

**CASSAVA BASED CROP MIXTURES IN CRUDE OIL SPILLED AREAS IN
OGBA/EGBEMA/NDONI LOCAL GOVERNMENT AREA OF RIVERS STATE, NIGERIA: A
PROFITABILITY ANALYSIS**

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Abstract

This study was carried out in Ogba/Egbema/Ndoni Local Government Area of Rivers State, Nigeria. The broad objective of the study was to ascertain the profitability of cassava based crop mixtures in crude oil spilled areas. Multi-stage sampling technique was used in selecting a sample of 48 farmers involved in cassava/maize/melon crop mixture from the area. Data were analyzed using descriptive statistics, net returns, gross margin and multiple regression technique. The results of the analysis showed that majority of the farmers (62.5%) in the area were females practicing cassava/maize/melon mixtures. Cassava based crop mixture farmers in the area had a gross margin of ₦134,100 and a net return of ₦101,590. This shows low profitability of cassava based production in the area. Size of farm lands and educational qualification were significant at 1% level. Majority of the farmers (79.2%) had problem of food storage facilities, followed by high cost of labour and transportation which accounted for (73%) of the farmers. From the study, it is recommended that farmers should form advocacy groups to aggressively address the local government authorities to intervene on the issues of crude oil pollution in the area as to increase food output.

Keywords: Profitability; Cassava; Crop Mixture, Crude Oil Spilled; Net Returns, Gross Margin

Introduction

Food production is a very primal aspect of agriculture as it is vital for life sustenance as well as bedrock for economic development especially in the provision of essential raw materials for agro-allied industries (Mohammed *et al.* 2010). Cassava (*Manihot esculenta*) is a very important food crop in many African Countries especially Nigeria where it has been transformed from minor to major crop as well as a contributor to agricultural development (Ahmadu and Egbodion, 2013). Cassava is one of the most important crops in Nigeria as well as in Africa as it serves as a major source of carbohydrate and a food crop. It is widely consumed in the forms of *garri* and *fufu*; its leaves are used as vegetable in most regions. Nigeria is the largest producer of Cassava in the world, accounting for 19% of the world production and 35% of total African production with a yearly production of about 52 million metric tonnes (Sanni *et al.* 2009). Cassava as a food crop is better suited to the farming system of most households in Nigeria especially those in the Niger Delta region as it ensures all year round food availability and livelihood sustenance. Cassava based

crop mixture (CBCM) refers to an intercrop of cassava-maize-melon on the same piece of land with cassava as the major crop. About 70% of cassava, 73% of maize and 55% of melon grown in Nigeria are produced under intercropping system (Chidiebere-Mark *et al.* 2014).

Crops in the mixture are mostly annual crop which attain maturity within one production cycle or season. Crop mixture is a viable strategy used in spreading the risk of crop failure and labour demands for critical operations of sowing, weeding and harvesting (Fakayode *et al.* 2008). In order to achieve increased productivity and maximize profit, resources must be made available and in the appropriate quantity under favorable ecological conditions but it is obvious that the favorable agro-ecological conditions are being constantly altered by man's industrial activities of which crude oil exploration is a major part (Obasiet *et al.* 2015). The Crude oil exploration and exploitation industry which is currently domicile in the Niger Delta region is without doubt the most important earner of foreign exchange for Nigeria as its activities has been on the increase since 1950s when crude oil was discovered in commercial quantity in the country and, it however replaced agriculture as the major contributor to the national gross domestic Product (GDP) (Elum *et al.* 2016). Crude oil spillage resulting from crude oil exploration is the major cause of losses in several agricultural production activities as it causes environmental degradation and leads to infertility of land meant for agricultural practice. The study focused on the profitability of cassava based crop mixture in crude oil spilled areas in Ogba/Egbema/Ndoni Local Government Area of Rivers State, Nigeria.

Materials and Method

The study was conducted in Ogba/Egbema/Ndoni Local Government Area of Rivers State. It occupies a land area of 969 km² and is located within latitude 5° 23' 26" North and longitude 6° 33' 42" East. According to the National Population Census of Nigeria (NPC, 2006), the Local Government Area has a population of 283,294 persons. It is bounded in the North by Delta State, in the South by Ahoada, in the East by Ohaji Egbema, Imo State and in the West by Sagbama in Bayelsa state. Indigenes of Ogba/Egbema/Ndoni Local Government Area are involved in the practice of agriculture. Apart from agriculture, trading and oil exploration activities are also carried out in the area. The Local Government Area consists of 183 communities. Amongst them

are Omoku, Obrikorm, Ndoni, Idu, Okwuzi, Aggah, Mgbede, Akabuka, Obagi, Erema, Ogbidi and many others. Crops grown in the area include, but not restricted to, yam, maize and vegetable and they are intercropped with cassava being the major based crop. The area plays host to several multinational companies involved in crude oil exploration including, Shell Petroleum Development Company, Nigerian Agip Oil Company and TOTAL, Mobil, Elf.

Multi stage sampling technique was used to select farmers. In the first stage 2 clans were selected using purposive sampling based on the predominance of oil crude oil spillage. In the second stage, 2 communities were purposively selected from each clan, also due to the predominance of crude oil spillage. In the third stage, 19 farmers involved in cassava-based crop mixture in crude oil spilled areas were selected giving a total of 76 farmers out of which 48 farmers were found useful for data analysis. Data were analyzed using descriptive statistics, net returns/gross margin models and multiple regression techniques. The Net Returns/Gross Margin Models are expressed as follows;

$$NR = TR - TC \text{ ---- (1)}$$

Where:

NR = Net returns (in Naira)

TR = Total Revenue (in Naira)

TC = Total Cost (TVC +TFC)

TVC = Total variable cost (in Naira)

TFC= Total fixed cost;(derived by depreciating the fixed assets) (in Naira)

$$GM = (TR - TVC) = (PQ - PQ) \text{ ---- (2)}$$

Where,

GM = Gross Margin (in Naira)

P = Unit price of output(in Naira)

Q = Quantity of output (Kg)

P = Unit price of each input(in Naira)

Q = Quantity of each input (Kg)

In this study, 3 functional forms were fitted into the Ordinary Least Square Multiple Regression Model expressed as follows;

$$Y = F(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8 + e) \text{ ----(3)}$$

Linear function

$$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + e \text{ ----(4)}$$

Semi-log

$$Y = b_0 + b_1 \log X_1 + b_2 \log X_2 + b_3 \log X_3 + b_4 \log X_4 + b_5 \log X_5 + b_6 \log X_6 + b_7 \log X_7 + b_8 \log X_8 + e \text{ ----(5)}$$

Double- log

$$\log Y = b_0 + b_1 \log X_1 + b_2 \log X_2 + b_3 \log X_3 + b_4 \log X_4 + b_5 \log X_5 + b_6 \log X_6 + b_7 \log X_7 + b_8 \log X_8 + e \text{ ---- (6)}$$

Where;

Y = Profitability (naira)

X₁= Age (years)

X₂= Gender (M=1; F=0)

X₃= Household size (number)

X₄= Farm size (hectare)

X₅= Farming experience (years)

X₆= Marital status (Married=1; Single=0)

X₇= Level of education (years)

X₈= Labours (man-days)

e = Error term

A priori expectation =X_{2i},X_{3i},X_{4i},X_{5i},X_{6i},X_{7i}, X_{8i}>0; X_{1i}<0

Results and Discussion

Socio-Economic Characteristics of Cassava Based Crop Mixture Farmers

Table 1: Socio-Economic Characteristics of Cassava Based Crop Mixture Farmers

Variable	Frequency	Percentage	Mean
Age			49
<30	4	8.3	
31-40	14	29.2	
41-50	11	22.9	
51-60	18	37.5	
60>	1	2.1	
Gender			
Male	18	37.5	
Female	30	62.5	
Farming Experience			8
<1 year	5	10.4	
1-5	14	29.2	
6-10	14	29.2	
11-15	5	10.4	
16-20	6	12.5	
21>	4	8.3	
Marital Status			
Single	4	8.3	
Married	26	54.2	
Divorced	5	10.4	
Widowed	13	27.1	

Educational Qualification			6
0 (No formal education)	8	18.7	
1-6	21	43.8	
7-12	15	31.2	
13>	4	8.3	
Total	48	100	

Source: Field survey, 2017

The results of the socio-economic characteristics of cassava based crop mixture farmers in crude oil spilled areas are shown in Table 1 below. Majority (37.5%) of the farmers were between the age limit of 51-60 years and the least (2.1%) of the farmers were 60 and above. The mean age of 49 years indicates that cassava-based crop mixture is dominated by young people who are strong and energetic. Young farmers are more productive and this positively affects their level of adoption of innovation. Majority (62.5%) of the farmers were females and the least (37.5%), were males. This indicates that women are more engaged in cassava based crop mixture farming than their male counterparts. This affirms the results of Ahmadu and Egbodion (2013) which reported that in boosting cassava production in particular and agricultural production in general, women must be given central focus in the policy thrust of the government. Again, majority (29.2%) of the farmers had 1-5 years and 6-10 years farming experiences respectively and the least (8.3%) of the farmers had over 20 years farming experience. The mean of farming experience is 8 years.

This indicates that the farmers had acquired experience in cassava-based crop mixtures as well as practicing alternative measures to cushion the effect of oil spills on farm lands. 26 farmers representing 54.2% of the respondents were married, while 4 farmers representing 8.3% of the respondents were single. This affirms the result of Fawole and Oladele (2007), that marriage provides additional farm labour for the farmers. Majority (43.8%) of the farmers had primary education and the least (8.3%) of the farmers had tertiary education. The mean educational qualification is 6 years which implies that farmers in the area had primary education which could make them favourably disposed to accessing information that would increase their productivity. Education enhances the adoption of innovations that would lead to increase in the profitability of cassava-based crop mixture.

Costs and Returns of Cassava Based Crop Mixture Farmers in the Area

Table 2: Costs and Returns Per Hectare of Cassava Based Crop Mixture Farmers

Items		Quantity	Unit price	Value
Revenue				
Cassava tubers	Kg	55	2900	159000
Maize	Kg	20	3100	62000
Stem	Bundles	21	500	10500
Melon	Kg	13	2500	32500
Total				264,000
Variable Costs				
Cassava cuttings	Kg	25 bundles	500	12500
Maize seeds	Kg	16 kg	2500	40000
Melon seed	Kg	10 kg	2000	20000
Poultry droppings	Kg	10 (bags)	400	4000
Fertilizer Application		5bags	6000	30000
Clearing	MD	10 (m/d)	2000	20000
Ploughing	MD	12 (m/d)	1200	14400
Planting	MD	10 (m/d)	1600	16000
Droppings Application	MD	6 (m/d)	1500	9000
Weeding	MD	26 (m/d)	1000	26000
Total				159,900
Fixed Cost				
Rent on land/annum				30000
Depreciation on farm tools/annum				2510
Total				32,510
Total Cost				192,410
Net Return (TR-TC)				71,590
Gross Margin (TR-TVC)				104,100
Returns per naira invested				1.37

Source: Field survey, 2017

The costs and returns of cassava based crop mixture production of farmers in the area are shown in Tables 2, below. The Table showed the various mixtures of crops cultivated in the area which range from cassava to melon with a total revenue of ₦264, 000. This implies that farmers in the area made a fair amount of money from their crop mixture production. The total variable cost (TVC) generated in the area was ₦129, 900. This indicates the cost a farmer incurred in the production of his farm outputs. The total fixed cost (TFC) accounted for ₦32, 510 which involved cost incurred on rents and depreciation of fixed

assets of the farmers(Obasiet *al.* 2015). Again, a total of ₦101, 590 was generated as net returns (NR) with a gross margin (GM) of ₦134, 100. This implies that farm production in the area recorded a low profitability probably due to oil spillage on cultivable farm lands in the area. Oil spilled lands reduces farm size, farm productivity, yields and income of the farmers in general (Elum et al., 2016).

Factors Affecting Cassava Based Crop Mixture Yield of Farmers in the Area

Table 3: Factors Affecting Cassava Based Crop Mixture Yield of Farmers

Variables	*Linear	Semi-log	Double-log
Constant	1832.85 (0.02)	1855.30 (-1.01)	10.9864 (18.69)***
Age	-7864.92 (-2.55)**	-26638.3 (-0.65)	-0.0419 (-0.318)
Gender	5901.832 (0.729)	-12600.9 (-0.57)	0.201745 (1.64)
Household size	1477.267 (0.50)	48841.2 (1.51)	0.03981 (0.22)
Size of farm	-72880.8 (-14.93)***	-175869.4 (-9.44)***	-0.81833 (-7.90)***
Farming experience	2029.528 (3.75)***	195456 (-2.93)***	0.702805 (1.89)**
Marital status	-4680.46 (-0.88)	-34975.8 (-1.48)	-0.09763 (-0.74)
Educational qualification	10402.61 (3.23)***	312876.9 (0.35)	0.142812 (0.35)
Labour	160.0285 (0.16)	6905.081 (0.59)	0.011527 (0.17)
R square	0.96706	0.90178	0.89876
Adjusted R square	0.91001	0.88163	0.85045
F-statistics	145.1926	36.3427	44.7584

Source: Field survey, 2017. **and *** indicates significance at 5% and 1% respectively. Parenthesis indicates (t-ratios)

The factors affecting cassava based crop mixture yield of farmers in the study area is presented in the Table 3, below. From the Table, the linear model provided the lead equation based on highest R², F-statistics and significant number of variables investigated. R² which is 0.96 shows that 96% of the changes in cassava based crop mixture output is accounted for by the variables investigated, ceteris paribus. The F-statistics of 1459.26% confirms the fitness of the model. The coefficient of age had a negative relationship with the profitability of the farmers and was significant at 5% level. This implies that as farmers advance in age, the ability to practice crop mixtures deminishes(Henri-Ukoha and Osuji, 2017). Size of farm was negative and significant at 1% which implies that the larger the farm size, the less the profitability of cassava-based crop mixtures. This could be through as a result of crude oil spillage on farm lands. Oil spillage reduces farm

size, as well as renders it infertile thereby promoting low income. The coefficient of farming experience had a positive relationship with the profitability of the farmers and was equally significant at 1% level. This implies that increase in farming experience of the farmers increases the profitability of cassava-based crop mixtures. Farming experience enhances farmers understanding in mitigating the effects of oil spillage. Educational qualification was also positive and significant at 1% which implies that the higher the educational qualification of the farmers, the greater the profitability of cassava-based crop mixtures. Education exposes farmers to information that will enhance their productivity and income as well as overcome certain phenomenal challenges (Osuji, 2017).

Problems Encountered by the Cassava Based Crop Mixture Farmers in the Area

Problems Encountered by the Cassava Based Crop Mixture Farmers

Problems	*Frequency	Percentage
Pests and Diseases	29	60.4
Scarcity of materials	34	70.8
Storage facilities	38	79.2
Scarcity of labour	27	56.3
High cost of labour	35	73
Transportation	35	73
Lack of input	27	56.3
Inadequate land	32	66.7

Source: Field study, 2017 * Multiple Responses recorded

The problems encountered by the cassava based crop mixture farmers in the area are shown in Table 4; below. The Table revealed that majority of the farmers, (79.2%) had problem of food storage, followed by high cost of labour and transportation which accounted for (73%) of the farmers. Others indicated scarcity of materials (70.8%), inadequate land (66.7%), pests and diseases (60.4%), scarcity of labour (56.3%) and lack of input (56.3%) respectively. This implies that these problems affected the cassava based crop mixture farmers operating in the area (Nwaru, 2004).

Conclusion and Recommendations

The study found that oil spillage on farm lands affected the farmers' production in the area. Majority of the farmers in the study area were females as the male population is mostly involved in commercial and crude oil exploration activities. A total of ₦101,590 was generated as net returns (NR) with a gross margin (GM) of ₦134,100. This implies that farm production in the area recorded a low profitability probably due to oil spillage on cultivable farm lands in the area. Oil spilled lands reduces farm size, farm productivity, yields and income of the farmers in general. It was further observed from the result that there was significant effect of crude oil spill on cassava based crop mixture production in the study area. Both young and ageing farmers seem to focus more on oil exploration than involving in farming activities. The Table revealed that majority of the farmers, (79.2%) had problem of food storage, followed by high cost of labour and transportation which accounted for (73%) of the farmers. Based on the findings of the study, the following recommendations were made;

1. Farmers should form advocacy groups to aggressively involve the local government authorities to intervene on the issues of crude oil pollution and the effect it has on crop production
2. Farmers should form cooperative groups to make provision for loan with low interest rate to farmers in order to purchase more inputs like fertilizer, storage facilities like silos among others that will increase output and net income

3. Government should as a matter of urgency come up with stringent policy measures to address this menace

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