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Profitability of Small-Scale Oil Palm Seedlings Production in Makurdi Local Government Area of Benue State, Nigeria

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Abstract. The study examined the profitability of small-scale oil palm seedling production in Makurdi Local Government Area of Benue State. A multi-stage sampling technique was used to select 114 respondents for the study. Primary data were obtained with the aid of a well-structured questionnaire and analysed using descriptive and inferential statistics such as mean, frequency distribution, percentages, gross margin analysis and F-value test. Results showed that majority (50.9%) of the respondents were males, while (49.1%) were females. The mean age (42 years) of respondents indicates that small-scale oil palm seedlings producers are in their productive age, while the result of household size was 8 persons. Result of educational level shows that the majority (40.0%) of the respondents attended tertiary institutions, (32.5%) attended secondary school, (12.3%) attended primary school while (12.3%) had no formal education. Result on constraints faced by oil palm seedling producers shows that (47.4%) of the oil palm seedling producers indicated insufficient access to improved varieties which is a very severe challenge encountered by oil palm seedling production in the study area. The results on the profitability of oil palm seedling production show that the average mean value of seed, top soil, fertilizer, labour, water, agrochemical, polythene, equipment, shade and others respectively stood at ₦25.90, ₦31.98, ₦5502.66, ₦29711.45, ₦5526.84, ₦287.54, ₦20493.95, ₦7865.83 and ₦19842.8, while the total variable cost stood at ₦106612, the mean total revenue stood at ₦254603.22 while the mean total gross margin stood at ₦147990. The study concludes that oil palm seedling crop enterprise is profitable in the study area with positive values ₦147, 990.74 of the mean gross margin in oil palm seedling production. It was recommended that government and NGOs should support farmers with inputs such as seed and fertilizers that will aid oil palm seedling farmers in their production, organize seminars and workshops with increased involvement of extension agents on oil palm seedling production to educate them while farmers should be encouraged to join cooperatives unions as this will help in accessing credit facilities for sustainable oil-palm seedlings production in agriculture.

Keywords: oil palm, production, profitability, seedlings, small-scale, Nigeria

Introduction

Prior to the discovery of crude oil, Nigeria was the home of the oil palm (Agbugba & Binaebi, 2018). The oil palm is as old as creation. Every part of the tree is useful both

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economically and domestically. Oil palm is believed and accepted to have originated from West Africa. In Nigeria, it's cultivated in the South-East Zones and the Niger Delta regions. Oil palm is a low-land crop that thrives up to 900 meters in elevation. Having a fibrous root structure, it prefers a deep fertile and well-drained soil, yet it requires a lot of sunlight, which limits productivity significantly (Udoh and Essien, 2015). Oil palm is a tropical crop grown mainly for the production of palm oil (FAO, 2015). The oil palm features a sessile drupe with a leathery exocarp, fleshy oily mesocarp and a hard endocarp (shell) that encloses the kernel or seeds (Adetola, 2015).

The high yielding characteristics of the oil palm plant has resulted in a widespread cultivation as a plantation crop in most countries with annual rainfall of about 1600mm to 5000mm (Keu, 2001). There are economically three important varieties of the oil palm plant. These are the dura, the Pisifera, and the Tenera. The Tenera is a cross between the dura and the Pisifera (NIFOR, 1995). The oil palm production requires the application of fertilizer particularly nitrogenous fertilizers such as sulphate of ammonia, murate of potash. Nigeria is currently ranked as the fifth largest producer of palm oil in the world with countries like; Indonesia and Malaysia holding the first and second positions, Nigeria also has an average production rate of about 1.4 million metric tonnes, with states such as; Akwa Ibom, Cross river, Rivers, Abia and Edo being the largest producing states in the country.

The kernel, positioned at the center of the fruit is where the kernel oil is derived. It is the dark yellow oil that is normally used in the production of detergent, cosmetics, plastics and chemicals. This is bound to have positive impact on agricultural production, household income and food security (Ezihe *et al.,* 2020). Also Crude palm oil, extracted from the mesocarp produces deep red oil that is found in a wide variety of foods (Sophie, 2020). Oil palm seedlings are very important in the production of the oil palm plant as it helps to deal with the challenge of delayed germination faced by growers. Growers, therefore tend to buy seedlings already having four-five leaves on it, which is carefully watched over in a nursery and subsequently move them to the palm grove. The Tenera variety is the most successful variety in Nigeria, it has a thin shell and yields a lot of oil when harvested and processed.

The production of high quality seedling is dependent on a good growing medium. The physiochemical and biological properties of a growing medium will affect the plant growth and directly influence its roots growth. Furthermore, the planting medium must be porous and well drained to permit free root penetration, secure anchorage, and have sufficient nutrients to support the growth of the crop (Rosenani, 2016). Despite Nigeria being one of the largest producers of oil palm in the world, it still struggles with scarcity of oil palm seedling, poor output after harvest and processing. There is need for oil palm increased production in Africa and especially in Nigeria, and that is why the Federal and State Governments plans is targeted towards enhancing agricultural productivity, neglected for many years (Doherty, 2006). Many researchers have carried out related studies on oil palm production in Nigeria. For example Olagunju (2008) carried out research on the economics of oil palm processing in southwest Nigeria. Basiron (2002) carried out study on palm oil and its global supply and demand prospects. However, to the researcher's best knowledge there is little or no work on the economics of oil palm seedling production especially in Makurdi Local Government Area of Benue state, Nigeria. Therefore, this study intends to fill the gap for optimizing oil palm seedling production. This situation, therefore calls for in-depth evaluation of the challenges and gains of small scale oil palm seedling production in the study area.

Methodology

The study was conducted in Makurdi Local Government Area of Benue State, Nigeria. The State is located at the North Central zone out of the six geopolitical zones of Nigeria. Its geographical coordinates are; longitude 7º 47' and 10º 0' East and latitude 6º 25' and 8º 8'

North with a population of 4,253,641 as the census conducted in 2006. The State derives its name from the Benue River which is the second largest river in Nigeria. The state is predominantly inhabited by the Tiv, Idoma, and the Igede people. The minority ethnic groups in Benue are; Etulo, Jukun, Akweya, and Nyifon. The state is made up of 23 local government areas; Ado, Agatu, Apa, Buruku, Gboko, Guma, Gwer East, Gwer West, Katsina-Ala, Konshisha, Kwande, Logo, Makurdi, Obi, Ogbadibo, Ohimini, Oju, Okpokwu, Otukpo, Tarka, Ukum, Ushongo and Vandeikya. Its capital is Makurdi (Ezihe *et al.*, 2017). Benue is a rich agricultural region growing crops such as: oranges, mangoes, sweet potatoes, cassava, soya bean, guinea corn, flax, yams, sesame, rice, groundnuts and palm trees.

Makurdi doubles as the State capital and also serves as the Local Government Area headquarters of Makurdi Local Government. It's located in North-Central Nigeria, latitude 7º 73N to 7º 93N and longitude 8º 53E to 8º 73E. The Local Government is bordered by Guma to the north, Gwer-East to the south, Gwer-West to the West and Doma Local Government Area of Nasarawa State to the North-West. It covers 804 km2 land mass in a 16km radius circle (Isma'il and Kersha, 2018). The city is situated on the South bank of the Benue River estimated to have a population of 365,000. The study area has 11 council wards (Agan, Ankpa, Bar, Clerk/Market, Central/South Mission, Fiidi, Mbalagh, Modern Market, North Bank 1, North Bank 2 and Wailomayo wards). It is one of the major cities and the main location of commercial activities, serving as the local trade center for agricultural products such as sesame, rice, cassava, millet, yams, cotton, soya beans, groundnuts, oil palm and even livestock in the State (Awopetu *et al*., 2013)

The commercial activities especially the sales of agricultural product is mostly carried out by the Tiv speaking people of Benue who make up a vast majority of its population and this makes tiv language the official trade language of study area. Makurdi being located at an elevation none meters (0 feet) above sea level, has a tropical wet and dry savanna climate. The district's yearly temperature is 29.32ºC (84.78ºF) and it is -0.14% lower than Nigeria's averages. The study area receives about 134.92 millimeters (5.31 inches) of precipitation and has 159.68 rainy days (43.75% of the time) annually, with a mean monthly relative humidity of between 43% in January to 81% in July and August. The town is also drained by the Benue River, which cuts across the town from east to west, separating it into two major parts (the North and South banks). There are two major types of soil in the Makurdi town: hydromorphic soils formed from alluvium sediments along the River Benue, and red ferrasols formed from sedimentary rocks away from the immediate river channel. (Ahile & Ityavyar, 2014). Makurdi Local Government Area is the growing hub of oil palm seedling production in Benue State for economic, developmental and other purposes.

Population and Sample Size Selection

The population for the study comprises of oil palm seedling producers in Makurdi Local Government Area of Benue State, Nigeria. Multistage random sampling technique was used to select the respondents for the study. In the first stage, three districts out of the eleven were selected using a purposive sampling technique as they have highest number of oil palm seedling producers. The three districts selected were Bar, Agan and Modern Market. The second stage will involve selection of three (3) oil producing communities from each of the districts selected making the total of nine (9) communities. The third stage was a simple random selection of thirteen (13) oil palm seedling producers from each of the nine communities giving a total of 117 respondents out of which 114 were returned for the study.

Data and Analytical Technique

The primary data was collected from a set of well-structured questionnaires to elicit information based on the objectives of the study and analysed using descriptive statistics such

as mean, percentages, frequency distribution and gross margin analysis. The hypothesis was analysed using F-value test.

Measurement of Variables

Seed was measured in kg
Labor was measured in man day
Agrochemicals was measured in litres
Fertilizer was measured in kg
Age was measured in years
Sex was measured in male or female, if male =1 and female=0
Farming experience was measured in years
Access to credit was measured using dummy 1 for access and 0 otherwise
Contact with extension agent was measured using feature variable 1 for contact and 0 otherwise
Membership of cooperative was measured using 1 for those that are members and 0 for otherwise
Education was measured using 1 for producers with any form of education and 0 for those who are illiterates
Household size was measured by the number of persons that makes up the producer's family.
Oil palm seedling output was measured in kg. it is expected that seed, land, labour, fertilizer, agrochemicals, age of respondents, access to credit, farming experience, membership of cooperative and contact with extension agent will have a positive relationship

Gross Margin Analysis

$$GM = TR - TVC \quad (1)$$

Where;
GM= Gross Margin
TR= Total Revenue
TVC= Total Variable Cost

The component of the variable cost includes; the cost of seeds, cost of labour, cost of land, cost of transportation, cost of fertilizer, cost of agrochemicals, polythene bag, hoe and shovel (farm implements).

Model for the study is explicitly specified as follows:

$$Y=\beta_o+ \beta_1X_1+ \beta_2X_2+ \beta_3X_3+ \beta_4X_4\ldots\ldots. \beta nXn + ei \quad 2)$$

Where;
Y= dependent variable
β_o= equation constant
β_1-βn = coefficient of the explanatory variables
X_1-Xn = independent variables
e= error term.

Results and Discussion

Socio-Economic Characteristic of the Small Scale Oil-Palm Seedlings Producers

The result of distribution according to age in the table 1 revealed that the mean of age of the respondents was 42 years indicating that averagely respondents were in their productive age. Furthermore, the study showed that majority (48.2%) of the respondents were aged 31-40 years. Specifically, (0.9%) were less than 20 years old, (39.5%) were within 21-30 years, (7.9%) were within 41-50 years while (3.5%) were within 51-50 years. This implies that oil

palm seedlings production in the study area was dominated by producers who were in their active age of production and therefore could handle tedious tasks involved in oil palm seedlings production. This finding agrees with the findings of Ofor *et al.* (2018).

The result of sex showed that majority of the respondents (50.9%) were male while 49.1% were female. This result agrees with Adetola (2015) findings who reported similar result on the male sex dominance in oil-palm production. The dominance of the male gender in oil palm seedlings production in the study area can be attributed to the tedious nature of oil palm seedlings production which can be easily handled by the stronger male gender. The result of marital status showed that majority (40.4%) of the respondents were married. About (38.6%) were single, (9.6%) were widowed while (11.4%) were divorced. This indicates that married people were more active in the production of oil palm seedlings. This implies that majority of the respondents have families, hence greater involvement in oil palm seedlings production in order to ensure household food security.

The result of household size revealed that, the mean household size is 8 persons. 36.8% have household size of less than or equal to 5 persons, 40.4% have household size of 6-10, (21.10%) have household size of 11-15%, while 1.8% have household size of as from 16 to 20. This showed that the respondents had a sizeable household size. Members of the household could serve as source of labour used in carrying out farming activities. The finding confirmed with that of Rosennani (2016) who observed that rural households in Nigeria are characterized by large family size with high dependency ratio.

The result of educational level showed that majority of the respondents (40.0%) attended tertiary schools, (32.5%) attended secondary school, (12.3%) attended primary school and (12.3%) had no formal education. This finding is an indication that producers are literate enough to adopt new technology. Uche *et al.* (2018) stress the role of education in increasing the adoption of improved agricultural technologies.

The result of the farming experience also revealed that (90.4%) of the respondents have between 1-5years of farming experience; while (9.6%) have 6-10 years farming experience This implies that majority of the respondents have average experience in oil palm seedling production, having engaged in oil palm seedlings farming for a long period of time. The findings of this study agreed with Taufiq *et al*. (2020) who stated that most of the small-scale oil palm seedlings producers have been involved in agricultural production for some period.

The mean annual oil palm seedlings production income was found to be ₦236491.00k while (54.4%) had annual oil palm seedlings production income of about ₦200000 and below, (38.6%) of the respondents had annual oil palm seedlings production income of ₦200001-₦400000; while (7.0%) had annual oil palm seedlings production income ₦400001-₦600000 and above.

The result on primary source of income revealed that (36.0%) were primarily farmers, (20.2%) does other paid jobs, (21.1%) were primarily students while (22.8%) were primarily traders the result of extension contact revealed that majority (61.4%) of the respondent do not have extension contact while about (38.6%) had extension contact. (23.6%) had extension contact among others.

The results on area of land for seedling revealed that (38.6%) of the respondents had area of seedling of about of 1.1 to 2 hectares while (31.6%) had area of land of about 1 and below. Also, (15.8%) had area of land of about 2.1 to 3 hectares, 6.2% had area of land of about 3.1 to 4 hectares, (5.3%) had area of land of about 4.1 to 5 hectares while (2.6%) had area of 5.1 hectare and above. Similarly, **(**54.3%) had seedling capacity of 0.2-0.9, (44.7%) had seedling capacity of 1.0-3.0 while (0.9%) had 150 seedling capacity.

Table 1. Socio-Economic Characteristics of the Respondents

VARIABLES	FREQUENCY	PERCENTAGE %	MEAN
Sex			
Male	58	50.9	
Female	56	49.1	
Age			**42.07**
≤20	1	0.9	
21-30	45	39.5	
31-40	55	48.2	
41-50	9	7.9	
51-50	4	3.5	
Marital Status			
Single	44	38.6	
Married	46	40.4	
Widowed	11	9.6	
Divorced	13	11.4	
Farming Experience			**18.60**
≤5	103	90.4	
6-10	11	9.6	
Education			
No formal education	14	12.3	
Primary school	14	12.3	
Secondary	37	32.5	
Tertiary	49	40.0	
Annual income			**236491.00**
≤200000	62	54.4	
200001-400000	44	38.6	
400001-600000	8	7.0	
Primary source of income			
Farming	41	36.0	
Paid job	23	20.2	
Student	24	21.1	
Trading	26	22.8	
Household size			**8.17**
≤5	42	36.8	
6-10	46	40.4	
11-15	24	21.1	
16-20	2	1.8	
Extension contact			
No	70	61.4	
Yes	44	38.6	
Number of ext. contact			
1-3	27	23.6	
4-6	14	8.9	
7-10	3	2.7	
Area of land for seedling			
≤1	36	31.6	
1.1-2	44	38.6	
2.1-3	18	15.8	
3.1-4	7	6.2	
4.1-5	6	5.3	
≥5.1	3	2.6	
Seedling capacity			
0.2-0.9	62	54.3	
1.0-3.0	51	44.7	
150	1	0.9	

Source: Field Survey (2023

Profitability of Oil-Palm Seedling Production

The result in table 2 showed profitability in oil palm seedling production. The analysis revealed that the average mean value of seed, top soil, fertilizer, labour, water, agro-chemical, polyethene, equipment, shade and others respectively stood at ₦ 25.90, ₦31.98, ₦5502.66, ₦2971.45, ₦217.45, ₦5526.84, ₦287.54, ₦20493.95, ₦7865.83 and ₦19842.8. The mean of total variable cost stood at ₦106612.48, Mean of total revenue stood at ₦254603.22 while mean of gross margin stood at ₦147990. This implies that with more inputs use there will be increase in the returns of oil palm seedling production. Since total revenue is high than the total variable cost, and gross margin is positive oil palm seedling production is profitable in the study area. This result is in agreement with Taufiq *et al.* (2020) who reported that oil palm seedling production is profitable.

Table 2. Profitability of Oil-Palm Seedling Production

Variables	Min	Max	Mean	Std deviation
Seed	5	80	25.90	8.30
Top soil	2	70	31.98	12.84
Fertilizer	0	12000	5502.66	3053.76
Labour	50	11000	2971.45	1776.94
Water	0	5400	217.45	721.31
Agro-chemical	80	12000	5526.84	2923.40
Polyethylene	40	5500	287.54	64042
Equipment	5	60000	20493.95	13487.09
Shade	0	30000	7865.83	6909.65
Others	6	60000	19842.8	11900.23
Total variable cost			106612.48	
Total revenue			254603.22	
Gross margin			147990.74	

Source: Computed from Field Survey, 2023

Factors Responsible for the level of Income Generated by Oil-Palm Seedling Producers

The result of factors that responsible for the level of income generated by oil palm seedling producers in the study area is shown in Table 3. The coefficient of determination (R^2) is 0.868; indicating that 86.8% of the factors responsible for income generated in oil palm seedling is explained by seed, land, fertilizer, agrochemical, labour, age, experience, sex, extension contact, education and household size. The result shows that F-statistics (59.040) is positive and significant at 1% level indicating the goodness of fit for the model and overall significance of variables used in the model.

The result further indicates that seed was positively significant at 1% significant level, which implies that for every 1% increase in seed, will increase the oil palm seedling production by 0.824%. In order words, land was positive and significant at 5% level of significant and this implies that for every 5% increase in land, will increase output of oil palm seedling production by 35.290%, farming experience was positive and significant at 1% level of significance, this implies that for 1% increase years farming experience, increases oil palm seedling production by 14.812%. Extension contact was positive and significant at 5%, which implies that for 5% increase extension visits results in 9.269 increase in oil palm seedling production. Fertilizer, agrochemical, labour, age, sex, education and household size are insignificant and therefore do not significantly affect performance i.e. income generated by oil palm seedling farmers. The null hypothesis which stated that production inputs are not responsible for income generated in oil palm seedling production in the study area is rejected. In their studies, Udoh and Essien (2015) and Agbugba *et al.* (2023) recorded a similar observation.

Table 3. Factors Responsible for the level of Income Generated by Oil Palm Seedling Producers

Variables	Coefficient	std.error	T statistic	Sign
Constant	38.344	81.791	0.469	0.640
Seed	.824	0.047	17.680	0.000**
Land	35.290	10.907	3.236	0.002*
Fertilizer	.005	0.019	0.245	0.807
Agrochemical	-6.905	10.875	-0.635	0.527
Labour	-.267	0.856	-0.312	0.755
Age	-2.121	1.882	-1.127	0.262
Experience	14.812	6.886	2.151	0.001**
Sex	5.802	22.766	0.255	0.799
Extension contact	9.269	23.461	0.395	0.003*
Education	8.455	12.826	0.659	0.511
Household size	-2.301	3.319	-0.693	0.490
R^2	0.868			
Sig	0.000			
F-statistic	59.040			

Note: ** and * are significant at 1% and 5% respectively.
Source: Computed from Field Survey (2023)

Conclusion and Recommendations

The study analysed the economics of small-scale oil palm seedling production in Makurdi Local Government Area of Benue State. The study found that majority of farmers were male in their productive age. With considerable tertiary school education, and 18years of farming experience. The study also found that most of respondents earned ₦23, 6491 as their annual income. The result of profitability of oil palm seedling crop enterprise shows that the enterprise is profitable, with positive values (₦147990.74) of the mean gross margin in oil palm seedling production. The study also revealed that oil palm seedling farmers were faced with several constraints which include insufficient access to improved varieties, lack of uniformity in growth of seedlings, prevalence of pest and disease, land space constraint, labour availability limitation, transport and distribution limitation, lack of government support, inadequate extension services, poor access to research institutes, labour cost and high cost of improved seeds in the study area. Based on the findings of the study it recommended that government and non-governmental organizations should assist farmers with inputs such as high quality yielding seed, fertilizers, training and more area of land possibly at subsidized rate that will aid oil palm seedling farmers in their production in the study area while farmers are encouraged to form cooperative unions as this will help them in accessing credit facilities and policy reforms to support the growth of the oil palm enterprise in Benue state.

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