constraint to yam farming in Nigeria Reuben and Barau (2012). Eniola (2015). Most of the farmers about 69% get land through family inheritance, due to the communal land tenure system being practiced in most rural areas. The yam farmers in Imo State plant 60% yam sett and 40% seed yam, 73% get their planting materials from the market, 27% from previous harvest. About 57% cultivated 1 – 2 hectares, while 39% cultivates below 1 hectare of land, about 73% do not apply fertilizer to their farms, 78% don't even use any agro-chemical in their farms, these have already been identified as problem of developing our agricultural sector as reported by Donye*et al* (2012), Ekunwe (2018).

Production Factor	Imo State Parameters	Coefficient	Std. Error	t-ratio
Constant	β	0.892	0.328	2.724***
Area Cultivated (farm Size)	X_1	0.021	0.006	3.636***
Planting Materials (Setts)	X_2	0.162	0.030	5.329***
Labour in Man-days	X_3	-0.043	0.011	-3.799***
Fertilizer	X_4	-0.030	0.010	-3.028***
Agro. Chemicals	X_5	-0.000	0.005	-0.029
Inefficiency Effect				
Constant	δ	-.1805	2.305	-0.783
Gender	GEND	0.022	0.097	0.230
Age	AGE	-0.029	0.057	-0.515
Marital Status	MSTATU	0.756	0.648	0.012
Household Size	HSIZE	0.329	0.210	0.016
Level of Education	LEDU	-0.936	0.636	-1.472
Years of Experience	YEXP	0.013	0.033	0.390
Sources of Finance	SFIN	-0.113	0.115	-0.986
Sources of Land	SLAND	0.425	0.246	1.173
Diagnostic Statistics				
Sigma Squared	σ^2	0.102	0.014	7.134***
Gamma	γ	0.002	0.019	0.103
Log Likelihood Function		-41.061		
LR test		19.364		

Table 2: maximum likelihood estimation of the stochastic frontiers production analysis of yam farmers in Imo State

Source: Computed output from Frontier 4.1 version, 2022

Table 2. evealed that estimated coefficients for the Sigma square (δ^2) of 0.102 and t-ratio of 7.134, these were all positive and significant at 1% level, which indicates the existence of in-efficiency effects amongst various variables, the Gamma (y) coefficients was 0.002 and t-ratio of 0.103 also significant at 1% level, this implies that greater proportion of the variations in yam output in Imo-state were due to differences in their technical efficiencies as upheld by Abdullahi (2015). The result of the maximum likelihood estimation on the stochastic frontier production function revealed that variables such as farm size, planting materials should positive coefficient, which is a direct relationship with yam output, an increase in these variable will result to increase in output, while labour, fertilizer and Agro-chemicals had inverse relationship, they do not increase yam output in Imo State. A look at the sources of inefficiency effects showed that, Gender (sex), marital status, house hold size, source of land were all directly related to in efficiencies, they increased in-efficiency of the yam farmers, while on the other hand, age of the farmer, level of education and source of finance all had inverse relationship with the farmer in-efficiencies, they reduce farmers in-efficiencies and increase output of yam in Imo State. In contract, Rahman and Uma, (2010) had earlier reported positive coefficients for labour, while Fatuase*et al* (2015), Sani*et al* (2010) agreed that fertilizer and agro-chemicals were not major constraints hence it could be easily overcome.

ISSN No:-2456-2165

Cost Factor	Imo State Parameters	Coefficient	Std. Error	t-ratio
Constant	β	0.314	0.571	0.550
Cost of Seed	X_1	0.004	0.004	1.145
Cost of Land	X_2	0.056	0.018	3.039***
Cost of Fertilizer	X_3	-0.006	0.005	-1.210
Cost of Agro-Chemical	X_4	-0.010	0.005	-1.908*
Cost of Land Preparation	X_5	0.002	0.004	0.364
Cost of Planting	X_6	0.023	0.077	0.293
Cost of Staking	X_7	-0.028	0.038	-0.743
Cost of Weeding	X_8	0.064	0.105	0.609
Cost of Harvesting	X_9	0.015	0.014	1.031
Cost of Transportation	X_{10}	0.007	0.015	0.439
Inefficiency Effect				
Constant	δ	6.063	1.190	5.093***
Gender	GEND	-0.156	0.056	-0.028
Age	AGE	2.044	0.931	2.196**
Marital Status	MSTATU	-4.736	1.045	-4.531***
Household Size	HSIZE	0.447	0.916	0.488
Level of Education	LEDU	4.668	1.077	4.333***
Years of Experience	YEXP	-5.084	1.073	4.737***
Sources of Finance	SFIN	0.555	0.751	-0.739
Sources of Land	SLAND	0.944	0.563	1.675*
Diagnostic Statistics				
Sigma Squared	σ^2	0.377	0.007	52.788***
Gamma	γ	0.910	0.000	622849.100***
Log Likelihood Function		-11.729		
LR test		60.581		

Table 3: Stochastic frontier cost analysis of small scale yam farmers in Imo State

Source: Computed output from Frontier 4.1 version, 2022

The result from table 3.0 shows sigma square (δ^2) value of (0.377) and co-efficient for Gamma (y) was (0.910) significant at 1% level. This is a very high Gamma coefficient, which implies that 91% of cost in efficiencies were from factors under the control of the farmers, similar case was reported by Ani*et al* (2014), Abdullahi (2015). Information from this table, reveals that variables like cost of seed yam (planting material) cost land, cost of labour for land preparation, planting, weeding, harvesting and cost of transport were all positive and has direct relationship with overall cost of yam production in Imo State on the other hand, cost of fertilizer, Agro-chemicals, and staking had negative coefficients therefore were insignificant to the overall cost of yam production. This agrees with Bassey and Nwankwo (2017), Ume *et al* (2018) who identified cost of labour, Abdullahi (2015) reported that agro-chemicals were not major challenge in yam production, this is because most of rural farmers do not use fertilizers and agro-chemical to plant yam. The cost function inefficiencies and effects reveals that variables such as Gander (sex) of the farmer, marital status, years of experience in farming decrease the level of inefficiency of the farmers and increase output or efficiency, while age, house hold size of the farmer. The level of Education, source of finance and source of land all had positive values and has direct relationship with yam farmers inefficiencies, meaning that the older the farmer gets, the more children or house hold size, the more inefficient in use of resources. But this is contrary to the opinion of Okoye et al (2010), Ugwumba and Omojola (2012), who reported that age, family size, and access to finance increase farmers efficiency.

ISSN No:-2456-2165

Technical Efficiency Range	Frequency	Percentage
0.51-0.60	2	1
0.61-0.70	18	12
0.71-0.80	49	33
0.81-0.90	47	31
0.91-0.100	34	23
Total	150	100
Mean Efficiency	0.822	
Minimum	0.524	
Maximum	0.998	

Table 4: Distribution of technical efficiency range for production estimate among small scale yam farmers in Imo state.

Source: Computed output from Frontier 4.1 version, 2022

Technical Efficiency Range	Frequency	Percentage
1.00-1.99	104	70
2.00- 2.99	29	19
3.00 – 3.99	17	11
Total	150	100
Mean Efficiency	1.708	
Minimum	1.000	
Maximum	3.493	

Table 5: Distribution of technical efficiency indices for cost estimate among yam farmers in Imo State
Source: Computed output from Frontier 4.1 version, 2022

The result from table 4.1 shows that technical efficiency range for yam farmers in Imo State has minimum limit 0.524 and maximum 0.998 with a mean technical efficiency of (0.822), however, the result shows that greater percentage of the farmers operates within efficiency range (0.71- 0.80) which is 71- 80% level of resource efficiency. To the average yam farmer with 82.2% level of efficiency, he requires about 17.8% adjustment to attain full efficiency, while the least efficient farmer needs about 47.8% adjustment in production inputs to attain full efficiency. The result however, indicates a reasonable high level of resource efficiency among yam farmers in Imo State, this is in line with the findings of Tiku*et al* (2012). On the other hand, table 5 shows the technical efficiency indices for cost estimates, which ranges between 1.000 – 3.99. The minimum of (1.000) and maximum of (3.493) with mean of (1.708). The result shows that 70% of the yam farmers in Imo State operated between (1.000 – 1.999), this implies that about 70% of the farmers were operating close to the cost efficiency frontier which lies between (0) and (1).

Variables	**MPP**	**APP**	**EP**	**MVP**	**Px**	**AE1**
Area Cultivated	469.691	3759.66	0.125	234845.50	20,000	11.74
Planting Materials	936.759	2036.94	0.460	468379.50	180	2602.10
Labour	2769.36	4124.68	0.6714	1384,680	1500	923.12
Fertilizer	8426.16	12690.02	0.664	421305	280	150.66
Agro-Chemical	1757.00	5791.66	0.303	878500	140	6275.00
Returns to Scale			2.2234	1.000		

Table 6: EstimateAllocative Efficiency of Small-scale Yam Farmers in Imo State, Nigeria

Source: Computed output from Frontier 4.1 version, 2022

Result from table 6. shows marginal physical product (MPP) for various inputs, Land (farm size), planting materials (seed), labour, fertilizer, and agro-chemical was, 469.691, 936.759, 2769.36, 8426.16, 1757.00 respectively, while the marginal value product (MVP) was 234845.50, 468379.50, 1384.680, 421305 and 878500 respectively. The table shows a total co-efficient elasticity of 2.2234. The fact that the co-efficient for allocative elasticity index for all the input (variables) were greater and not equal to one (AEI ≠I), this is an indication of under utilization of resources, hence they were still operating at stage 1 of the production function. Again the marginal value product (MVP ≠1) this is another indication of inefficient use of resources among small scale yam farmers in Imo State, Nigeria, this agrees with the view of Izekor (2014), Onynweaku*et al* (2000), who reported under-utilization of farm land, labour and yam seeds.

ISSN No:-2456-2165

Items	Unit	Qty (kg)	Unit Price (₦)	Cost/Value (₦)
Gross Revenue:				902,000,000
Yield	Kg	1,804,000	500	-
Physical Cost:				
Yam Setts	Kg	802,900		67,862,000
Fertilizer	Kg	7280		1,02,1000
Agro-Chemical	Kg	34.5		165,000
Transportation Cost				2982,000
Total				72,030,000
Labour Cost				
Land Preparation				6,324,000
Planting				5,937,000
Staking				6,886,500
Hand Weeding				9098,000
Harvesting				4,568,000
Total Labour Cost				**32,813,500**
Total Variable Cost				**104,843,500**
Fixed Cost				
Cost of Land				7,090,000
Depreciation				
Total Cost				111,933,500
Gross Margin (TR-TVC)				797,156,500
Net Farm Income (NFI)=TR-TC				790,066,500
Return on Investment: $\frac{GM}{R}$				0.883765521
Gross Margin Percentage: $\frac{GM}{R}\ x\ 100$				88.37%

Table 7: cost and returns of yam production in Imo State

Source: field survey, 2022

Gross margin analysis calculated from the cost and returns of yam product in Imo state as presented on table 7. reveals that the gross revenue was N902,000,000 total variable cost (TVC) was 104,843,500 and fixed cost (TFC) was 7,090,000 this gives a total cost (TC) of 111,933,500. This implies 93.67% variable cost and 6.33% fixed cost respectively. Musa et al (2011) reported that fixed cost contributes small portion of total cost (TC) among rural farmers in Nigeria.

The result showed a gross margin of 797,156,500, Net farm income (NFI) was 790,066,500 with this the return on investment (RI) was 0.883765521 which implies a gross margin percentage of 88.37%. This means that any naira invested in yam farming in Imo state will yield return of 88.37%. Therefore we can conclude that yam production in Imo State is profitable , this had earlier been observed by Maikasuwa et al (2012).

		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	31	110	9	0	492	3.14	V.SC
2	Inadequate provision of fertilizer	20	50	50	30	360	2.40	NC
3	Lack of access to Credit facilities	130	20	0	0	580	3.86	V.SC
4	High cost of Agro-Chemicals	10	120	10	10	430	2.86	C
5	Inadequate land for farming	10	50	70	20	350	2.33	NC
6	Problem of Pest and Diseases	20	40	80	10	361	2.41	NC
7	Problem of Poor Finance	140	5	5	0	585	3.90	V.SC
8	Poor Quality of soil due to oil/exploitation	0	15	75	60	255	1.70	NC
9	Problem of Insecurity in rural areas	60	70	20	0	490	3.26	V.SC
10	Problem of flooding of the Soil	0	17	57	80	245	1.63	NC
11	Migration of Youths to the cities	30	70	40	10	420	2.80	C
12	Inadequate extension service	20	90	30	10	420	2.80	C
13	Inadequate storage facilities	25	120	5	0	470	3.13	V.SC
14	High cost of Labour	140	10	0	0	590	3.93	V.SC

Table 8: four point LikertScale, showing constraints of Small Scale Yam Farmers in Imo State
Source: Field Survey, 2020.

ISSN No:-2456-2165

Table 8 shows various degrees of impact and constraints to yam farmers in Imo State.

Looking at information from this table we can see that high cost of labour, inadequate finance, lack of access to credit, insecurity of the rural areas, high cost of planting material (seed yam), as well as inadequate storage facilities were very serious constraint against small scale yam farmers in Imo State. This is in line with the findings of Izekor and Olumese (2010),who identified high cost of labor, lack of finance and cost of planting materials as major constraint to yam farmers.

Model	R	R-Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square	F	df1	df2	Sig. F Change
1	394[a]	.155	.107	5057785.169	.155	3.230	8	141	.002

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

ANOVA[a]

Model		Sum of Square	df	Mean Square	F	
1	Regression	661025428558092.500	5	82628178569761.560	43.589	.000[b]
	Residual	3606947904775242.000	144	25581190814008.810		
	Total	42673333333334.500	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)	1669120.172	4672957.968		357	.721
GENDER	-1633318.165	1217376.194	-141	- 1.342	.182
AGE	-48495.187	85888.341	-065	-565	573
MSTATU	-210528.529	481163.787	.041	-438	.662
HSIZE	186885.681	168620.478	.119	1.908	.270*
LEDU	-78156.170	148992.078	.063	-525	.601
YEXP	83442.383	73873.363	112	1.730	.261*
SFIN	2371993.989	1588030.395	135	1.694	137*
SLAND	1217772.289	601877.431	195	2.023	.045**

a. Dependent Variable: Revenue

Table 9: linear regression analysis of the relationship between socio-economic characteristic of yam farmers and total revenue from the production in Imo State

Model Summary

Model	R	R-Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square	F	df1	df2	Sig. F Change
1	540[a]	.291	.267	4583517.263	.291	11.831	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	12427305555070100	5	248546111014020.000	11.831	.000[b]
	Residual	3025242778263234	144	21008630404605.757		
	Total	42679733333333.500	149			

a. Dependent Variable: Revenue

b. Predictors (Constant), Agro, Chemical, Planting Materials, Fertilizer, Area Cultivated, Labour in Manday.

Model	Coefficients [a]				
	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Constant	74023.006	1045496.754		071	944
Area Cultivated	-493084.373	1239099.074	-065	-398	.691
1 Planting Materials	202.392	230.389	.105	1.878	.381*
Labour in Manday	24492.177	9295.847	.467	2.635	.009***
Fertilizer	2361.753	6606.068	.042	.358	.721
Agro. Chemical	241315.538	1209073.233	.024	.200	842

Table 10: Linear regression analysis, showing the relationship between cost of production and total revenue/output from yam production in Imo State.

a. Dependent Variable: Revenue

IV. HYPOTHESIS TESTING

Ho:1 There is no significant relationship between socio-economic characteristics of the farmers and output/revenue.

The result showed that there was a positive r-squared (R^2) value (0.155), this implies that about 15% of the variation in yam production in Imo State were due to differences in socio-economic characteristics. Further examination shows positive coefficients and direct relationship between years of experience, source of finance, source of land, household size and output, increase in these variables will increase yam output. The positive t-ratio, which is at 10% level of significance, shows that there is significant relationship between socio-economic characteristics of the farmers and overall revenue/output. Therefore, we reject the Null hypothesis of no relationship and accept the alternative that there is relationship between socio-economic characteristics and yam output, hence socio-economic characteristics affect profitability:

Ho:2 (Null Hypothesis). There is no significant relationship between cost of production and yam output in Imo State. The result revealed that the value of R-squared (R^2) was (0.291), which implies that 29% of differences or variation in yam output were attribute to changes or differences in cost of inputs land, yam setts, labour, fertilizer etc. The values of coefficients and t-ratio were positive figures which indicates direct relationship and some level of relationship significant at 1% and 10% levels respectively. This result implies that an increase in the cost of inputs land, labour, planting materials (yam setts) will increase total cost of production and therefore affect output of yam in Imo State. With these result, we can therefore reject the null hypothesis or no relationship, instead we accept the alternative, that there is a significant relationship between cost of inputs and revenue of small scale yam farmers in Imo State.

V. CONCLUSION

This study identified various socio-economic characteristics of small scale yam farmers in Imo State Nigeria, their impact on the level of efficiency of the farmers, as well as profitability. Stochastic frontier analysis revealed a wide range of technical efficiency among the yam farmers, with an average technical efficiency of 0.822 (82.2%), which means an average yam farmer requires technical adjustment of about 17.8% to attain full technical efficiency. The values of co-efficients and allocative efficiency/index (AEI) were all greater than one (AEI>), (AEI≠1) which implies under utilization and inefficient allocation of resources, moreover the marginal value products (MVP) were all greater than unit price of input (MVP>Px) (MVP≠ Px). However, gross margin analysis (GM) showed that yam production in Imo state, Nigeria was profitable with an 88.37% return on investment (RI). Nevertheless, certain constraints such as high cost of labour, planting materials (yam sett), lack of finance, non access to farm credit, insecurity situation in the rural areas were identified. The following recommendations were suggested, that cost of inputs, (seed yam) should be subsidized, more access to bank loans, improvement in the socio-economic status of rural farmers by provision of certain amenities will go a long way to boast farmers efficiency. Adequate collaboration and synergy between community heads, local vigilantee and government security agencies could curb the insecurity, instead more of the youths could be engaged in farming and other productive sector.

ISSN No:-2456-2165

REFERENCES

[1.] Abdullahi, Man. (2015). Profitability and Efficiency of yam production among small holder farmers in selected Local Government of Niger State, Nigeria: An MSc. Dissertation-Depth of Agricultural Economics and Rural Sociology.

[2.] Ani, D. P, Iorkaa, J.T &Ogebe, F. O. (2014).Technical efficiency of yam producers in Uum Local Government Area, Benue State Nigeria. Journal of Agriculture and veterinary science, Vol.(7):14-19.

[3.] Andres, C. Adeoluwa, O.O &Bhulla, G.S. (2017).Yam (D.spp). In Encylopedia of applied plan Science. Vol. 3 eds Thomas, B. Muray, B.G. Murphy, D. J. Editors (Walthan, M.A: Academic Press) 435-441.

[4.] Arnau, G., Ibraham, K, Sheela, M., Chair, H., Sartie, A. &Asiedu, R. (2010).*Yams in root and tuber crops*.Handbook of plant breeding. Vol. 7, ed. Bradshaw J., editor (New York: NY:Spinger science + Business media)127-148.

[5.] Battese, G.E, Malik, S.J.&Braca, S. (1996). Production function frontier for wheat farmers in selected district of Pakistan: An application of a stochastic frontier production function with time varying inefficiency effects. *The Pakistan development review*. 32:233-268.

[6.] Bamire, A. S &Ariujoyegbe (2005), Economics analysis of land improvement techniques in small-holder yam-based production system in the agro-ecological zones of South west Nigeria.*Journal of Human Ecology* 18:1-12.

[7.] Bassey, E.E, &Akpan, U.S. (2015).Evaluation of guinea white yam (D.spp) Botundata for yield and yield components in Nigeria.*American journal of experience*. Agricultural 8, 216-233.

[8.] Coelli, T.J. (1994).*A guide to frontier version 4.1*: A computer programme for stochastic frontier production and cost function estimation. *Mimeo Department of Econometrics*, University of New England Armidale. (4):32.

[9.] Eka, O.U. (2008). The chemical composition of yam "in: Osuji, G. (ed) Advances in yam resource frontier publishers. Enugu, Nigeria. 13:61-83.

[10.] Ekunwe, P.A, Orewa, S. I. &Emokaro, C. O. (2008). Resource use efficiency in yam production in Delta and Kogi States of Nigeria. *Asian Journal of Agricultural Research*.2(2).61-69.

[11.] Ekwune, P.A., Henri-Ukoha, A & Emmanuel, R, (2018).Technical efficiency and Return to scale in yam production in Tai Local Government Area of Rivers State, Nigeria.*Advances in Research*. 15(2):1-9.

[12.] EniolaOluwatoyin, Olerumsanya, (2015). A gender based economic analysis of yam production among resources poor farm households in Kwarra State, Nigeria.

[13.] FAO STAT. (2016). Food and Agricultural Organisation Statistics 2016.

[14.] Fatuase, A. I. (2015). Performance and Resources use efficiency of yam production in Owo Local Government Area of Ondo State Nigeria. *A Journal of Applied Tropical Agriculture*.

[15.] Henri-U.A., Orebiyi, J.S., Lemchi, J.I., Ibekwe, U.C, Onyeagocha, S.U.O &Benchende, G.N (2011). Comparative analysis of Agricultural credit users and non-user, among Cassava farmers in Ohafia Local Government Area of Bia State, South East Nigeria. *International Journal of Agricultural management*. 1(1):23-41.

[16.] Ibekewe, U, C, &Orebiyi, J. S. (2012). Resource Use Efficiency in Cassava production in South-East. Nigeria.

[17.] Ibitonye, S. J, &Attah, S. (2012). An assessment of yam mini-sett utility and project level in Kogi State Nigeria, *Journal of Development and Agric. Economics* 5(11):470-475.

[18.] Ike, P.G. &Inoni, O.E (2006).Determinant of yam production and economic efficiency among small holder farmers in South East, Nigeria. *Journal of central European Agriculture*. 7(2):337-342.

[19.] Izekor, O.B &Olumese, M.I. (2010) Determinant of yam production and profitability in Edo State, Nigeria, *African Journal of General Agriculture*. 6(4):1-3.

[20.] Maikasuwa, M.A.,&Ala, A.L (2013). Determinants of Profitability and resource –use efficiency of yam production by women in Bosso Local Government Area of Niger State, Nigeria. *European Journal Scientific journal*. 91

[21.] Manyong, V. M, IAP, A, Olayemi, J.K, Yusuf, S.A, Omonona, B.T., Okoruwa, V &Idachaba, F.S (1998). Agriculture in Nigeria identifying opportunities for increased commercialization and investment.*IITA*, Ibadan Nigeria. 159.

[22.] Nwike, C.M, Obianefo, C. A, Odinaka, O. A., &Onyekaneso, C. J. (2016).Analysis of the resource management.Ability by Cat Fish farmers in Nigeria.A case of Ogbaru Local Government Area of Anambra State.*International Journal of Agricultural Economics* 5(5):156-164.

[23.] Nyenke, O.A. (2010) Over of Rice production in Nigeria, paper presented at a seminar on Sustainable rice in Nigeria. Organized by C.B.N. held at Hamadala Hotel Kaduna. 24

[24.] Okoye, B.C &Okezie, C.A (2010) Determinant of Technology efficiency among egg- plant farmers using the stochastic frontier approach model in IsialaNgwa Local Government Area of Abia State, Nigeria. *Medwell Agricultural Journal* 1(3):113-122.

[25.] Onwueme, I. C. (1978).*The tropical tuber crops*: yam, cassava, sweet potato, cocoyam. John Wiley and Sons Hd Toronto.

[26.] Onyenweaku, C.E &Nwaru, J.C (2005).Application of stochastic frontier production function to the measurement of technical efficiency in food crop production in Imo State, Nigeria. *The Nigeria Agricultural Journal*. 36:1-12.

[27.] Rahman, S. A & Umar, H.S. (2010). Measurement of technical efficiency and its determinants in crop production in Lafia Local Government Area of Nasarawa State. Nigeria.*Journal of tropical science*. 8:90-96.

[28.] Reuben, J., Barau, A.D (2012) resources use efficiency in yam production in Taraba State, Nigeria. *Journal of Agricultural Science*. 3(2):71-77.

[29.] Sani, A, Yakubu, A.A, & Bello, H.M (2010). Resource

use efficiency in Rice production under Small scale irrigation in Bunkure Local Government Area of Kano State, Nigeria. *Nigerian Journal of Basic and Applied Science*. 18(2):292-296.

[30.] Shehu, J. F. (2010). Determinants of yam Production and Technical and efficiency among yam farmers in Benue State Nigeria.*Journal of Social Science*. 143-148

[31.] Tiku, N.E, &Enoibor, J.H.(2012). Analysis of resource use efficiency in yam production in Yakur Local Government Area of Cross Rivers, Nigeria. *Journal of Science and Techno*logy. 1(2):15-21.

[32.] Udoh, E. F &Etim, N.A. (2007).Measurement of farm level efficiency of water leaf production among city farmers in AkwaIbom State. Nigeria. *Journal of sustainable development in agriculture and environment*. 3(2):47-54.

[33.] Ugwumba, C. O &Omojola, J. T (2012).Socio-economic determinants and profitability of yam production in Iparo-Ekiti, Nigeria.*Journal of science and Multidisciplinary research* Vol. 4.

[34.] Umoh, G. (2006). *Technical inefficiency in urban farming*: An application of stochastic frontier production function: *International Journal of Agriculture and Biology*. 8(1):38-44.

[35.] Verter, N., Becvarove, V, (2014), Yam Production as a pillar of food security in Logo L. G.A of Benue State, Nigeria.*European Scientific Journal*. 12(3):23-30.

[36.] Zaknayiba, D.B, & Tank, L. (2013). Costs and Return analysis of yam production among Small Scale farms in Karu Local Government Area, Nassarawa State, Nigeria. *Agricultural Journal*. 9(1):73-80.