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EFFECTS OF OIL SPILLAGE ON THE WELFARE OF CASSAVA FARMERS IN OIL PRODUCING COMMUNITIES OF ABIA STATE, NIGERIA

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Abstract
The study examined the effects of oil spillage on the welfare of cassava farmers in oil producing communities of Abia State, Nigeria. Multistage, purposive and random sampling techniques were used to sample 120 cassava farmers for the study while well structured questionnaire was used to collect data from the farmers. Data were analysed using frequency, percentage, means, z-test statistics and Ordinary Least Squares (OLS) multiple regression analysis. The results identified the effects of oil-spillage in the area to include: pollution of water bodies (100.0%), poor yield of crops (100.0%), low farm income of farmers in affected areas (100.0%) and threat to aquatic lives (95.0%). Environmental factors that significantly influenced the welfare status of the farmers included: soil remediation cost at 1%, farm size at 1%, oil producing status at 5% and soil condition at 1%. The result of the profitability analysis showed profitability index of cassava farmers in oil producing and non oil producing communities as 0.47 and 0.65 respectively, while their benefit cost ratios were 1.89 and 2.87 respectively. Socioeconomic factors that significantly influenced profitability of cassava farmers include: farm size, education, household size, gender, extension contacts, cooperative and oil-bearing status at 1 and 5%. Based on the findings, the study recommends increaed provision of intervention funds to farmers, and the remediation of degraded soils, to boost farm productivity and improve farmers' income and welfare.

Keywords: Oil spillage, Cassava, Welfare, Abia State

Introduction

Agriculture is crucial to economic development of most developing nations as about 80% of the poor in Africa, Nigerian inclusive resides in rural areas and depends largely on subsistence farming for food and means of livelihood. One of the most important food crops in Nigeria is cassava. Enete, Amusa and Nwobodo (2013) affirmed that cassava is Africa's second most important staple crop in terms of calories consumed after maize, with Nigeria as the World leading producer and consumer. Cassava contributes significantly to the nutrition and livelihood of about 800 million people and thousands of processors and traders around the world, and forms a base for a wide variety of fermented foods (Udoro, Gbadamosi & Taiwo, 2008). For instance, cassava tubers are processed to varieties of food items such as cassava flour (*alibo/elubo),* cassava pastes (a*kpu),* cassava toasted granules (*garri*), and a*bacha* among others. Osun, Ogundijo and Bolariwa (2014) shared that the growing importance of cassava as a major food and cash crop in Nigeria has put it on the priority list of government and international development agencies as a target crop for food security with potentials for agro-based industrialization. In addition, cassava can be used for the production of flour for confectioneries, formulation of animal feeds and the production of industrial starch, alcohol, adhesive and gums. Cassava is grown nearly by every farming household across Nigeria and it is used as animal feed, agro-industrial uses, accounting for daily calories intake of about 30% and major source of income (FAO, 2006). The results of the studies of Nandi, Gunn and Yurkushi (2011), Eze and Nwibo (2014) and Akerele, *et al* (2019) all showed that cassava production is an economically viable farm enterprise among farming households. At the national level, the economic significance of cassava cannot be overestimated. For instance, Akerele, *et al* (2019) observed that the output of cassava in Nigerian has continued to fall below its total demand for food, industrial use and export purposes. In spite of the significance of cassava to economic and food security, its full potential has not been realized as its production rarely exceeds 11 metric tonnes per ha. Eze and Nwibo (2014) reported that regional yields of cassava in countries such as India, Laos, Thailand and Barbados were established to be as high as 25 to 40 metric tonnes per ha. Hence, Nigeria's cassava yield of less than 11 metric tonnes per ha falls well below the yield in Asian

region. This situation is not unconnected with a number of factors including environmental deterioration across the country and Niger Delta region in particular. For instance, Amusa, Okoye and Enete (2018) noted that environmental conditions, to a very large extent determine the yield and productivity of agriculture because the environment provides farmers with the resources such as water bodies, land, forest, vegetation and biodiversity for agricultural production. The increasing trend of pollution and oil spillage which have destroyed arable lands is not unconnected with poverty increase in the Niger Delta, Abia oil producing communities inclusive. Oil spoilage, according to Echetama, *et al* (2020) is the presence of crude or refined oil on soil or sea water mostly due to human activities. Oil spillage cause significant damage to water and soil nature degrading most agricultural lands and rendering them unproductive. In 2013 alone, the volume of oil spills in Niger Delta was about 20,000 barrels which negatively affects crops growth and yield in the region (Shell Petroleum Development Company [SPDC], 2015). The rising cases of oil spillage in Niger Delta Nigeria has further worsened soil infertility in the area resulting in destruction of soil micro-organisms and decreasing agricultural productivity of farmers in oil producing communities. In affirmation, Echetama, *et al* (2020) stated that the effect of oil spillage on farmlands has greatly hampered agricultural activities in Niger Delta including oil producing areas of Abia State as there have been records of oil spillage covering farming areas and water bodies resulting in loss of soil fertility, decrease in farm productivity and deterioration of farm produce. Abia State is one of the oil producing states in the Niger Delta facing associated effects of oil spillage resulting in environmental degradation in the oil producing communities. For instance, between 2011 and 2015, there were more than 64 major cases of oil spillages destroying farmlands and water bodies in Abia oil producing communities such as Umuorie, Owaza, Umuokwor, Obiga, Uzuaku and Imo river (Shell Petroleum Development Company, 2015). However, studies that investigated the effects of oil spillage on environmental and particularly, on agricultural production in Abia and Imo States are limited. Most research efforts that assessed environmental effects of crude oil spillage in Nigeria were concentrated in other Niger Delta States such as Akwa Ibom, Delta, Rivers and Bayalsa probably because of the predominance of oil production and spillage in those areas. The fact that Abia State is not producing the same volume of barrels of crude oil with Akwa Ibom, Delta and Rivers State does not exonerate her agricultural activities from the devastating effects of oil spills most especially in the oil producing communities. Hence, the study investigated the effects of oil spillage on welfare of cassava farmers in oil producing communities of Abia State, Nigeria. Specifically, the study examined major effects of oil spillage in the area, environmental factors influencing welfare status of cassava farmers, cost and returns (profitability) of the farmers, test of significant difference in profitability of cassava production in oil and non oil producing communities and factors influencing their profitability.

Methodology

Study Area

The study was conducted in Abia State, Nigeria. The state is made up of seventeen (17) administrative local government areas broadly divided into three agricultural zones which are: Aba, Ohafia and Umuahia. The population of Abia State according to National Bureau of Statistics (2012) is 3,256,642 people. Abia State is located within the tropical rainforest zone and lies between longitudes 7^{O} 10^{1} and 8^{O} East of the Greenwich meridian and latitudes 4^{O} 40^{1} and 6^{0} 14^{1} North of the equator (NBS, 2005). It occupies a land area of 4,900sq.km, annual rainfall of 1,980.1 mm, annual mean minimum temperature of 22.8^{0}C and annual mean maximum temperature of 31.9^{0}C (NBS, 2012). Apart from Aba and Umuahia as the economic and administrative centres respectively, the state is predominately agrarian with farming being the major means of livelihood of the people providing income and employment for more than 65% of the population. Major food crops grown in the state include cassava, rice, yam, cocoyam, maize, melon, and vegetables.

Sampling Techniques

Purposive, multi stage and random sampling techniques were used to select 120 cassava farmers for the study. The first stage involved purposive selection of Aba Agricultural zone being the oil producing zone in the state. In the second stage, two local government areas (LGAs) Ukwa West (oil producing) and Ukwa East (non oil producing) LGAs were purposively selected from Aba Agricultural zone. The third stage involved purposive selection of four oil producing communities in Ukwa West LGA which are: Umuorie, Owaza, Umuokwor/Obiga and Uzuaku and random selection of four non oil producing communities from Ukwa East LGA which include: Akwete, Ikwuorie, Ohandu and Ikiruamike making eight communities for the study. At the fourth stage, random sampling was employed to select 15 cassava farmers from the list of cassava farmers obtained in each of the selected eight communities making a total of 120 respondents (60 from oil producing communities and 60 from non oil producing communities) for the study..

Data Collection and Analysis

Data for this study were obtained from primary source through the use of well-structured questionnaire. The data were collected in 2019 cropping season by the researchers and their research assistants. Data collected focused on socio-economic characteristics of the cassava farmers, effects of soil spillage, household food and non food expenditure, and cost and returns of the cassava farmers. The data were analysed using descriptive statistics such as frequency, percentage, means, gross margin, and inferential statistics such as Z-test and Ordinary Least Squares (OLS) multiple regression analysis. For the multiple regression models, four functional forms: linear, semi-log, double-log and exponential were estimated. In the semi-log and double

log functional forms, dummy variables with "0" values were not logged. This is because; the number 0 is undefined for log.

Estimation Procedure

Gross Margin Analysis

The cost and returns (profitability) of cassava production in oil-bearing and non oil-bearing communities was determined using Gross Margin analysis. The model is expressed as:

Gross Margin

GM = TR -TVC 1

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

Rate of Return on Investment (RRI)

$$RRI = \frac{NR}{TC} X \frac{100}{1} \ldots\ldots\ldots\ldots\ldots\ldots\ldots 2$$

Where: RRI = Rate of Return on Investment
NR = Net Return
TC = Total Cost

Profitability Index (PI)

$$PI = \frac{NR}{TR} \ldots\ldots\ldots\ldots 3$$

Where: PI = Profitability Index
NR = Net Return
TR = Total Revenue

Operating Expense Ratio (OR)

$$OR = \frac{TVC}{TR} \ldots\ldots\ldots\ldots 4$$

Where: OR = Operating Expense Ratio
TVC - Total Variable Cost
TR = Total Revenue

Ordinary Least Squares (OLS) Multiple Regression Models

To estimate environmental factors influencing welfare status of cassava farmers in the area, welfare function using Ordinary Least Squares (OLS) multiple regression was used as applied by Ukoha, Mejeha and Nte (2007) and Ademiluyi (2014) which was specified as:

W = f(X1,X2,X3,X4,X5,e 5

Where:
W = Welfare Status (proxied by household's expenditure on food and non-food items in ₦).
X_1 = Soil Remediation Cost (Total cost of enhancing soil fertility in ₦)
X_2 = Farm size (hectare)
X_3 = Oil producing status (1 if oil producing, 0 if non oil producing)
X_4 = Extension visit (number of extension contacts)
X_5 = Soil Condition (1 if degraded, 0 if not degraded)

Similarly, to examine the factors influencing profitability (net returns) of cassava farmers, Ordinary Least Squares (OLS) multiple regression analytical technique was used and specified as:

$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8) + e$ .....(6)

Where:
Y = Profitability (proxied by Net Return of each cassava farmer).
X_1 = Farm size (hectare)
X_2 = Age of the farmers (years)
X_3 = Farming experience (number of years in farming)
X_4 = Household size (number of persons)
X_5 = Gender (male 1, female 0)
X_6 = Extension visit (number of visitations)
X_7 = Membership of cooperative (Yes =1, No =0)
X_8 = Oil producing status (1 if oil producing, 0 if non oil producing)
e = error term

The lead equations were chosen based on the values of the coefficient of multiple determinations (R^2), the highest F values, the exposition of highest number of significant variables and conformity to a prior expectation.

Z-test for Hypothesis Testing

Ho_1: hypothesis one was tested using

$$Z_{cal} = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{S^2\bar{X}_1}{n_1} + \frac{S^2\bar{X}_2}{n_2}}}$$

Where;

X_1 = Mean profitability index of cassava farmers in oil producing communities.
X_2 = Mean profitability index of cassava farmers in non oil producing communities.
$S^2\bar{X}_1$ = Variance of profitability index of cassava farmers in oil producing communities.
$S^2\bar{X}_2$ = Variance of profitability index of cassava farmers in non oil producing communities.
n_1 = number of cassava farmers in oil producing communities.
n_2 = number cassava farmers in non oil producing communities.
n_1+n_2-2 degree of freedom.

Results and Discussion

Effects of Oil Spillage on Agricultural Production in the Study Area

The result on the effects of oil spillage on agricultural production is shown in Table 1. The Table showed that the most predominant effects of oil spillage on agricultural production were: pollution of water bodies (100.0%), poor yield of crop (100.0%), stunted plant/crop growth (100.0%), low farm income of farmers in affected areas (100.0%), threat to aquatic lives (95.0%), poor soil condition/reduce soil fertility (91.7%), oil spilage on farm land (85.0%), poor quality of farm produce (73.0%), negative effect on humman

health (71.7%), endangering of plant and animal species (70.0%) and increased food shortage (63.3%) among others. In agreement with the findings, the report of National Bureau of Statistics (2004) showed that the incidence of poverty in the Niger Delta increased from 15.4% in 1980 to 52.2% in 2004 due to constant incidence of water and soil pollution resulting from oil spills which has destroyed sources of income and productive activities in the region. Similarly, Nnabuenyi (2012) observed that most of the destroyed farmlands and polluted rivers have contributed to the frustration and poor livelihoods for farmers. Echetama, *et al* (2020) reported that the effect of oil spillage on farmlands has greatly hampered agricultural activities in Niger Delta region.

Socioeconomic Factors Influencing the Welfare Status of the Cassava Farmers

Table 2 presents the results of the regression analysis on environmental factors influencing the welfare status of cassava farmers. Four functional forms (linear, semi-log, double-log and exponential) were tried, the linear functional form had the best fit, based on the values of R^2 (0.9714), number and levels of significance of explanatory variables and their signs. The R^2 value of 0.9714 indicated that the explanatory variables in the model were responsible for about 97% variation in the welfare status (expenditure on food and non-food items) of the farmers. The F-value (247.25) at Prob>F value of 0.0000 indicate that the overall equation was highly significant at 1 percent. Out of the five explanatory variables specified in the model, four were statistically significant which included: soil remediation cost, farm size, oil bearing status and soil condition. The coefficient of soil remediation cost was highly significant at 1% but negatively related to welfare status of the cassava farmers indicating that, increase in the cost of remediating degraded soil to support farming reduces their purchasing power and consequently their welfare. It is expected that increase in remediation cost will increase cost of production of the farmers which will in turn reduces the welfare of the cassava farmers. Motshumi and Muzenda (2014) observed that it is essential to regenerate degraded soil to support animal, plant and human lives which come with a cost. Wu, et al (2013) noted that most soil remediation technologies are costly therefore farmers must ensure selection of cost effective and sustainable soil remediation measures. The coefficient of farm size was positive and significantly influenced the welfare of cassava farmers at 1%. This conforms with *a priori* expectation as large farm sizes are expected to result in higher yield of cassava and improved welfare of the farmers, all things being equal. Ademiluyi (2014) reported that increase farm size if properly managed will positively influence welfare status of farmers. Idam (2017) in a study established positive and significant relationship between increased farm size and enhanced welfare status of farmers in Ebonyi State. The coefficient of oil producing status was significant at 5% but negatively related with welfare status of the cassava farmers. This implies that cassava farmers in oil producing areas of Abia State have poor welfare probably due to spillage and soil degradation in the area resulting into poor yield of the farmers. Similarly, the coefficient of soil condition was highly significant (1%) and also negatively related to farmers' welfare status. The implication of the negative relationship of soil condition and farmers' welfare is that, farming on degraded soil reduces the welfare status of the cassava farmers through poor yield. Anum, *et al,* (2020) reported that many accidental spillages of crude oil in oil producing areas have threatened the nature, and the livelihood of people in the communities through poor yield. Ebegbulem, Ekpe and Adejumo (2013) noted that the ecologically unfriendly activities of the multinational corporations in the region lead to environmental degradation which in turn leads to poverty. Obire and Nwaubeta (2002) observed that soil contaminations have great effects on agricultural productivity as they cause decrease in plant growth, yield and farmers income thereby worsening food insecurity and poverty among the farmers.

Profitability of Cassava Farming in Oil producing and Non Oil producing Communities

The result of the cost and returns in Table 3 showed that the total revenue (TR) of cassava farmers in oil producing communities was ₦102,350.40 with gross margin (GM) of ₦51,540.40. Net return (NR) of ₦48,355.70 and profitability index (PI) of 0.47. This implies that about 47% of the total revenue from cassava production in oil producing communities constitutes net income. Further results showed that the rate of return on investment (RRI) was 89.55% which implies that the farmers in oil producing communities earns about 89% profit on every naira invested in cassava farming enterprise. The operating expense ratio (OR) of 0.49 indicates that the variable cost constitute about 49% of profit of the cassava farmers. The Benefit Cost Ratio (BCR) value of 1.89 indicated that ₦1.89 kobo is earned on every ₦1.00 invested by the cassava farmers in the oil-bearing communities. This showed that cassava production is still profitable in the oil-bearing communities of Abia State despite the environmental challenge of oil spills confronting the farmers.

The results of the cost and returns of cassava farmers in non-oil bearing communities in Table 4 further showed that the Total Revenue (TR) of cassava farmers was ₦147,185.30 and Gross Margin (GM) of ₦99,216.20. The Net Return (NR) for cassava farmers in non-oil bearing communities was ₦95,923.60 and a Profitability Index (PI) of 0.65 which indicates that about 65% of the Total Revenue (TR) from the cassava production in non-oil bearing area constitutes the net income. The Rate of Return on Investment (RRI) of about 187.13% signifies that an average cassava farmer in non-oil bearing communities earns about 187% profit on every naira invested in their cassava farming enterprise. The Operating Expense Ratio (OR) of 0.33 indicates that the variable cost constitute about 33% of profit of the cassava farmers. The Benefit Cost Ratio (BCR) value of 2.87 indicated that ₦2.87 kobo is earned on every ₦1.00 invested by the cassava farmers in the

non oil-bearing communities in the state.

Test of Significant Difference in Profitability of Cassava Production in Oil and Non Oil producing Communities

The result of z-test statistics in Table 4 showed that the p-value (sig.) of 0.022 is less than 0.05 level of significance. This implies that there is significant ($p<0.05$) difference in the mean profitability index of cassava farmers in oil producing (0.47) and non oil producing (0.65) communities in Abia State. The mean profitability index of cassava farmers in non oil-bearing communities was significantly greater than that of cassava farmers in oil producing communities probably due to negative effects of oil contamination on soil fertility and consequently reduced crop yield among other factors. Benson and Odinwa (2010) found that cassava planted in polluted soil recorded low yield while land degradation also reduces productivity thereby contributing to the low efficiency of the farmers. Also in agreement with the findings of this study, Ojimba (2012) carried out a study and found that grain yield on oil polluted soil was significantly reduced by as much as about 58.3% after harvesting.

Socioeconomic Factors Influencing the Profitability of Cassava Farmers

Table 5 presents the results of the regression analysis on socioeconomic factors influencing the profitability of cassava farmers in Abia State. Four functional forms (linear, semi-log, double-log and exponential) were tried, the exponential functional form had the best fit, based on the values of R^2 (0.975), number and levels of significance of explanatory variables and their signs. The R^2 value of 0.98 indicated that the significant variables are responsible for about 98% variation in the profitability of cassava production. The F-value of (149.57) at a Prob>F value of 0.0000 indicate that the overall equation was highly significant at 1 percent. Out of the nine explanatory variables specified in the model, seven were statistically significant which included: farm size, years of education, household size, gender, extension contacts, cooperative and oil producing status (oil producing or non oil producing). The coefficient of farm size was positive and significantly influenced profitability of cassava farmers at 1%. This implies that an increase in farm size will lead to increase in profitability of the cassava farmers. Daud, Amao, Ganiyu and Adeniyi (2015) in a study also established significant and positive relationship between farm size and farmer's revenue. The coefficient of years of education of the farmers was significant (5%) but negatively related to profitability. This indicates inverse relationship between education and profitability, implying that as years of education increases, profitability of the farmers decreases. This is not expected, but the threats of environmental challenges could force the educated ones to migrate to cities in search for greener pastures, thereby leaving cassava production in the hands of uneducated farmers with less prospect in the area. Household size negatively and significantly influenced profitability of cassava farmers at 1%, indicating that as household size increase, the profitability of cassava farmers decrease. The negative relationship could be as a result of pressure by household members on cassava output for food which therefore reduce the proportion that is sold in the market. The coefficient of gender of the cassava farmers was highly significant at 1% and positively influenced the profitability of cassava production. The result indicates that being a male gender increases the profitability of the cassava production. The findings of the study agreed with that of Xaba and Masuku (2013) found that gender is one of the factors that significantly affected productivity of crop farmers in Swaziland. Nandi, *et al* (2011) had also found that gender was significant factor influencing cassava production. Extension contact was significant and positively influenced profitability of cassava farmers at 1%. This implies that increase in the number of extension visits increases the profitability of cassava farmers. This is expected as extension contacts exposed farmers to improved technologies in farming which result in overall increased efficiency and output of farmers. Orawan and Surasak (2020) in a study found that the determinants of technical efficiency of cassava farmers were household labour, farm size, and extension service. The coefficient of membership of cooperative society was significant at 1% and positively related to profitability of cassava farmers in Abia State. This indicates that increase in membership of cooperative societies increase the profitability of cassava production. This conforms with *a priori* expectation as cooperative members enjoy some benefits in terms of better access to information, fund, inputs and other resources that enhance their productivity than farmers who are not members. Oil producing status was significant at 1% but negatively related to profitability of cassava farmers. This implies that increase in cassava cultivation in oil producing communities decrease the profitability of cassava production. Various environmental challenges faced by farmers in oil producing communities in Nigeria result in their low farm output and profitability. Obire and Nwaubeta (2002) observed that soil contaminations have great effects on agricultural productivity as they cause decrease in plant growth, yield and farmers income thereby worsening food insecurity and poverty. Benson and Odinwa (2010) found that cassava planted in polluted soil recorded low yield while land degradation also reduces productivity thereby contributing to low efficiency of farmers.

Conclusion

This study examined oil spillage and welfare status of cassava farmers in oil producing communities of Abia State, Nigeria. From the data collected and analyzed, the study identified 15 effects of oil spillage in oil producing communities on agricultural production some of which include: pollution of water bodies, poor soil condition/reduce soil fertility, lost of natural vegetation and poor yield of crop. Environmental factors that significantly influenced the welfare status of farmers included: soil remediation cost ($p<0.01$), farm size ($p<0.01$), oil producing status ($p<0.05$) and soil

condition ($p<0.01$). The gross margin of the farmers in oil producing communities was ₦51,540.40 with profitability index of 0.47, while for those in non-oil producing communities, gross margin and profitability index were ₦99,216.20 and 0.65 respectively. The difference in profitability between cassava farmers in oil producing and non-oil producing communities was statistically significant ($p<0.01$). Farm size, years of education, household size, gender, extension contacts, membership of cooperatives and oil producing status significantly influenced the profitability of cassava farmers. Based on the findings, the study recommends increaed provision of intervention funds to farmers, and the remediation of degraded soils to boost soil fertility for improved farm productivity, farmers' income and welfare.

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Table 1: Frequency and percentage distribution of effects of oil spillage on agricultural production in oil producing communities of Abia State (n = 60)

S/No	Effects of oil spillage	Frequency	Percentage (%)
1	Oil spilage on farm land reducing environemtal quality	51*	85.0
2	Pollution of water bodies	60*	100.0
3	Threat to aquatic lives	57*	95.0
4	Poor soil condition/reduce soil fertility	55*	91.7
5	Stunted plant/crop growth	60*	100.0
6	Increased cases of pest and diseases	34*	56.7
7	Lost of natural vegetation	30*	50.0
8	Endangering of plant and animal species	42*	70.0
9	Poor yield of crop	60*	100.0
10	Low farm income of farmers in affected areas	60*	100.0
11	Farmers' lost of farmland to oil exploitation	31*	51.6
12	Increased erosion and flooding	27*	45.0
13	Poor quality of farm produce	44*	73.0
14	Increased food shortage	38*	63.3
15	Negative effect on humman health	43*	71.7

Multiple responses

Source: Field Survey Data, 2019

Table 2: Multiple regression estimates of environmental factors influencing welfare status of the cassava farmers

Variable	+Linear	Semi-Log	Double-Log	Exponential
(Constant)	0.0302738	-2.038542	-7.311918	0.9062623
	(0.0027223)***	(0.0613416)***	(0.3469051)***	(0.0213333)***
Soil Remediation Cost	-1.9432611	-0.9231391	-0.7456187	-1.643207
	(0.2587006)***	(0.08079124)***	(0.0442131)***	(0.1306423)***
Farm Size	0.0365458	0.1362461	0.0861613	0.0575874
	(0.0129461)***	(0.0624204)**	(0.0787351)	(0.0217085)**
Oil Producing Status	-0.0299382	-0.1202544	-0.1214551	-0.0499668
	(0.0129211)**	(0.0623321)*	(0.0468519)**	(0.0216666)**
Extension Visits	0.002523	-0.0076449	0.0034894	0.0067518
	(0.0021184)	(0.0102138)	(0.0068921)	(0.0035521)*
Soil Condition	-0.0436252	-0.0595024	0.0374629	-0.0400767
	(0.0159101)***	(0.0767115)	(0.0561854)	(0.0266786)
R^2	0.9714	0.8817	0.9379	0.9540
Adjusted R^2	0.9701	0.8766	0.9352	0.9529
F - Value	247.25	169.99	144.55	185.00
Prob>F	0.0000	0.0000	0.0000	0.0000
Observation	120	120	120	120

Note: ***Figures in parentheses are standard errors.***
****** denotes 1%; ** denote 5% while * denotes 10%***
{+} is the lead equation based on fitness.
Source: Field Survey, 2019

Table 3: Costs and Return (Profitability) of Cassava Farmers in Oil and Non-oil bearing Communities of Abia State (n = 120)

Items	Oil Producing Communities		Non Oil producing Communities	
	Amount (₦)	Perc. of TC	Amount (₦)	Perc. of TC
Variable Cost (VC)				
Cost of planting materials (cuttings)	1,280.00	2.37	1,224.00	2.39
Labour	16,900.00	31.30	16,328.50	31.85
Cost of fertilizers/manure	7,280.00	13.48	5,435.00	10.60
Cost of chemicals	4,453.00	8.25	4,120.30	8.04
Cost of transportation	10,337.00	19.14	10,297.90	20.09
Cost of marketing charges	560.00	1.04	563.40	1.10
Miscellaneous cost	10,000.00	18.52	10,000.00	19.51
Total Variable Cost (TVC)	**50,810.00**	**94.10**	**47,969.10**	**93.58**
Fixed Cost (FC)				
Depreciation on land	1,250.00	2.32	1,345.20	2.62
Depreciation on farm tools	1,934.70	3.58	1,947.40	3.80
Total Fixed Cost (TFC)	**3,184.70**	**5.90**	**3,292.60**	**6.42**
Total Cost (TC)	**53,994.70**		**51,261.70**	
Total Revenue (TR)	102,350.40		147,185.30	
Gross Margin (GM)	51,540.40		99,216.20	
Net Return (NR)	48,355.70		95,923.60	
Profitability Index (PI)	0.47		0.65	
Rate of Return on Investment (RRI)	89.55%		187.13%	
Operating Expenses Ratio (OER)	0.49		0.33	
Benefit Cost Ratio	1.89		2.87	

Source: Field Survey Data, 2019

Table 4: Result of z-test Statistics of Mean Comparison of Profitability Index of Cassava Production in Oil-bearing and Non Oil-bearing Communities (n = 120)

Variable	N	Mean PI (X)	Var	DF	Std. Error	t-cal	p-value (sig)	Decision
Oil Producing	60	0.47	0.026	118	0.030	2.354	0.022	S* ($H0_1$ Rejected)
Non-Oil Producing	60	0.65	0.017					

Note: S* **= Significant**
Source: **Field Survey, 2019**

Table 5: Multiple Regression Estimates of Socioeconomic Factors Influencing Profitability of the Cassava Farmers

Variables	Linear	Semi-Log	Double-Log	+Exponential
(Constant)	0.2450621	-1.480904	-2.105819	1.352400
	(0.0534431)***	(0.2464577)***	(0.4972477)***	(0.065300)***
Farm Size	0.0457119	0.1118332	0.6478084	0.0025178
	(0.0165333)**	(0.0762448)	(0.0907943)***	(0.0008625)***
Age	-0.0003118	0.0042684	0.214794	1.39e-35
	(0.0006818)	(0.003144)	(0.1194678)*	(1.89e-35)
Education	-0.0054072	-0.0257922	-0.2623246	-0.0449676
	(0.0022453)**	(0.0103546)**	(0.0409836)***	(0.0165305)**
Farming Experience	0.0006028	0.0016937	0.1356466	0.0004364
	(0.000579)	(0.0026702)	(0.0483744)**	(0.0010125)
Household Size	-0.012406	-0.0416263	-0.2643981	-0.0189188
	(0.0035554)***	(0.0163959)**	(0.0775976)***	(0.0064852)***
Gender	0.065918	0.1754352	0.1272847	0.1009423
	(0.0226786)***	(0.1045843)*	(0.0863305)	(0.0337732)***
Extension contacts	0.063558	0.1282217	0.0955539	0.12483730
	(0.0034386)***	(0.0158573)***	(0.0124338)***	(0.0048220)***
Cooperative	0.1077752	0.2372655	0.305246	0.1957198
	(0.0154506)***	(0.0712518)***	(0.0569516)***	(0.0242168)***
Oil bearing status	-0.0884883	-0.3967741	-0.2693763	-0.2016442
	(0.0259264)***	(0.119562)***	(0.0947939)***	(0.0377946)***
R^2	0.9711	0.8888	0.9250	0.9752
Adjusted R^2	0.9687	0.8797	0.9189	0.9732
F - Value	141.54	97.72	130.85	149.57
Prob>F	0.0000	0.0000	0.0000	0.0000
Observation	120	120	120	120

Note: ***Figures in parentheses are standard errors.***
****** denotes 1%; ** denote 5% while * denotes 10%***
{+} is the lead equation based on fitness.
Source: Field Survey, 2019