

## Resource Use Efficiency and Profitability of Sweetpotato (*Ipomea batatas* L.) Production in Etche Local Government Area of Rivers State, Nigeria

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### Abstract

*This study examined the resource use efficiency and profitability of potato production in Etche Local Government Area of Rivers State, Nigeria. Sweetpotato is one of the crops pivotal to overcoming food insecurity in sub-Saharan African countries including Nigeria. However, despite the numerous benefits of sweetpotato, the production of sweet potato in Nigeria is still below the nation's potential. This research examined the socio-economic characteristics of the potato farmers and factors influencing efficiency and returns to scale/profitability of potato production in Rivers State, Nigeria. Multi-stage sampling technique was adopted by selecting a sample of 200 small-scale potato farmers, primary data was gathered through a structural questionnaire. Descriptive statistics and stochastic frontier analysis were used in realizing our objectives. The results indicated that the average age of farmers in the study area was 42yrs, with house-hold size of 11 persons, mean years of experience was 11 years, size of farm land 1.0 ha. The result showed a mean technical efficiency of 76%. The allocative elasticity index (AEI) was greater or less than one. This indicated inefficient allocation. However, the result also revealed that variables like, level of education, years of experience, gender and size of family could enhance farmer efficiency. The returns to scale/profitability analysis indicated a 91.27% return on investment, however, some constraints were established such as high cost of planting materials, lack of capital, transportation, lack of access to loan, high cost of land and destruction of crops by livestock (herders cattle). It was therefore recommended that more access to capital through government intervention and more awareness will increase investment in sweetpotato production and agricultural development in general.*

**Key words:** Resource, Efficiency, Sweetpotato, Profitability, Etche L.G.A

### 1.0 Introduction

Sweetpotato (*Ipomea batatas* L) belongs to the family *solanaecae*, it is closely related to the Irish potato (*Solanum tuberosum* L.). Sweet potato originated from South America and was later introduced into Europe. By the middle of the eighteenth-century sweetpotato has become widely

cultivated and serves as a major food crop in the whole of Europe as well as other parts of the world including Nigeria. Early cultivation of sweetpotato (*Ipomea batatas* L) and *Solannum tuberosum* L in Nigeria was around Jos in Plateau State and Offa in Kwara State (Tewe *et al.*, 2003).

Analysis revealed that sweetpotato is a good source of energy, providing about 70 calories of energy per 100gram (Ajakaiye and Akande 2016). It contains about 78% water, 16% carbohydrate, 2.1% protein and some amount of minerals and vitamins; the root tuber of some varieties (orange fleshed) can be chewed raw like carrot; the leaves and tender shoots can be used as vegetable for soup, the leaves are much richer in protein, mineral and vitamin than the roots (Ajakaiye and Akande 2016). Sweetpotato ranks among the five most important food crops in developing countries (Ben *et al.*, 2024; Potato New World Encyclopedia, 2018). Industrial use of sweetpotato flour as a substitute for wheat flour in bread baking has been reported by (Agbo & Ene 2012). Baby foods have also been formulated using sweetpotato. However, some medicinal values of sweetpotato have been revealed, Azuogu & Oloma (2020), reported medicinal value such as the treatment of inflammation, arthritics pain and stomach ulcers, bronchitis and cardiovascular diseases, reduction and regulation of blood pressure etc. In Sub-Saharan African Countries including Nigeria, sweetpotatoes has gained importance in overcoming food insecurity, it is widely accepted, and some local cultivars have been introduced. For example: KENSPORT 3 KENSPORT 4, KAKAMEGA, KABODE and SUNAIMA . The yield per hectare of sweetpotato globally ranges between 20 – 50 tonnes/ha (Adeyonu *et al.*, 2019). Potato production has expanded due to availability of improved technology, expanded irrigation structure and increasing market value (Eiar & Arari 2013).

Despite the numerous benefits of sweetpotato, the production of sweet potato in Nigeria is still below the nation's potential; Nigeria had one of the world's lowest average yields per hectare of 3.1 tonnes. The low yield of sweet potato in Nigeria may be due to quality of planting material (Vines) and high cost of labour (Ben *et al.*, 2024). However, Fawole (2017) traced the low productivity to farmers inefficient use of resources. One major way of increasing productivity is by enabling farmers utilization of resources (Antia-Obong *et al.*, 2021; Oladele *et al.*, 2014). Production can be increased by making some adjustments in the use of inputs or through the adoption of modern and improved technology.

Compared to yam and cassava (other tuber crops) little works have been done on the economics of sweetpotato production in Etche Local Government Area of Rivers State, Nigeria. Therefore, this study was carried out to (a) examine the socio-economic characteristics of sweetpotato farmers in Etche L.G.A of Rivers State (b) determine the technical and allocative efficiency (c) ascertain the profitability of sweetpotato production and identify the constraints against sweetpotato production in Etche L.G.A of Rivers state.

## 2.0 Materials and Methods

### 2.1 Study Area

The study was carried out in Etche Local Government Area of Rivers State, Nigeria. The land mass of the area is about 750km<sup>2</sup> with a population of over 900,000 people (National census, 2006). According to Nlerum (2006) Etche Local Government lies between longitude 4.47 and latitude 6.70, Situated on the Northeast axis of Rivers state. The local government is within the up-land region of Rivers State with a tropical climate and experiences two major seasons of rainy and dry seasons. It has a verse array of table land which supports various Agricultural activities, and it is often regarded as the food basket of the state. The major occupation of the people is farming. The major crops cultivated include – yam, cassava, maize, plantain, cocoyam, potato, oil palm, with cassava,yam and

plantain taking the lead,. The cassava production gives rise to the popular Etche garri which has high amount of starch. However, the presence of Imo Rivers, Ogochie River and the popular Otamiri River makes fishing activities possible. Etche Local Government share inter-state boundaries with Imo and Abia States, Southeast Nigeria. It also share boundaries with other local government in Rivers State like, Obio/Akpor, Oyigbo, Omuma and Ikwerre Local Government Areas of Rivers State. One of the earliest discovery of crude oil in Nigeria was in Umuechem Etche Rivers State and still produces the high quality Bonny light crude till date.

## 2.2 Method of Data Collection

Etche local government area has two state constituencies, Etche constituency 1 and Etche State constituency 2. Each of the two state constituencies is made up of three clans. Constituency 1 comprises of Okehi clan, Mba clan, Ozuzu clan with about 20 autonomous towns/communities while constituency 2 comprises of Igbo Ulakwo and Umuselem clans, with about 21 autonomous towns/communities. The population of this study was the entire sweetpotato farmers in the forty one (41) autonomous communities in Etche local government area. Multi-stage sampling technique was adopted. Firstly, two clans each from the two state constituencies were selected. The clan selected for the study was Ozuzu and Mba clans from constituency 1, while Igbo and Umuselem clans were selected from constituency 2, based on their scope of involvement in farming activities from the list of potato farmers in the area which is as follows, 150, 170, 202 and 145 farmers drawn from the four clans respectively, giving a total of (667) sweet potato farmers. Out of which 30% of sweetpotato farmers from each clan were randomly selected giving a sample population of 200 potato farmers for this study. A well-structured questionnaire was administered to generate our primary data.

## 2.3 Analytical Technique

Descriptive statistics such as frequencies mean and percentages were used in data analysis, also stochastic frontier production function was used to determine resource efficiency, while a five points Likert scale was used to evaluate the constraints militating against potato farmers in the area. Functional form of cobb-douglas production function was adopted as specified by Coelli (1996). Profitability and economic efficiency of sweetpotato production was determined with specific type of budgetary analysis/gross margin analysis and net farm income (NFI).

### 2.3.1 Specification of Model

$$\ln Y_i = \beta_0 + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \beta_3 \ln X_3 + \beta_4 \ln X_4 + \beta_5 \ln X_5 \dots \dots + V_i - U_i$$

Where:

$\ln$  = Natural logarithm (logarithm to base e)

$Y_i$  = Output of sweetpotato in (kg)

$X_1$  = Land area in hectare (ha)

$X_2$  = Fertilizer in (kg)

$X_3$  = Planting materials (vines bundles) kg

$X_4$  = Labour (man-days)

$\beta_0$  = Technical efficiency level

$\beta_1, \beta_2, \beta_3, \beta_4 \dots \dots \beta_n$  = Coefficient of various inputs with respect to output level to be estimated

On the other hand, an inefficiency model which assume inefficiency effects are written as follows:

$$U_i = \delta_0 + \delta_1 Z_1 + \delta_2 Z_2 + \delta_3 Z_3 + \delta_4 Z_4 \dots \dots \delta_n Z_n$$

Where:

$U_i$  = Farmer technical inefficiency

$Z_1$  = Sex (Gender) – (male or female)

$Z_2$  = age of the farmer (no of years)

$Z_3$  = marital status

$Z_4$  = Household size (no of persons)

$Z_5$  = Educational level (no of years)

$Z_6$  = years of experience (years)

**Decision Rule:** if  $U_i = 0$ , no technical inefficiency, the production lies on the stochastic frontier. If the  $U_i > 0$ ; the production lies between the frontier and it is inefficient. Since the dependent variable is a measure of inefficiency, farm specific variables with negative/positive co-efficiency will have a positive/negative effect on efficiency levels.

Or

$$Y = f(X_i \beta) e^{-} + V_i - U_i$$

Where:

$Y$  = Output of sweet potato

$X_i$  = Vector of input

$\beta$  = the parameter to be estimated

$f(X_{ii}\beta)$  = The deterministic part of the function

$e^{-}$  = the stochastic part of the production function

$\varepsilon$  = the random error term

$\varepsilon = V_i - U_i$

Where:

$V_i$  = random variable associate with technical efficiency.

$U_i$  = random variable associated with technique inefficiency (Coelli 1996).

Also, gross margin analysis, which is the difference between total revenue (TR) and the total variable cost (TVC). The model is written as  $GM = GI - TVC$

Where:

$GM$  = gross margin

$GI$  = gross income

$TVC$  = total variable cost

$$NFI = GM - TFC$$

Where:

$NFI$  = net farm income

$GM$  = gross margin

$TFC$  = total fixed cost

$$\text{Therefore: } GM = \sum P_i Y_i - \sum P_i X_i$$

$GM$  = gross margin (N)

$P_i$  = unit price of output (N)/ton

$Y_i$  = quantity of output (Kg/tons)

$P_j$  = price per unit variable inputs

$X_i$  = quantity of variable in puts

$\Sigma$  = summation

The net revenue = total income – total costs

Total cost (TC) = TFC + TVC

Decision = If the GM > 0 the firm production is profitable

### 3.0 Results and Discussion

#### 3.1 Socio-economic Characteristics of Respondents in the Study Area

Table 3.1 showed that 59% of the farmers were female only 41% were male, this is contrary to the position of Ekunwe (2018) who reported in his earlier study that majority of yam farmers in Tai Local Government Area of Rivers State (a similar local government) were male. The age of potato farmers in the area varies between 25 –60 yrs with a mean age of 42 yrs. However, Shreastha *et al.* (2017), Tayinde (2014) reported a mean age of 51 years. This goes to confirm that potato farmers were at their peak age of productivity. Most of the potato farmers were married as 70.5% of the respondents were married and women. The results revealed an average household size of 11 persons. This supports the use of family member's source of labour, previously reported by Ekunwe *et al.* (2008). About 49% of the respondents had minimum of post-primary education, while 44% had primary education, which means that most of the farmers had basic education. Ike *et al.* (2008) and Adenyonu (2019) indicated that education is positively related to farmer's level of efficiency. On the years of experience about 45.5% of the respondents had 10 – 14 years' experience with an average of 11 years' experience across all the respondent unlike yam production where many of the farmers had average of 17 years' experience as reported by Ekunwe (2018) and Iroegbu *et al.* (2021). Only 38% belong to association, also 84.5% do not take potato production as primary occupation.

Most of the potato farmers financed their operations through personal saving (66.5%). On the other hand, 67.5% were full time farmers only 32.5% were part time farmers. About 81% of the respondents used vine cuttings instead of seeds/tubers as planting material. Nwinyi (1991) reported that best yield is obtained by use of vine cuttings. Greater number of respondent representing 63% obtained their planting material from the market. This could be attributed to poor extension service. Most of the potato farmers do not apply fertilizer, representing about 81% respondents, which means that the use of fertilizer is not popular in the area; majority of the respondents (46.5%) indicated that they made use of family members as source of labour with 36.5% relying on hired labour. This explains why they have large family sizes. About 53.5% of the respondents got their farm land through inheritance; this is primarily due to the prevalence of communal land tenure system and family land inheritance. Most of the farmers cultivated on farm land sizes of between 0.5 – 1.5 hectares with averages farm size of 1.0ha, this also could be attributed to the system of land fragmentation. Hence cost of land is very high and farmers could not afford it. Adenyonu *et al.* (2019) identified high cost of land as major constraint to sweet potato production.

The result on table 3.2 shows the co-efficient estimate of MLE from the sweetpotato farmers. The stochastic frontier production function assumes Cobb-Douglas production function. Therefore, the values of the co-efficient of the various variables can be used as the value of elasticity of the production function and so can represent proportional changes in sweetpotato production as a result of proportional change in the inputs used in sweetpotato production in the study area.

**Table 3.1: Socio-economic Characteristics of Sweet Potato Farmers in Etche Local Government Area**

Variables		No. of Farmers	Percentage (%)	Mean
<b>Gender:</b>				
	Male	82	41	
	Female	118	59	
	<b>Total</b>	<b>200</b>	<b>100</b>	
<b>Age:</b>				42 years
<b>Marital status</b>				
	Single	37	18.5%	
	Married	141	70.5%	
	Widowed	19	9.5%	
	Separated	3	1.5%	
	<b>Total</b>	<b>200</b>	<b>100</b>	
<b>Household size</b>				11 persons
<b>Edu. Level</b>				
	Primary	88	44	
	Post primary	98	49%	
	Tertiary	14	7%	
	<b>Total</b>	<b>200</b>	<b>100</b>	
<b>Years of experience</b>				11 years
<b>Membership of association</b>				
	Yes	67	38%	
	No	124	62%	
	<b>Total</b>	<b>200</b>	<b>100%</b>	
<b>Primary occupation</b>				
	Yes	31	15.5	
	No	169	84.5	
	<b>Total</b>	<b>200</b>	<b>100</b>	
<b>Source of finance:</b>				
	Personal savings	133	66.5	
	Bank loan	3	4	
	Friends/relatives	29	14.5	
	Cooperative society	30	15	
	<b>Total</b>	<b>200</b>	<b>100</b>	
<b>Mode of farming</b>				
	Full time	135	67.5%	
	Part time	65	32.5%	
	<b>Total</b>	<b>200</b>	<b>100</b>	
<b>Type of planting material</b>				
	Vine	162	81%	
	Seeds/tuber	38	19%	
	<b>Total</b>	<b>200</b>	<b>100%</b>	
<b>Source of planting material</b>				Mean
	Private farm	49	24.5	
	from market	126	63.00%	
	Cooperative	25	12.5%	
	A.D.P	-	-	
	<b>Total</b>	<b>200</b>	<b>100</b>	
<b>Labour type:</b>				
	<i>Family</i>	93	46.5	
	Hired labour	73	36.5	
	Exchange labour	5	2.5	
	Self labour	29	14.5	
	<b>Total</b>	<b>200</b>	<b>100</b>	
<b>Source of land:</b>				
	family inherited land	107	53.5	
	Rented	50	25	
	Purchased	8	4	
	Gift	8	4	
	Govt. land	-	-	
	Lease hold	20	10%	
	<b>Total</b>	<b>200</b>	<b>100</b>	
<b>Size of land:</b>				
	0.1-0.4ha	30	15%	
	0.5-0.9ha	75	37%	
	1.0 – 1.5ha	79	39%	
	1.6 – 2.0ha	16	8%	
	2.0-5.0ha	-	-	
	<b>Total</b>	<b>200</b>	<b>100</b>	

Source: field survey, 2024

**Table 3.2: Maximum Likelihood Estimate (MLE) of the stochastic frontier production function analysis of sweet potato farmers in Etche L. G.A., Rivers state**

Production Factor	Parameters	Coefficient	Standard Error	t-ratio
Constant	B	-4.844	0.969	-4.998***
Area Cultivated (ha)	X <sub>1</sub>	1.636	0.407	4.021***
Labour in Mandays(number)	X <sub>2</sub>	-0.807	0.742	-1.087
Potatoes Vine Bundle (Kg)	X <sub>3</sub>	0.336	0.089	3.769***
Fertilizer(kg/ha)	X <sub>4</sub>	0.692	0.274	2.531**
<b>Inefficiency Effect</b>				
Constant	$\Delta$	2.040	0.061	33.436***
Gender	GEND	-0.001	0.001	-0.497
Age	AGE	-0.004	0.006	-0.637
Marital Status	MSTA	0.003	0.003	1.198
Household Size	HSIZE	-0.002	0.002	-0.916
Level of Education	LEDU	-0.001	0.003	-0.368
Years of Experience	YEXP	-0.626	0.006	4.583***
<b>Diagnostic Statistics</b>				
Sigma Squared	$\sigma^2$	0.531	0.065	8.167***
Gamma	$\Gamma$	1.000	0.000	637945.060***
Log Likelihood Function		-46.925		
LR test		153.686		

NB: If the t-ratio value is greater than 2.576 then it is significant at 1%, if it ranges between 1.96 to 2.576 then it is significant at 5%, if it ranges between 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, 2022

It can be seen that some inputs like land (area cultivated), fertilizer, and potato vine cuttings had positive co-efficient of 1.636, 0.692 and 0.336 respectively, significant at 1% levels. This implies that a one percent increase in this input will result in a corresponding increase in sweetpotato production by 1.636, 0.692 and 0.336 respectively. Thus there is a direct relationship between these inputs and yield (output) of sweetpotato in the study area. On the other hand, labour input showed no statistical significance. This is contrary to apriori expectation. It might also be explained by the law of diminishing returns, labour usage may have been saturated due to the fact that most rural farmers make use of family members as source of labour, therefore, there could be over employment/engagement of labour. This agrees with Shehu *et al.* (2011) who reported that rural farmers were over utilizing labour input in yam production. However, Oladele *et al.* (2014), Babatunde *et al.* (2015) reported a positive coefficient for planting materials and fertilizer inputs as a way of increasing output.

### 3.2 Technical Inefficiency

Looking at the inefficiency parameter, the result was capable of explaining the source of various inefficiencies experienced by the sweetpotato farmers in the study area. A negative coefficient value indicates that such variable is capable of reducing technical inefficiency of the farmers, while any

positive co-efficient value is capable of increasing technical inefficiency. The result from table 3.2 revealed that years of experience, level of education, size of house hold, age of the farmers, and gender had negative coefficient which implies that they help to reduce technical inefficiency and improve efficiency of the farmers, while source of land source of finance and marital status contributed to increasing inefficiency. This result agrees with Abdallahi (2015) who reported that technical inefficiency decreased with an increase in the level of education of yam farms. Also Jude (2011) reported that marital status reduces farmers' technical efficiency. The result corroborate the findings of Ekunwe *et al.* (2007) who reported that age of the farmer was significant in decreasing technical inefficiency. The more years of schooling the more knowledge gained which helps in enhancing the ability to acquire technical skills or knowledge as to apply improved techniques of production. The result reveal a positive coefficient for sigma squared ( $\delta^2$ ) significant at 1% level which gives credibility to the model and various assumptions, where as the gamma ( $\gamma$ ) estimated value is 1.000 which was significant at 1% level. This implies that about 100% of the variations in potato output among respondents were attributable to differences in their level of technical efficiencies.

### 3.3 Distribution of technical efficiency range for production estimate of sweetpotato farmers in Etche Local Government Area

**Table 3.3: Technical efficiency range of sweetpotato farmers**

Range of Technical efficiency	Frequency	Percentage (%)
0.4 – 0.5	5	2
0.5 – 0.6	18	9
0.6 – 0.7	40	20
0.7 – 0.8	58	29
0.8 – 0.9	50	25
0.9 – 1.00	29	15
Total	200	100

Mean efficiency 0.755

Minimum range 0.553

Maximum range 0.995

Source: computed output from frontier version 4.1 (2024)

The table 3.3 above showed that potato farmers had a minimum efficiency range of 0.553 while the maximum efficiency range was 0.995, the mean efficiency of the farmers was 0.755 which is about 76%. This means that an average farmer need at least 24% adjustment in resource to be 100% efficient in resource allocation. However, the least efficient farmer will need about 45% adjustment in resource allocation while the best efficient farmer needs 1% adjustment in resource allocation to be efficient.

Table 3.4 above shows marginal physical product (MPP) values for various inputs, relying on the productivity estimate gotten from the MLE table. The MPP farm area / land is 11.33, labour is 40.35 planting materials are 26.88, while fertilizer is 15.098. The marginal value product (MVP) for the inputs was 13.064, -32.280, and 21.504,12078 respectively. The table showed allocative efficiency index for land, labour, planting material (vines) and fertilizer as follows, 0.1451, -12912, 25.299, and 60,392 respectively. From this result, the MPP and APP for land is 11.33 and 9.979. This means that if land increases by 1 hectare (1ha) output of sweet potato will increase by 16.33 tons, on the other hand one hectare contributes an average of 9.976 tons to the overall output of potato. However,



APP<MPP this shows that farmers are at the stage 3 of production function. Also the table showed that MPP for

labour was (-40.35). This is a negative value, which means that labour input has no marginal effect to output hence it appears to be grossly over utilized. According to Coelli *et al.* (1996) an input resource is efficiently allocated when the allocative elasticity index (AEI =1) and (MVP =Px). Therefore, looking at the results on table 3.4 above, land has AEI (0.1451) (Labour is -12912) planting material (25.299) and fertilizer is (60.392), this indicate that planting materials and fertilizer were under-utilized, while labour was over utilized. All indicating that there were various degrees of inefficient use of resources among the sweet potato farmers in the study area. This result agrees with the findings of Ekunwe *et al.* (2018) that rural farmers in the Tai local government area of Rivers State were inefficient in resource usage/allocation.

**Table 3.4: Allocative efficiency estimate of sweetpotato farmers in Etche Local Government Area of Rivers State**

Variable	MPP	APP	EP	MVP	PX	AEI	RMK
<b>Land area</b>	11.33	9.979	1.636	13.064	90.000	0.1451	Over utilize
<b>Labour</b>	-40.35	50.0	-0.807	-32.80	2.500	-12.912	Over utilize
<b>Planting material</b>	26.88	80.00	0.336	21.504	850	25.299	under utilize
<b>Fertilizer</b>	15.98	21.919	0.692	12,078.4	200	60.392	Under utilize
Return to scale		1.87					

Source: field survey 2024

**Table 3.5: Costs and returns per hectare of sweetpotato farmers in Etche Local Government Area of Rivers state**

Items	Unit	Quantity (kg)	Unit price (₦)	Value (₦)
Gross revenue				
Yield	2.4 00	2400kg	800/kg	1,920,000
<b>Cost:</b>				
Physical cost	Rivers State			
Vine cuttings	Bundles	30	850/bundle	25,500
Fertilizer	Kg	110	200/kg	22,000
Total physical cost				47,500
<b>Labour cost:</b>	Man days	48	2500	120,000
Total variable cost				167,500
<b>Fixed costs:</b>				
Cost of land (rent)			120,000	120,000
Total cost				287,500
Gross margin				
(GM)TR-TVC				1,752,500
Net farm income				1,632,500
Return on investment (RI)				0.9127604
GM/R	=			
<b>Gross margin percentage</b>				
GM/R x 100	=			91.27%

Source: field survey 2024

**Table 3.6: Five point Likert scale showing the range of constraints against sweetpotato farmers in Etche LGA, Rivers State**

S/N	ITEMS	ESC	VSC	SC	NVSC	NC	Total	Mean	Remark
	Constraints of sweet potato production	5	4	3	2	1			
1.	Lack of finance/capital	105	90	5	0	0	900	45	ESC
2.	Lack of access to bank loan	110	70	20	0	0	890	4.45	ESC
3.	High cost of land	80	90	30	0	0	850	4.25	VSC
4.	High cost of planting materials	125	60	5	10	0	900	4.5	ESC
5.	Lack and high cost of labour	95	85	10	10	0	865	4.32	NC
6.	Problem of pest and disease	0	0	25	140	35	390	1.95	NC
7.	Problem of weeds	0	0	10	52	138	272	1.36	NC
8.	Cost of fertilizer	0	0	15	70	115	300	1.5	NC
9.	Lack of extension service	30	40	95	25	15	650	3.25	SC
10.	Destruction of crops by cattle	100	70	20	10	0	860	4.3	SC
11.	Poor prices of produce	40	50	70	40	0	690	3.45	VSC
12.	Problem of transportation	120	80	20	0	0	900	4.5	ESC
13.	Low yield per hectare	0	0	160	40	0	560	2.8	NVSC

Source: Field survey, 2024

**ESC – extremely serious constraint, VSC – very serious constraint; SC - Serious constraint; NVSC-not very serious constraint; NC – not constraint**

The costs and returns/profitability analysis on table 3.5 above shows gross revenue from one hectare of potato production at 1920,000 with a total variable cost (TVC) of 167,500 and fixed cost of 120,000. Also the table shows a gross margin (GM) 1752,500 and net from income (NFI) 1,632,500. Further analysis revealed that return on investment (RI) was 0.9127604 which gives a gross margin percentage of 91.27%. This result implies that any naira investment in sweet potato production in the study area will result or produce a profit of 91.27%. This result indicate an almost 100% return on investment, with this there is no doubt that sweetpotato farming is a profitable venture. This result agrees with the findings of Omoare (2017) Adenyonu (2018); potato production was profitable and should be encouraged.

Table 3.6 results from a five point Likert scale which revealed various degrees of impact of different factors affecting the operation of sweetpotato farmers in the study area. Generally any value of mean below (3.0) is regarded not to be a constraint against sweetpotato farmers in the study area. Therefore, close examination of the table showed that several factors constituted serious challenge against sweet potato production in Etche Local Government Area of Rivers State. High cost of planting materials (vines) transportation, lack of capital, poor access to bank loan, high cost of labour, destruction of crops by herders cattle and high cost of land ranked amongst the highest challenge extremely serious constraint (ESC). This is in line with the findings of Adenyonu *et al.* (2019) and Abdulahi (2015) who identified lack of capital, poor access to credit and high cost of planting materials as a major constraint to farmers. In the same vein, poor pricing of produce due to inadequate storage, lack of extension service were indicated as serious constraints to sweetpotato production. This result agrees with Gbegeh and Akubailo (2013) who also opined that lack or inadequate extension service were major constraint to potato production.

## 4.0 Conclusion

The result showed a wide range of technical efficiency among sweet potato farmers in the study area. The mean technical efficiency implies that an average farmer needs some adjustment in resource allocation to attain full efficiency. However, gross margin analysis / profitability study showed a positive return on investment (RI), This means that sweet potato farming in Etche local government area is a profitable venture, even though the farmers were not efficient in the allocation of resource as the allocative elasticity index (A E I) indicate that ( $AEI \neq 1$ ) not equal to one, and the ( $MPV \neq Px$ ). Certain constraints were identified such as lack of capital, high cost of planting materials, lack of access to bank loans, high cost of labour and the destruction of crops by herder's cattle among others. Recommendations were made that government should subsidize the cost of input, create more accessible funds to farmers, and farmer should also approach some (NGO) non-governmental organizations who are interested in agricultural development. Adequate security, arrangement and collaboration to stop destruction of crops by herders cattle. There should be more awareness to encourage youths to engage in farming as to boast food sufficiency in the country.

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