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PRODUCTIVITY FACTOR AND CONSTRAINTS ASSOCIATED WITH YAM FARMING AMONG SMALLHOLDER FARMERS IN DELTA STATE, NIGERIA

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ABSTRACT
The study examined the productivity factor and constraints associated with yam farming among smallholder farmers in Delta State, Nigeria. Primary data were collected from a cross-section of 208 respondents through the administration of 230 questionnaires and adopting the multistage sampling method. Data were analyzed using descriptive statistics and Marginal Value Productivity (MVP). The results showed that males dominated yam production (93.3%), the respondents were ageing (mean = 53 years) and a majority (85.1%) of them were married. They had a low level of education and farming experience of 7 and 20 years respectively. The result also revealed that farmers in the study area cultivated an average of 2 hectares. The farmers were found to operate at an increasing return to scale (RTS = 1.545). Allocative efficiency was never achieved in yam production in the study area with the ratio of marginal value product (MVP) of the inputs to the inputs' acquisition prices found to be either less than unity or greater than unity. The problems facing yam production in the study area were; Low price of the product (mean = 2.79), high cost of staking (mean = 2.66) and high cost of labour (mean = 2.62). The study concluded that no allocative efficiency in yam production was achieved implying that there was inefficient allocative efficiency in yam production in the study area; Factors such as land, seedlings and labour were over-utilized while staking material and seedlings were under-utilized by small-scale yam farmers in the study area. It was recommended that provision should be made by relevant authorities to make land available to prospective yam farmers to avoid the over-use of the farmer's existing holdings, the high cost of labour should be addressed through the mechanization of some of the operations in yam production and the attraction of yam-producing communities to the young school leavers through the provision of basic amenities

Keywords: Constraints, Factor, Productivity, Smallholder and Farmers.

INTRODUCTION
In Nigeria currently, food is scarce and expensive as demand outstrips supply. The high cost of food products (yam inclusive) resulting from low production output has led to food shortage. Yam ranks second after cassava as the most produced crop in Nigeria that could help in the fighting against food insecurity (Kareem, 2021). However, yam is arguably the most important crop Nigeria often referred to as the king of crops. Therefore, to satisfy food consumption requirement, it is necessary to increase agricultural production. Encouraging yam production is important because it stands a better chance to enhance food security owning to its storing ability after harvest. Also, farmers earn their incomes from yam sales and these earnings can contribute to their well-being as well as the enhancement of the Nations' Gross Domestic product (GDP).

According to FAO (2019), the total farm size devoted to yam farming in Nigeria was 6.24 million hectares, accounting for 70.03% of the world farm. Irrespective of this fact, there

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is a scarcity of the supply of yam resulting from poor production performance. This might be attributed to the ineffectiveness in the utilization of resources meant for yam production. There is no doubt that agriculture in Nigeria has been majorly operated by small-scale farmers with poor resources accounting for 80% of the population involved in agriculture and cultivate small farm holdings of five hectares and below (Oyaniran, 2020). Accordingly, this has led to fragmentation of farm land with an undeveloped system of farming leading to poor performance with emphasis on yield and income. Several factors have been blamed for poor production output of food crops in Nigeria. Notable factors include poor awareness and adoption of improved technologies, poor capital, lack on needed farm inputs and inadequate extension services (Onyemekonwu, *et al*., 2019). It has equally been reported that food production African countries have not been sustained (Akinwale *et al*., 2023). It is therefore important to note that yam production is not exempted in this respect. Yam production has equally been criticized for poor performance resulting from lack of good yam seeds and improved technologies; leading to poor quality of yam harvest and shortage in the market (Idu, *et a.l*, 2018).

In an effort to address food shortages in Nigeria, various policies and programmes were introduced by the Government, some of which include root and tuber expansion programme, (RTEP) initiated in 2001 to enhance the production of tuber and crops, Agricultural Transformation Agenda, (2007), Growth Enhancement support Scheme GESS (2012), Nigeria Incentive Base Risk Management System for Agricultural Lending, NIRSAL (2010), Agricultural Transformation Action plan of the present Administration from 2011, Anchor borrowers (2015), presidential fertilizer initiative (2016), Youth farm lab, presidential economic diversification initiative (2017), food security council (2018) and the Central Bank of Nigeria initiatives. All these were programmes geared towards the enhancement of agricultural production in Nigeria. However, these programmes have failed to make an impressive enhancement to yam output. Hence there is research need to examine the production factors and constraints associated with yam farming among smallholder farmers in Delta state, Nigeria. This study was carried out to describe socio- economic characteristics of smallholder yam farmers, examine the production factors and constraints associated with yam farming among smallholder farmers in the study area.

MATERIALS AND METHODS

The study was carried out in Delta State of Nigeria. Delta state is one of the six state in the South-South geopolitical zone. The State lies on longitude 5º.00” and 6º.04” East and latitude 5º.00” and 6º.30”, North of the equator known for the production various food crop including yam, plantain, cassava, maize, Okra, melon and diverse vegetables majorly in the northern part of the state with vast land agricultural suitable for crop production.

Sampling Technique

In the selection of respondents, multi-stage sampling procedure was adopted. In the first stage, Delta North Agricultural zone was purposively selected based the predominance yam. In the second state, purposive selection of five local government areas was done based on the intensity of yam production; these include Ika South, Ika North East, Aniocha South, Ukwani, and Oshimili North) in the northern Agricultural zone of the state. In the fourth stage, four communities from chosen L.G.As were randomly selected for sampling (Table 1). At the final stage, 10% random sampling of yam farmer’s population in the selected community was carried out (Table 1), this gave a total a total of 299 who were sent questionnaire. Notwithstanding, only 208 questionnaires were returned and analysis was based in this figure.

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Data Collection and Analysis

Primary data were collected directly from the farmers with the aid of a structured questionnaires and interview schedule administered by trained enumerators who understand the local dialect of the people under the supervision of the researchers. Data analysis was done using descriptive statistics. The marginal value productivity was adopted to determine the farmer's resource-use efficiency with regards to yam production. Resource-use efficiency of the farming inputs refers to the ability of farmers to adopt optimal level of inputs for the prices of a given input or the market prices for acquiring a given input. Thus at the point of optimum input use or at the level of resource-use efficiency of input utilization, the ratio of input-output prices must be equal to the marginal physical product of each of the input used. For the yam farming venture, the criterion is expressed as:

$d_y/d_x = P_{xi}/p_y$ or $MPP_x = P_{xi}/p_y$……... …….(1)

where:

d_y/d_x = Marginal physical product (Mpp) of the input (X_I) used

P_{xi} = Market price of the input

P_y = Market price of the yam output

Hence, $d_y/d_x = Mpp_{xi}$……..... (2)

Multiplying both sides of equation 19 by P_y/P_{xi}, will yield,

$$MPP_x \times \frac{P_y}{P_{xi}} = P_{xi} \times \frac{P_y}{P_{xi}}$$

Or $(MPP_{xi}) \times \frac{P_y}{P_{xi}} = 1$

Or $\frac{P_y(MPP_{xi})}{P_{xi}} = 1$ or $P_y (MPP_{xi}) = P_{xi}$ ……...(3)

But $P_y (MPP_{XI}) = MVP_{xi}$ (Marginal value product of input)

Hence, if $\frac{MVP_{xi}}{P_{xi}} = 1$; resource is efficiently used

If $\frac{MVP_{xi}}{P_{xi}} < 1$; resource is over used and it is inefficient

If $\frac{MVP_{xi}}{P_{xi}} > 1$; resource is under used and it is inefficient

If $\frac{MVP_{xi}}{P_{xi}} < 0$; resource is grossly over used and it is grossly inefficie

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Table 1: Sample Size and Distribution

L.G.As	Communities sampled	Population of registered farmers	Sampled population based on 10%
Aniocha South	Ejeme-Aniogor	74	7
	Ewulu	106	11
	Isele-Nkpitime	92	9
	Nsukwa	79	8
	Sub-total	**351**	**35**
Ika North East	Idumuesa	113	11
	Igbodo	180	18
	Umunede	191	19
	Ute-kpu	97	10
	Sub-total	**574**	**57**
Ika South	Abavo	212	21
	Alishime	91	9
	Emuhu	109	11
	Oki	81	8
	Sub-total	**493**	**49**
Oshimili North	Akuku-Igbo	91	9
	Ebu	105	11
	Illah	211	21
	Ugbolu	94	9
	Sub-total	**501**	**50**
Ukwuani	Amai	117	12
	Ndemili	86	9
	Umutu	83	8
	Utagba-uno	89	9
	Sub-total	**375**	**38**
	Grand total	**2,294**	**228**

Sources: Farmers' co-operatives organizations and Ministry of Agriculture and Natural Resource in the five L G As (2014).

RESULT AND DISCUSSION

The respondent's socio-economic characteristics as shown in Table 2 revealed that a high proportion (93.3%) of the yam farmers were male. This implies the dominance of male in yam production in the study area. A related by Izekor and Olumese (2010) equally shows the dominance of male in yam farming in Edo State where they reported 92% were male. The mean age of the farmers was found to be 53 years implying that the respondents engage in yam production were getting old. The implication of this result is that, if young ones who are able bodied are not encourage to embark in yam farming, there is the likelihood that yam production in the study area will be left for the aged yam farmers who their production capacity is diminishing. Majority (85.1%) of the yam farmers were married suggesting a sense of responsibility among the farmers. A similar study by Idu *et al*. (2018), found that 93.2% of Yam farmers Bwari Area Council of the Federal Capital Territory. The farmers had a large family size with a mean of 7 persons per family. This is good for yam production as family labour could be utilized for production. The study found a low literacy level among the respondents with 40.4% of them not having formal education. The low level of education among the farmers could have negative effects on yam production among the farmers as they might not be able to acquire some relevant skills and adopt improved technologies for farming. This assertion is in agreement with Nwibo and Okorie (2013), who reported that as farmers

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improve their educational status, their production quest and skill is enhanced, thus, expanding his production knowledge base which places in a better position for yam production, thereby increasing the farmers' opportunity to adopt new farming techniques. The result further agrees with Apu *et al.*, (2020) who reported that the more the educational attainment of the farmers, the more the farmers acquire ability and understanding in yam production. Yam farmers in the study area were highly experienced, having spent a mean of 20 years in yam farming. This number of years is reasonable the enable yam farmers acquire some skills and practical knowledge in yam production.

Table 2: Socio – economic Characteristics Distributions of Respondents

Characteristics		Freq	%	Mean	SD
Gender	Male	194	93.3		
Female	14	6.7			
	Total	208	100.0		
Age (yrs)	≤ 40	16	7.7		
	41-50	10	49.5		
	51-60	55	26.4		
	61-70	34	16.3		
	Total	208	100.0	53	8.01
Marital	Married	27	85.1		
Status	Widow(er)	15	7.2		
Divorced	10	4.8			
Single	6	2.9			
	Total	208	100.0		
Household	1-4	31	14.9		
Size	5-8	140	76.3		
	9-12	35	16.8		
	13-16	2	1.0		
	Total	208	100.0	7	2.07
Level of	No Formal	84	40.4		
Education	Primary	52	25.0		
	Secondary	43	20.7		
	Tertiary	29	13.9		
	Total	208	100.0	7	
Farming	1-10	34	16.3		
Experience	11-20	95	45.7		
(Years)	21-30	58	27.9		
31-40	21	10.1			
	Total	208	100.0	20	3.85

Source: Field survey (2015).

Productivity Analysis

Because of the choice of the Maximum Likelihood Estimation technique of the Cobb-Douglas production function, the estimated parameters of the variables employed in yam production in the study area, are the direct elasticities of the dependent variable with respect to each of the inputs used. The elasticity of production with respect to farm size, fixed cost, yam seedlings, hired labour, herbicides used, cost of staking and transport cost were, 0.700, 0.060,

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0.119, 0.055, 0.424, 0.150 and 0.070 respectively, hence 1% increase in the employment or use of these factors will increase the output of yams by these elasticities. These variables are used at the rational zone of production in the production process. In order of importance, farm size (0.700), herbicides used (0.424), staking cost (0.150), yam seedling (0.119), transport cost (0.070), fixed cost (0.060) and hired labour (0.055) are the productive factors in yam production. However, marketing cost (-0.033) is a decreasing factor in the output of yams, suggesting that the farmers may have been over-exploited by the marketers, thereby reducing their earning from yams.

Returns to Scale

The returns to scale (RTS) analysis which serves as a measure of total resource productivity is 1.545, indicating that the farmers, collectively, are operating at increasing return to scale (Table 4). This suggests that a joint increase in the use of these factors by 100% will result in more than proportionate increase (154.5%) in the output of yam. This result conforms with the result obtained by Nwosu (2011), on cassava – based crop mixture farming in Imo state, who indicated that small-holder arable farmers usually operated at increasing return to scale.

Table 4: Analysis of Return to Scale in Yam Production

Variables	Elasticities
Farm size	0.700
Herbicides	0.424
Staking materials	0.150
Yam seedlings	0.119
Transport cost	0.070
Fixed cost	0.060
Hired labour	0.055
Marketing cost	-0.033
Return to scale (RTS)	1.545

Source: Computation from survey data (2015).

Marginal Value Productivity of Factors in Yam Production

The estimates of marginal value productivity of factors employed for the production of yam in the study area used for determining allocative efficiency of factors are contained in the Table 5. The factors considered were Land, Herbicides, staking material, Yam seedlings and Hired labour. For allocative efficiency of factors to be achieved, the ratio of the marginal value product of the inputs employed to the inputs' acquisition price (p_{xi}) must be unity. It is obvious from the table that no allocative efficiency of factors was achieved in yam production in the study area. The ratios obtained were either less than unity or greater than unity. The result obtained for the over utilization of land may be due to the respondents' limited access to cultivable land, making them to perpetually keep the land under intensive utilization. Therefore, land available to these farmers for yam production will lead to efficient utilization of land in the study area. The over utilization of seedlings could be the fallout from land over utilization. Since farm land is in short supply, the farmers have to resort to over planting of seedlings in their small farm holdings, leading to overcrowding of yams with the resultant poor yields. Therefore, reduction in the quantity of seedling planted will lead to efficient utilization. The over utilization of labour could be the result of high wages paid to hired labour. Therefore, reduction in the use of hired labour and adoption of mechanization in some of the farm

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operations especially with the application of herbicides for weed control will lead to optimum utilization of hired labour in yam production in the study area. For the underutilized herbicides, it could be the over dependent on hired labour especially for weed control that resulted in the finding. Therefore, increasing the application of herbicides for weed control, will lead to efficient utilization of the input. Finally, the underutilization of staking material could be due to the tedious nature of staking operation in yam farms, making some farmers to abandon staking of their yams and allowing the tenderies to creep on the ground.

Table 5: Marginal Value Productivity of Factors in Yam Production.

Variable	Ep	MPP=(Ep.App)	Py = $\frac{Y_{\#}}{Y_{kg}}$	MVP = (MPP.P_y)	$P_{xi} = \frac{TC_{xi}}{Q_i}$	$\frac{MVP}{P_{xi}} = 1$	Decision
Land	0.700	64.21	49.81	3198.30	9819.10	0.33	<1 ie over utilization
Herbicides	0.424	59.86	49.81	2919.10	109.27	2.69	>1 ie under utilization
Staking mat	0.150	5.76	49.81	286.91	95.00	3.02	> 1 ie under utilization
Seedlings	0.119	0.65	49.81	32.38	145.00	0.22	<1 ie over utilization
Labour	0.055	0.14	49.81	6.97	1574.17	0.004	<1 over utilization

Production Constraints in Yam Production

There major constraints that prevented the yam farmers from achieving maximum returns from yam production and hence, achieving efficiency in the resources employed were in Table 6 which shows that low price of yam (mean = 2.79), high cost of staking material (mean =2.66), and high cost of labour (mean =2.62) with standard deviations of 0.41, 0.58 and 0.49 respectively. The low price of yam as a problem affecting yam production is due to presence of market intermediaries who at times create fall in price. This agrees with Okwuokenye and Onemolease (2011), who confirms that wholesalers have better control of the market. Staking materials constitute another major production cost for farmers. Farmers spend a great deal of time looking for and cutting poles from trees to make stakes. Ayanwuyi, *et al*, (2011) in their study of yam farmers revealed that 90% of respondents identified inadequate staking materials as a production constraint. As deforestation increases in Delta State, the cost of staking materials, in terms of money spent purchasing stakes and/or time spent looking for adequate staking materials, is only expected to increase. The arduous nature of yam cultivation requires most yam farmers to supplement family labour with hired labor. Labour constitutes the largest proportion of yam production costs thereby increasing total cost and reducing total revenue from yam production. These constraints were serious as compared to such constraints as financial problem (mean =2.37 and SD = 0.48), preference of buyers for Hausa yam (mean =2.33 and SD = 0.52), land scarcity (mean =2.12 and SD = 0.67) and activities of market cartel (mean =2.00 and SD = 0.63). Others are high cost of herbicides (mean =1.63), high cost of seed yams (mean =1.24) and stealing of yams (mean =1.06) with SDs = 0.51, 0.47, 0.31, and 0.22 respectively, which did not pose serious problem to the yam farmers in the study area since their mean score were less than 2.50.

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Table 6: Rating of Production Constraints Identified by Respondents

Identified constraints	Mean score	S.D.
Low price of yam	2.79*	0.41
High cost of staking material	2.66*	0.58
High cost of labour	2.62*	0.49
Financial problem	2.37	0.48
Preference of buyers for Hausa yam	2.33	0.52
Land scarcity	2.12	0.67
Activities of market cartel	2.00	0.63
High cost of herbicides	1.63	0.51
High cost of seed yams	1.24	0.47
Stealing of yams	1.06	0.31
High cost of spoilage	1.03	0.22

*Serious (mean > 2.50).

CONCLUSION AND RECOMMENDATIONS

The study concluded that no allocative efficiency in yam production was achieved implying that there was inefficient allocative efficiency in yam production in the study area. Factors such as land, seedlings and labour were of over utilized while staking material and seedlings were under utilized by small scale yam farmers in the study area. Also, constraints such as low price of yam, high cost of staking and high cost of labour were the serious production constraints affecting small holder yam farmers in the study area.

Based on the findings the findings of the study, the following recommendations were made;

i. Provision should be made by relevant authorities to make land available to prospective yam farmers to avoid the over-use of the farmers existing holdings. This will solve the problem of land over utilization.
ii. The high cost of labour should be addressed through mechanization of some of the operation in yam production and the attraction of yam producing communities to the young school leavers through the provision of basic amenities such as electricity supply, water supply, health care facilities and good roads

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