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Profitability Analysis and Resource Use Efficiency of Smallholder Palm Oil Production in Delta State.

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A R T I C L E I NFO

Key words:

Small-holder oil palm,

Profitability,

Resource Use

ABSTRACT

Oil palm is an important crop whose products (oil and kernel) are used for food and non-food purposes. Palm oil is a commodity which is in high demand in Nigeria based on its food and non-food uses. The study examines the profitability level and resource utilization efficiency of small holder palm oil production across the agricultural zones in Delta State. A multistage random sampling technique was used in selecting respondents for the study. Primary data were collected with the aid of well-structured questionnaire and interview schedule. Data were analyzed using descriptive statistics; mode, frequencies and corresponding percentages and gross margin model and profitability techniques. The result of the analysis revealed that, the small-holder palm oil agribusiness is dominated by people from 50 years and above (32.5%) mainly married (76.8%). About 37% and 29% of the farmers possess West Africa School Certificate and Primary School Leaving Certificates respectively as their educational qualification. About 50% of the farmers have 16-20 years' experience in oil palm business. The resource use efficiency showed that family labour, hired labour and processing method cost were over-utilized while number of fresh fruit bunches were underutilized. The profitability indices indicated that palm oil production was profitable in all the three agricultural zones but comparatively, it was most profitable in the Delta Central zone, followed by the Delta North zone with the least being the Delta South agricultural zone. The study concluded that with efficient use of resources, the small holder palm oil production is a profitable and viable agribusiness in Delta State.

1.0 Introduction

Palm oil is the world's highest yielding oil crop, with an output 5–10 times greater per hectare than other leading vegetable oils. From a production level of 1.6% and a consumption level of 6% in 1976, global palm oil production and consumption has grown to 28% in 2009 to become the world's largest produced and consumed oil with production rate increased to 73 million metric tons in 2012 (Shahbandeh, 2012). According to Aidenvironment (2014), Palm oil recorded its fastest increase in global production due to the significant contributions by Malaysia and Indonesia. Given its enormous economic advantages and rich agronomical features, the oil palm has tremendous potential role to play in the drive for more sustainable farming systems. Combined with historically low prices, relative shelf stability, and reported nutritional benefits (Friends of the Earth, 2015), palm oil leverages natural advantages that position it as a likely long-term staple of the global diet. Adetola (2019) asserted that rapidly expanding populations and changing consumption patterns, as well as increasing demand from the bioenergy and oleo-chemicals industries, have resulted in sustained high prices for crude palm oil. These market forces have driven enormous growth of the palm oil industry in recent decades. Analysts predict further palm oil demand acceleration in the near term— potentially a 36% increase by 2012 over 2010 baselines, and more than 65% growth by 2020 (Sherry, 2015).

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Nigeria was the world's largest producer of palm oil accounting for 43% of global palm oil production and also the largest consumer of palm oil in Africa with a population of 197 million people (AgroBusiness Times, 2017). Over-reliance on traditional production methods, excessive tapping of palm trees for palm wine and the civil war between 1967-1970, are factors that contributed to Nigeria's inability to meet up with the global rise in demand for palm oil. Currently, Nigeria is the fifth-largest producer of palm oil globally with less than two per cent of total global market production. According to Partnership Initiatives in the Niger Delta (2011) about 80 per cent of palm oil production in the country comes from dispersed smallholder farmers. Given the right capacity building, Nigeria can improve palm oil production. As global demand for palm oil is increasing, the crop cultivation serves as a means of livelihood for many rural families, and indeed it is in the farming culture of millions of people in the country.

The Nigerian Oil palm belt covers twenty-four states and Delta State is one of the major Oil palm producing State. Within the oil palm belt in Nigeria, 80% of production comes from dispersed smallholders who harvest semi-wild plants and use manual processing techniques. Akhaine (2017) stated that several million smallholders are spread over an estimated area ranging from 1.65 million hectares to 2.4 million hectares and to a maximum of 3 million hectares.

Oil Palm productivity of smallholder oil palm plots is an important factor in determining the profitability of oil palm for smallholder cultivators. Financial viability assessments and resource utilization efficiency enables smallholders identify suitable conditions under which they will be able to generate sufficient return on their investment to improve their livelihoods while minimizing environmental impacts. Therefore this study sought to; ascertain the contribution of socio-economic characteristics of respondents' to palm oil production level, determine the level of resource utilization in palm oil production and compare the profitability level of palm oil production across the agricultural zones in the State.

MATERIALS AND METHODS

Sampling Technique/Data Collection

Both primary and secondary data were used. For the primary data, structured questionnaires were administered to smallholder oil palm producers. The questions were tailored toward meeting the set specific objectives. A multistage random sampling procedure was used in this research. In all, a total of 60 oil palm farmers were selected from each of the three agricultural (Delta Central, Delta North and Delta South) zones in the State, giving a sum total of 180 respondents for the study. However, a total of 174 viable questionnaires were finally retrieved for analysis. For secondary data, annual statistical reports, journals etc. were useful in examining the coverage of the agricultural situations.

Data Analysis

Resource Use Efficiency in terms of Allocative Efficiency.

The ratio of the marginal value products (MVP) and the marginal factor cost (MFC) were used to determine resource utilization in palm oil production. The theory of efficiency is derived from the production process which involved the transformation of inputs into outputs.

Mathematically, it is expressed as,

$$\frac{MVP}{MFC} > 1 \ldots\ldots\ldots\ldots 1(Under\ Utilization) \ldots\ldots (1)$$

$$\frac{MVP}{MFC} < 1 \ldots\ldots\ldots\ldots 2(Under\ Utilization) \ldots\ldots (2)$$

$$\frac{MVP}{MFC} = 1 \ldots\ldots\ldots\ldots 3(Optimum\ Utilization) \ldots\ldots (3)$$

Marginal value product (MVP) was determined by finding the product of marginal physical product (MPP) of the input and price of output. Then,

$$MPP_i = \frac{P_i}{P_y} = \frac{MPP\ X\ P}{P_i} = \frac{MVP}{MFC} \ldots\ldots\ldots\ldots\ldots\ldots (4)$$

Where P*i* = price of input per unit

P*y* = price of output per unit

Resource utilization in palm oil production with respect to the inputs was computed. First, is to determine the marginal value product for each resource, which is the product of marginal physical product (MPP) and the price of output per unit (P)

$MVP = MPP.P_y$ ..... ……(5)

Where P_y, = Price of output per unit …… (6)

Depending on the functional form selected as the lead equation, the MPP values were obtained using the method applied by Agbamu and Fabusoro (2001) as follows:

For Linear form, MPP = dy/dx b*i* ……(7)

Semi-log, MPP b*i*/Y*i* ……..(8)

Double-log, MPP b*i*. Yi/X*i* ……...(9)

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Resource use efficiency (RUE) = Resource utilization Index = MVP/MFC or MVP/Pxi

Where: V b*i* = regression coefficient

Y*i* mean output of palm oil

X*i* mean value of the resource / variable input

dy/dx = derivative of Y*i* and X*i*

Px*i* = Price of resource per unit

The coefficient of production function determines whether a resource is efficiently utilized or not.

Budgetary Analysis

Gross and net margins were used to compare the profitability level of palm oil production across the agricultural zones in the study area. Costs are expenses incurred in the operations of a production unit. Variable cost items include: planting materials, labour, fertilizer, cost of pesticides etc. The fixed cost items include: sprayers, hoes, cutlasses, baskets etc. The depreciated values of the fixed cost items was estimated.

The budgeting technique employed is given as:

Profit (π) = Total Revenue (TR) – Total Cost (TC) …… (10)

Gross Margin (GM) = Gross or Total Revenue (GR) – Total Variable Cost (TVC)

That is GM; = $\Sigma Pi\ Qi - \Sigma CjiXji$ …… (11)

Where:

GM; = gross margin of the i^{th} palm oil enterprises.

P*i* = Market price of output *i* per kg.

Q*i* = Quantity of output produced by enterprise *i* (kg).

C*ji* = Market price of variable input *j* in production enterprise *i*.

X*ji* = Quantity of the variable input *j* used in producing enterprise *i*.

The GR ($\Sigma Pi\ Qi$) is the value of total sales and home consumption.

NFI*i* = GM*i* – TFC*i* ……..… (12)

GM*i* = TR*i* – TVC*i* …… (13)

Where;

GM = Gross margin of i^{th} oil palm farm.

TR = Total revenue of the i^{th} oil palm farm.

TVC = Total variable cost of i^{th} oil palm farm.

TFC = Total fixed cost of i^{th} oil palm farm.

NFI = Net farm income of i^{th} oil palm farm.

Gross Margin Analysis:

GM = GFI (TR) – TVC …… (14)

Gross Margin Percentage: Gross margin (%) = GM/GFI x 100 ……... (15)

Farm earning = GM + value of products consumed at home …….. (16)

Return per Naira Invested (R/N): R/N = GM/TC …… (17)

Return per Gross Farm Income: GM/GFI = …… (18)

Production profitability Index (PPI): PI = Total Farm income / Total farm cost x 100 ……. (19)

where;

GM = gross margin (₦/ha)

GFI = gross farm income

TVC = total variable cost

TC = total cost

(Izekor & Olumese, 2010; Skarzynska, 2012).

RESULTS AND DISCUSSION

Determination of level of Resource Utilization by Gender

The resource use efficiency (RUE) was used to determine the level of resource utilization in the study area. RUE is related to the ability of the entreprise to utilize limited production resources in a cost-minimising or effective way. In order to achieve this

objective, the study employs the MVP/MFC analysis approach. This approach has been used by researchers such as Awunyo-Vitor, Wongnaa & Aidoo (2016), Sanusi *et al.* (2015) and Nimoh & Asuming-Brempong (2012) where the MVPs for each input used were computed and such computed MVPs were then compared with their respective acquisition cost, MFC. Results of this analysis is shown on Table 1.

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Table 1: Resource Use Efficiency Using Linear Function

Resources	MPP (b_i)	Py (N)	MVP (MPP.Py)	MFC (N)	Efficiency* (MVP/MFC)	Decision
No. of Oil palm bunches	0.812	125/litre	101.5	70/Bunch	1.45	Under Utilization
Family labour	0.010	125/litre	1.25	1200/md	0.001	Over Utilization
Hired Labour	-0.018	125/litre	-2.25	1200/md	-0.002	Over Utilization
Cost of Processing Method	-0.521	125/Litre	-65.125	2.5/Litre	-26.05	Over Utilization

Source: Field Survey Data, 2018

*When MVP/MFC > 1 indicates under utilization

MVP/MFC < 1 indicates over utilization

MVP/MFC = 1 indicates optimum use of resources

Note:

Py = Price of output palm oil / Unit

The result of the resource use efficiency in Table 1 showed that number of oil palm bunches, family labour, hired labour and processing method cost had efficiency indices of 1.45, 0.001, -0.002 and -26.05 respectively indicating underutilization of number of oil palm bunches and over utilization of family labour, hired labour and processing method cost. For these resources to reach optimum level the cost of processing method, hired labour and the number of family labour used should be reduced while oil palm bunches should be increased. When this is done profit will be maximized.

Profitability Level of Palm Oil Production across Agricultural Zones (Budgetary Analysis)

This sub-section focused on costs and returns structure of the palm oil producers, disaggregated across the agricultural zones (Delta Central, Delta South and Delta North) in the study area.

Costs and Returns

Various studies, (Jenkins, G.P *et al.* 2018; Aliyu A. A. (2015) have led credance to the usefulness of cost and returns model in the analysis of profitability. The data were analysed using various profitability indices. The items of cost were classified into fixed and variables cost items. The return of revenue in the study area was realized from the sales of oil palm processed from the farms by individual producer. The fixed costs items were depreciated over time while the variable cost items were determined by each producer based on the quantity used for palm oil production at a particular price. The profitability of palm oil production enterprise was examined using cost and returns analysis. The estimated costs and returns of small-holder palm oil producers when disaggregated across the agricultural zones in the study area are presented in Table 2 below.

The result from Table 2 showed the cost and return analysis as per hectare for the three agricultural zones; Delta Central, Delta South and Delta North. For Delta Central, the total cost was ₦112,458/ha, the total revenue or gross returns was ₦158,700/ha and the net farm returns was ₦46,242/ha while the return per naira invested (R.I) per hectare was ₦1.41. Similarly, result from Delta South agricultural zone indicated that the total cost was ₦101,414/ha, the total revenue was ₦120,060/ha and the net farm returns was ₦18,646/ha while the return per naira invested (R.I) per hectare was ₦1.18/ha. By the same token, the Delta North agricultural result revealed that total cost was ₦167,220/ha, the total revenue was ₦224,250/ha and the net farm returns was ₦57,030/ha while the return per naira invested (R.I) per hectare was ₦1.34/ha.

The summary from the analysis indicated that palm oil production was profitable in all the three agricultural zones but comparatively, it was most profitable in the Delta Central zone, followed by the Delta North zone with the least being the Delta South agricultural zone.

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Table 2: Cost and Returns for 1 ton of FFB from Small-holder Plantation (1ha)/year

	Cost and Returns for operating Small-holder Plantation (1ha) /year for Delta Central Agric. Zone			Cost and Returns for operating Small-holder Plantation (1ha) /year for Delta South Agric. Zone			Cost and Returns for operating Small-holder Plantation (1ha) / year for Delta North Agric. Zone		
Cost (Naira)	**Qty**	**Price**	**Total**	**Qty**	**Price**	**Total**	**Qty**	**Price**	**Total**
Weeding (rounds)	2	5000	10000	2	5000	10000	3	5000	15000
Fertilizer application (50kg bags)	4	6000	24000	4	6000	24000	8	6000	48000
Pruning (charge per tree)	140	100	14000	140	100	14000	140	100	14000
Fixed cost: Depreciation			3003			2459			2865
Harvesting (charge per FFB)	605	50	30250	455	50	22750	975	50	48750
Assembling (charge per FFB)	605	20	12100	455	20	9100	975	20	19500
Processing (bunch sterilization, threshing, pressing etc)/ton	1		19105		1	19105		1	19105
Total Cost			**112,458**			**101,414**			**167,220**
Revenue (Naira)	**Qty**	**Price**	**Total**	**Qty**	**Price**	**Total**	**Qty**	**Price**	**Total**
Yield in mt/ha	12			7			15		
Processed palm oil	690	230	158700	522	230	120060	975	230	224250
Total Revenue			**158,700**			**120,060**			**224,250**
Net Farm Returns			**46,242**			**18,646**			**57,030**
Return on Investment			**1.41**			**1.18**			**1.34**

Source: Field Survey Data, 2018.

Table 3: Profitability of Palm Oil Production

Model	Computation	Ratios		
		Delta Central	**Delta South**	**Delta North**
Benefit Cost Ratio / RoI	TR/TC	1.41	1.18	1.34
Rate of Return	Net Return/TC	0.41	0.18	0.34
Gross Ratio	TC/TR	0.70	0.85	0.75

Source: Field Survey Data, 2018.

CONCLUSION/ RECOMMENDATION

This study revealed that small-holder oil palm production is a profitable agribusiness, though the farmers have not been able to efficiently and effectively utilized productive resources to the optimal level. The above constraints which specifically were not captured because it didn't fall within the scope and objectives of this study, could however be a lead to provoke further research. Conversely the study has provided empirical evidence to draw conclusion and recommend that due to profitability of the oil palm agribusiness, the sector if adequately managed could be a source of job creation to leverage the unemployment challenges that has bedeviled the Country and drastically reduce the poverty index. Government should engage in adequate sensitization and awareness programme to the citizenry on the viability of oil palm agribusiness and encourage them through training and provision of takeoff grants to venture into it.

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