

Research paper

**EFFECT OF OIL SPILLAGE ON THE PRODUCTIVITY OF CASSAVA IN NIGER
DELTA REGION OF NIGERIA**

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ABSTRACT

The study examined the effect of oil spillage on the productivity of cassava in the Niger Delta region of Nigeria. Specifically, it, among others, examined the effect of oil spillage on the cassava farm land, yield and land productivity, and the determinants of land productivity in cassava production in the study area. A random sampling technique was employed to select 51 cassava farmers each from oil spillage and non-oil spillage communities, giving a total sample size of 102 respondents for the study. Data analysis was done using descriptive statistics, measurement (Likert) scale, t-statistic and regression analysis. The results showed that oil spillage had significant adverse effect on the farmers' farm land and cassava crop. The cassava farm size, yield and land productivity in oil spillage affected communities were significantly ($p < 0.01$) lower than those of the non-oil spillage communities by 0.61 ha, 6119 metric tonnes (MT) and 1447 MT/ha respectively. These represent significant reduction of 36, 48 and 20% of these variables in the oil spillage affected communities respectively. About 45% of the variation in land productivity in cassava production was influenced by oil spillage and the farmers' farming experience. The productivity increased with increase in farming experience but decreased with increase in oil spills. If constant incidence of oil spillage in the oil producing region of the country is



not adequately addressed, effort geared towards increasing cassava production in particular and agricultural production in general in the country will yield no significant result.

INTRODUCTION

Crude oil exploration in Nigeria has been on the increase since 1956 when crude oil was discovered in commercial quantity in the country. The earnings from the petroleum industry in the country grew from 1960 and skyrocketed in the early 1970s during the oil boom, thus, replacing earnings from agriculture which was the main stay of the nation's economy. Since the early 1970s, the place of crude oil as a key revenue earner for Nigeria has remained unchanged. The oil sector generates over 90% of the nation's foreign exchange earnings (1). The high earnings from the oil sector diverted the attention of Nigerians and their government away from agriculture which is the source of livelihood of the populace to oil. Besides the suppression of the agricultural sector by the petroleum industry, the oil exploration activities which cause constant incidence of oil spills, especially in the Niger Delta region of the country have worsen agricultural production including a major staple food crop such as cassava in the region.

The bulk of the nation's oil production comes from the Niger Delta region. The Niger Delta region is an area consisting of vast plain of alluvial sedimentary deposits exposed to flooding crisscrossed by a lot of rivers and creeks where banks are made of levees, bordered by areas mainly consisting of black swamps of equatorial forest and numerous lake-like water-logged depressions where heavy rainfall and surface flow can hardly be drained by gravity (2).

The location of the Niger Delta region in the rainforest and mangrove forest vegetative zones of Nigeria makes possible all-year-round agricultural production activities. The inhabitants of the region are engaged in fishing due to the presence of creeks and rivers, and in crop production, especially arable crops. Findings by FOS (3) showed that

53 50% of the active labour force in Delta State, which is the leading oil producing state of the
 54 Niger Delta, are engaged in one form of agricultural activity or another, with cassava, yam,
 55 plantain, maize, cocoyam and vegetable as the predominant food crops in the area. With
 56 high level of involvement in agriculture in the Niger Delta region and the increasing
 57 revenue from crude oil exploitation, one would expect high level of food security and very
 58 low (if not zero) poverty level in the region but the reverse is the case. Agriculture is a
 59 shadow of itself in the communities in which this black gold (oil) flows and the inhabitants
 60 of the communities continue to wallow in conditions of social deprivation and abject
 61 poverty. According to National Bureau of statistics (4), the incidence of poverty in the
 62 Niger Delta is alarming, increasing from 15.4% in 1980 to 52.2% in 2004. This is not
 63 unconnected with the constant incidence of oil spills which has destroyed the main source
 64 of income and productive activities of the region. Over 6,000 oil spills had been recorded in
 65 the 40 years of oil exploitation in Nigeria giving an average of 150 spills per annum. A total
 66 of 4,647 incidents of oil spills occurred between 1976 and 1996 resulting in the spillage of
 67 about 2,369,470 barrels of crude oil and only about 549,060 barrels were recovered,
 68 1,820,410 barrels were lost to the ecosystem (1). Between 2006 and 2012 alone a total of
 69 127,467.96 barrels of oil were spilled (5). This is alarming.

70 The consequences of oil spillage on agricultural production, the environment and
 71 humans are enormous. Nnabuenyi (6) observed the negative effects of oil spillage on
 72 agriculture and lamented that most of the farmlands are destroyed and rivers polluted
 73 leading to the death of fishes; and most farmers and fishermen are thrown into confusion
 74 and joblessness. Chindah and Braide (7) added that oil spills cause great damage to the oil
 75 communities due to the high retention time of oil in the soil occasioned by limited flow, and
 76 this prevents proper soil aeration and affects soil temperature, structure, nutrient status and
 77 pH, and ultimately, Crops are destroyed. To be specific, one may ask, what is the effect of

oil spillage on the productivity of an important crop such as cassava in the oil producing region of Nigeria such as the Niger Delta region?

Cassava has played and will continue to play a remarkable role in the agricultural development of Nigeria. It has been transformed from a minor crop to a major crop and recently to an export or cash crop. Though Nigeria is the highest producer of cassava in the world, she is also the world's largest consumer, leaving nearly nothing for export. This calls for concerted effort to increase the production of the commodity in the country, including combating the problem of oil spillage on its production. To make significant progress in tackling the problem of oil spills on cassava production, information on the effect of oil spillage on the production of the crop is required. It is in view of this that this study was designed to examine the effect of oil spillage on the productivity of cassava in the Niger Delta region of Nigeria. Specifically, the study examined the socio-economic characteristics of cassava farmers in the study area, causes of oil spillage in the region, the effect of oil spillage on the farmland, cassava crop, yield and land productivity, and examined the determinants of land productivity in cassava production in the study area.

2.0 METHODOLOGY

2.1 Study Area

The study was carried out in the Niger Delta region of Nigeria. The Niger Delta region, which spans over 20,000 square kilometers, is located in the Atlantic coast of Southern Nigeria where the River Niger divides into numerous tributaries. The region which cuts across nine (9) states of the Federation (Abia, Akwa-Ibom, Bayelsa, Cross-River, Delta, Edo, Imo, Ondo and Rivers States) lies between latitude 4° 49' 60" North of Equator and longitude 6° East of Greenwich Meridian. It is the third largest delta in the world with a coastline spanning about 4500 kilometers. About 2,370 square kilometers of the Niger Delta consist of rivers, creeks and estuaries, while stagnant swamp covers about

8,600 square kilometers, being the largest mangrove swamp in Africa (8). The region falls within the tropical rain forest zone with high rainfall and thick vegetation cover. The ecosystem of the area is highly diverse and supportive of numerous species of terrestrial and aquatic flora and fauna. Major occupation of the inhabitants of the area is agriculture. Some of the arable crops produced by the farmers include cassava, yam, cocoyam, maize and rice.

2.2 Sampling Procedure

Delta State was purposively chosen from the nine (9) states of the Niger Delta for the study. This is because of the high level of oil exploitation in the state. Three (3) Local Government Areas (LGA), (Isoko North, Isoko South and Udu) with high level of oil production and agricultural activities were purposively selected from the state for the study. Also, a purposive sampling technique was applied to select 2 communities from each LGA making a total of 6 communities. Three (3) of the communities had suffered oil spillages while the other 3 had not suffered from oil spillage. The communities that had suffered from oil spillages include Otor-Udu (Udu LGA), Olomoro and Uzere (both in Isoko South LGA); and those that had not suffered from oil spillage include Egini (Udu LGA), Aradhe and Ellu (both in Isoko North LGA). Thereafter, a random sampling technique was employed to select 17 cassava farmers from each community to give a total sample size of 102 farmers (51 respondents each from oil spillage and non-oil spillage communities respectively).

2.3 Data Collection

Data for the study were collected using a well-structured, pre-tested questionnaire administered to the respondents, and complemented with personal interview. Data were collected on the socio-economic characteristics of the cassava farmers, their production

inputs and output, causes of losses in cassava production, causes of oil spills and the effects of the oil spillage on both the cassava crop and farmland.

2.4 Data Analysis

Data were analyzed using both descriptive statistics measurement scale (Likert scale), t-statistic and regression analysis.

2.4.1 Descriptive Statistics: The descriptive statistics used included the mean, frequency count, percentages and standard deviation.

2.4.2 Likert Scale: This was used to measure the perceived causes of oil spillage, and the effect of oil spillage on farmland and the cassava crop. For the causes of oil spillage, the scale of strongly agree (score 4), agree (score 3), disagree (score 2) and strongly disagree (score 1) were used. A mean score of ≥ 2.5 was considered significant. The scales used for the effects of the oil spillage were extremely serious (5), very serious (4), serious (3), moderately serious (2) and not serious (1). The mean score of ≥ 3 was significant.

2.4.3 t-Statistic: The t-statistic was used to test for significant difference between the farm size, output and land productivity of farmers in the oil spillage and non-oil spillage communities. The t-test is given as:

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\frac{S_1 + S_2}{\sqrt{N_1} \sqrt{N_2}}} \text{----- eqn. (1)}$$

where:

t = t – test

$\bar{X}_1$ and $\bar{X}_2$ = mean of variable under consideration (farm size, cassava yield and land productivity) of farmers in non-oil spillage and oil spillage communities respectively.

S_1 and S_2 = Standard deviation of variables under consideration of farmers in non-oil spillage and oil spillage communities respectively.

153 N_1 and N_2 =Sample size of respondents from non-oil spillage and oil spillage areas
154 respectively.

155 **2.4.4 Regression Analysis:** Multiple Regression analysis was employed to examine the
156 determinants of land productivity in cassava production. The relationship adopted from
157 Doll and Orazem (9) is implicitly expressed as:

$$158 \quad Q_L = f(X_1, X_2, X_3, X_4, X_5, e_i) \text{ ----- eqn. (2)}$$

159 Where:

160 Q_L = Land productivity

161 X_1 = Labour (Man days)

162 X_2 = Planting material (kg)

163 X_3 = Farming experience (years)

164 X_4 = Depreciated fixed cost (₦)

165 X_5 = Oil spillage (Oil spills = 1, No oil spill = 0)

166 e_i = error term

167 Three (3) regression models, including linear, semi-log and Cobb-Douglas were fitted
168 for the analysis. Based on the criteria for the selection of lead equation (size of coefficient
169 of determination, signs and the significance of the independent variables and the standard
170 error of the estimate), the linear function was selected as the equation with the best fit. The
171 linear regression model adopted from is explicitly expressed as:

$$172 \quad Q_L = a_0 + a_1X_1 + a_2X_2 + a_3X_3 + a_4X_4 + a_5X_5 + e_i \text{ ----- (3)}$$

173 where:

174 $a_0, a_1 \text{ ----- } a_n$ are the unknown parameters to be estimated and all other variables are as
175 earlier defined.

176 3.0 RESULTS AND DISCUSSION

177 3.1 Socio-Economic Characteristics of Respondents

178 The socio-economic characteristics of cassava farmers in the oil spillage and non-oil spillage
179 communities of the study area are presented in Table 1. The results showed that females
180 dominated cassava production both in oil spillage and non-oil spillage affected communities.
181 This is contrary to established findings (10, 11) where males were dominant in the cassava
182 production enterprise. It, therefore, means that boosting cassava production in particular and
183 agricultural production in general, women must be given central focus in the policy thrust of
184 the government. The average ages of the farmers under both oil spillage and non-oil spillage
185 communities (48 and 47 years old respectively) indicated low involvement of the youth in the
186 cassava production enterprise. This confirms the known fact that majority of the youths in
187 Nigeria find agricultural production unattractive; migrating rather to the urban centres in
188 search of white collar jobs. The oil spills in the oil spillage communities which degraded the
189 farm land for agricultural production might have worsen the rural-urban migration of the
190 youth from the communities, leaving farming to older people. Evidently, farmers in the oil
191 spillage communities were older than those of the non-oil spillage communities.

192 Majority of the farmers in both communities were married with high family sizes. 
193 There were more married farmers with higher family size in the non-oil spillage communities
194 than in oil spillage communities. Large family size could have positive effect on farm 
195 production if there is significant family labour contribution to the production. It could,
196 however, affect production negatively if the household members are not actively involved in
197 farming.

198 On educational level, 71 and 82% of the farmers in the oil spillage and non-oil
199 spillage communities respectively had at least primary education, indicating that majority of
200 the farmers were literate. Farmers from the non-oil spillage communities were 11% more
201 educated than those from the oil spillage communities, probably because they were younger.
202 Higher literacy level might make them more favourably disposed to accessing information

that might increase their productivity more than their counterparts in the oil spillage communities. Though both categories of farmers had high level of farming experience (24 and 23 years for oil spillage and non-oil spillage communities respectively), those from the oil spillage communities were more experience, probably because they were older. Experience in the farming business might enhance the farmers' ability for efficient management practices that will ensure increased productivity, all things being equal.

Majority (59%) of the farmers in non-oil spillage communities were full-time farmers. The reverse is the case in the oil spillage communities as majority (63%) of the respondents were into farming on a part-time basis. This may not be unconnected with the problem of constant oil spills in the communities which had made the farm land unavailable and unproductive for farming thereby compelling the farmers to be engaged in other occupation, thus, giving farming a secondary priority. If urgent measures are not taken to arrest the problem of oil spillage in the oil producing areas of the country, efforts to revamp agricultural production in Nigeria will be a chase after the shadow.

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231 **Table 1: Socio-Economic Characteristics of Cassava Farmers in the Study Area**

Category	Oil spillage Frequency (51)	Percentage (100)	Non-oil spillage Frequency (51)	Percentage (100)
Gender				
Male	19	37	23	45
Female	32	63	28	55
Age (years)				
< 31	1	2	2	4
31 – 40	15	29	14	27
41- 50	17	33	19	37
51 – 60	13	26	10	20
> 60	5	10	6	12
Mean	48		47	
Marital status				
Single	1	2	3	6
Married	36	70	38	74
Divorced	4	8	2	4
Widow/Widower	10	20	8	16
Household size				
1 – 5	22	43	22	43
6 – 10	26	51	22	43
> 10	3	6	7	14
Mean	6		7	
Educational level				
No formal education	15	29	9	18
Primary school	24	47	22	43
Secondary school	12	24	19	37
Tertiary institution	0	0	1	2
Farming experience				
< 11	3	6	4	8
11 – 20	17	33	17	33
> 20	31	61	30	59
Mean	24		23	
Nature of farming				
Full-time	19	37	30	59
Part-time	32	63	21	41

232 Source: Field survey, 2012

233 3.2 Causes of Losses in Cassava Production

234 Table 2 presents the results of the multiple responses on the causes of losses in
 235 cassava production in the study area. Oil spillage is the major cause of losses in cassava
 236 production in the oil spillage affected communities as admitted by all the respondents. This is

expected as the effects of the oil spillage on both the crop plants and farm land are grave (Table 4). Inoni *et al.* (1) confirmed this result when they lamented the negative effects of oil spillage on agricultural production. Other causes of losses in cassava production of high degree in the oil spillage communities which are also major causes in the non-oil spillage communities in descending order of severity include flooding/climate change, pest/disease incidence, poor transportation and inadequate processing facilities. Flooding as one of the causes of losses in cassava production may not be unconnected with the fact that most of agricultural lands in the Niger Delta region are exposed to flooding from many crisscrossed of rivers and creeks. Besides, 2012 was a year of national flood disaster in Nigeria and agricultural production was the worst hit by the disaster. Losses caused by climate change were expected because climate change is a global phenomenon whose negative effect on agriculture is grievous (12). From experience, pest and disease incidence is one major challenge which cassava farmers always grapple with, thus, confirming this finding. The bulky nature of cassava tubers makes it difficult for easy transportation from the farm to processing centres. Besides, the tubers are susceptible to deterioration if not processed on time. These might be reasons why poor transportation and inadequate storage facilities accounted for losses in the production of the commodity.

Table2: Causes of Losses in Cassava Production

Causes	Oil spillage		Non-oil spillage	
	Frequency (51)	Percentage (100)	Frequency (51)	Percentage (100)
Pest/Disease incidence	20	39	20	39
Flooding/Climate change	22	43	21	41
Oil spillage	51	100	0	0
Poor transportation facilities	20	39	18	35
Inadequate processing facilities	15	29	14	28
Inadequate storage facilities	3	6	3	6
Poor market for product	2	4	2	4

Source: Field survey, 2012

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257 3.3 Causes of Oil Spillage

258 The causes of oil spillage in the study area were many as presented in Table 3. The most
 259 significant cause was corrosion of oil pipelines (mean: 3.73). Corrosion of the oil pipelines
 260 might be due to the poor maintenance of the pipelines by the oil companies and the fact that
 261 the pipelines had outlived their estimated life-span. This corroborates the finding of Ndinwa
 262 *et al.* (13) who reported that corrosion of oil pipelines and tankers accounted for 50% of the
 263 total oil spillage in the oil producing region of Nigeria. The second most significant cause of
 264 oil spillage in the study area was sabotage (mean: 3.60). Sabotage, popularly known as
 265 bunkering, is the damage of oil pipelines by saboteurs with a view to stealing oil from them.
 266 Shell Petroleum Development Company, however, claimed that oil spills caused by corrosion
 267 of pipelines had decreased drastically over the years due to the concerted effort to replace the
 268 pipelines, stating that sabotage had taken over the lead in oil spillage, accounting for over
 269 60% of the oil spills at its facilities in Nigeria (13). Other significant causes of oil spillage
 270 included drilling of oil wells (mean: 3.53) which Ndinwa *et al.* (13) reported accounted for
 271 about 21% of the total oil spills, and vandalization of oil pipelines (mean: 2.72) caused by the
 272 aggrieved members of the oil exploration communities due to the neglect accorded them by
 273 both government and the oil companies. This fact is evidenced by the youth restiveness in the
 274 Niger Delta region over the past decade.

275 **Table 3: Causes of Oil Spillage**

Causes	Mean	Standard deviation
Drilling of oil wells	3.53*	0.60
Explosion of oil wells/terminals/stations	2.30	0.73
Spills from vandalized oil pipelines	2.72*	1.03
Leakages from oil tanks	2.20	0.60
Corrosion of oil pipelines	3.73*	0.44
Spills from loading of oil vessels	2.12	0.50
Maintenance activities of oil companies	2.30	0.80
Sabotage	3.60*	0.73

276 Source: Field survey, 2012

277 *Significant (mean ≥ 2.5)

278 3.4 Respondents' Perception of the Effects of Oil Spillage on Farm Land and Cassava 279 Crop

280 The gravity of the effects of oil spillage on both farm land and the cassava crop was
281 enormous. This was evidenced by the fact that all the parameters under consideration were
282 significant (Table 4). The most significant effect on the farm land was the increased
283 temperature/soil toxicity (mean: 4.73), which might have multiplicati effects on the farm
284 land and the crop such as destruction of soil micro-organisms, burning and wilting of the crop
285 plants, rotting of the cassava tubers and ultimately poor yield or total crop failure. Other
286 effects of the oil spillage on the farm land included destruction of soil micro-organisms and
287 soil structure, poor soil aeration, reduction of soil fertility, degradation of the farm land and
288 low land productivity. The spilled oil might have caused contamination of the top soil thereby
289 reducing the availability of nutrients for the crop plants resulting in low productivity or total
290 yield loss. In confirmation, findings have shown that oil spills have degraded most
291 agricultural lands in the oil producing areas of the country and have turned hitherto
292 productive areas into wastelands. With increasing soil infertility due to the destruction of soil
293 micro-organisms, and dwindling agricultural productivity, farmers have been forced to
294 abandon their land to seek non-existent alternative means of livelihood (1).

295 The effects of the oil spillage on the cassava crop were numerous, ranging from
296 yellowing of the crop leaves, burning of the leaves, stunted growth, wilting of crop, poor 
297 yield to total crop failure which is the most significant effect (mean: 4.80). Other effects
298 included rotting of the cassava tubers and bad taste of the produce. Wilting of the crops might
299 not be unconnected with the accumulation of the oil on the crops' shoots which blocked the
300 stomata thereby inhibiting photosynthesis, transpiration and respiration. The toxic chemical
301 substances from the spilled oil might be responsible for the burning of the crop leaves,

inhibition of growth and ultimately reduction of yield. These results are in agreement with the findings of Dabbs (14).

Table 4: Perceived Effects of Oil Spillage on Farm Land and Cassava Crop

Effect	Mean	Standard deviation
On farm land		
Reduction of soil fertility	4.70*	0.50
Poor soil aeration	4.60*	0.64
Degradation of farm land	4.70*	0.53
Increased temperature/soil toxicity	4.73*	0.44
Destruction of soil micro-organisms	4.53*	0.70
Destruction of soil structure	4.62*	0.60
Low land productivity	4.70*	0.51
On crop		
Yellowing of leaves	4.63*	0.61
Stunted growth	4.75*	0.50
Crop failure	4.80*	0.50
Poor yield	4.78*	0.46
Rotting tubers	4.75*	0.47
Wilting of crop	4.58*	0.56
Crop leaves appear burnt	4.23*	0.20
Bad taste of produce	4.27*	0.62

Source: Field survey, 2012

*Significant (mean $\geq$ 3.0)

3.5 Effect of Oil Spillage on Farm Size, Yield and Land Productivity in Cassava Production

Table 5 shows the comparison between the average farm size of cassava, yield and land productivity of oil spillage and non-oil spillage communities of the study area. The cassava farm size, yield and land productivity in oil spillage affected communities were significantly ($p < 0.01$) lower than those of the non-oil spillage communities by 0.61 ha, 6119 metric tonnes (MT) and 1447 MT/ha respectively. These represent significant reduction of 36, 48 and 20% of these variables in the oil spillage affected communities respectively. These results are expected due to the diverse adverse effects of the oil spillage on both the farm land and the crop (Table 4). The lower farm size of the farmers in the oil spillage areas suggests that farmers in such areas were compelled to have their farm size reduced when part of their

farm land had been damaged by the oil. Where the farm land was not completely destroyed, crop yield and land productivity were drastically affected, thus, making them lower than those from the non-oil spillage communities.

It can be observed from the results that the average farm size and cassava yield of the farmers from the non-oil spillage communities were also low. For example, their cassava yield per hectare was low compared with the average yields of 19.57 and 15.28 MT/ha reported by Ahmadu and Alufohai (11) for mechanized and non-mechanized cassava farmers respectively. The low farm size might be occasioned by pressure on the farm land by farmers from the neighbouring oil spillage communities whose farm lands had been destroyed by the spilled oil, besides other factors such as the problem of land tenure system. Worgu (15) reported that farmers in the communities of oil exploitation had lost their farm lands and are forced to emigrate to other communities in search of livelihood, exerting additional pressure on farm lands in such areas. The low land productivity in the non-oil spillage communities might be due to the indirect effect of the oil spillage such as climate change which is adversely affecting agricultural production and the environment at large, among other factors.

Table 5: Average Farm Size, Crop Yield and Land Productivity of Cassava Production in Oil Spillage and Non-Oil Spillage Communities

Category	Oil spillage (A)		Non-oil spillage (B)		% mean reduction from B to A	t-ratio
	Mean value	Standard deviation	Mean value	Standard deviation		
Average farm size (ha)	1.11	1.14	1.72	0.58	36	2.533*
Average yield (MT)	6,605	888.50	12,724	689.37	48	27.62*
Land Productivity (MT/ha)	5,951	527.63	7,398	91.10	20	16.70*

Source: Field survey, 2012

*Significant at 1%

3.6 Determinants of Cassava Productivity

A regression analysis was carried out to examine the relationship between land productivity in cassava production and the factors affecting it. The factors included labour,

planting materials, farming experience, depreciation of fixed inputs and oil spillage. The results of the analysis as presented in table 6 indicated that the combined effect of these factors significantly ($p < 0.01$) explained about 45% of the variation in the land productivity of cassava production in the study area ($R^2 = 0.4478$). The coefficient of determination (R^2), though significant, was less than 50% of the total variation in the productivity which might be due to the fact that only 2 of the variables under consideration (farming experience and oil spillage) were significant. Farming experience correlated positively with land productivity, indicating that the higher the level of farming experience, the higher the productivity. This is so because experience, it is said, is the 'greatest teacher' and 'practice makes perfect'. The more experienced farmers might be more conversant with the management practices to adopt to increase productivity and also for curbing the effect of oil spillage on their farm land and crop. Oil spillage, on the other hand, correlated negatively with the productivity, implying that land productivity decreased with increased oil spills. This confirms the results in table 4 where low productivity is one of the significant effects of oil spillage on cassava production and in table 5 where land productivity in cassava production from oil spillage communities was significantly lower than that of the non-oil spillage communities. Furthermore, the results of labour and oil spillage in this study are similar to those of Inoni *et al.* (1) while those of planting material, farming experience and capital depreciation are at variance.



Having established the significant adverse effect of oil spillage on cassava production, the questions now are, what adaptation measures did the farmers employ to minimize the adverse effect of oil spillage on their production; and what mitigating measures did government and the oil companies employ to deal with oil spillage? Providing answers to these questions is a subject for further study.

365 **Table 6: Determinants of Cassava Productivity**

Variable	Parameter	Coefficient	t-ratio
Constant	a_0	2496.846	8.255
Labour (X_1)	a_1	- 29.629	- 0.596
Planting material (X_2)	a_2	0.022	0.275
Farming experience (X_3)	a_3	5.854	9.133*
Depreciation of fixed inputs (X_4)	a_4	- 0.005	- 0.255
Oil spillage(X_5)	a_5	- 1146.149	- 4.550*
R-squared	R^2	0.4478	
F-statistic		13.243*	

366 Source: Field survey, 2012

367 *Significant at 1%

368 **4.0 CONCLUSION/RECOMMENDATIONS**

369 The study found that the negative consequences of the oil spillage on both farm lands
370 and cassava crop were enormous. The oil spillage significantly reduced the farmers' farm
371 size, yield and land productivity. About 45% of variation in land productivity in cassava
372 production was significantly explained by the farmers' years of farming experience and oil
373 spillage. In view of the adverse effects of oil spillage on cassava productivity, it is vital to
374 know the adaptation measures the farmers employed to minimize the adverse effects of oil
375 spillage on their production; and the mitigating measures government and the oil companies
376 employed to deal with oil spillage in other to chat a way forward to adequately deal with
377 the situation. This is a subject for further study. Meanwhile, the oil companies should
378 ensure constant maintenance of the oil pipelines and tankers to prevent corrosion and avoid
379 oil spills from them. Effort should be intensified in checking the activities of saboteurs
380 which often destroy oil pipelines to steal oil, thus, resulting in oil spillage. Also, the
381 aggrieved oil producing communities should be accorded adequate attention by both the oil
382 companies and government in terms of developmental strides to prevent them from
383 vandalizing oil pipelines.

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