Poverty and Environmental-Degradation Nexus: An Economic Analysis of the effects of Crude-oil exploration on Livelihood activities in oil-producing Communities of Ondo State, Nigeria

APATA, T.G.[1], ADEOLA A. O. [2] and AFOLAYAN, J.A.[2]

[1]Departtment of Agricultural Economics & Extension, Joseph Ayo Babalola University (JABU) Ikeji, Arakeji, Osun State, Nigeria.
[2]Department of Crop Science, Joseph Ayo Babalola University (JABU) Ikeji, Arakeji, Osun State, Nigeria.

ABSTRACT: This study examined the relationship between crude-oil explorations as a form of environmental degradation and poverty levels. Specifically, effects of crude-oil exploration on the profitability of crop-farming/fishing activities were measured. Multi-stage random sampling procedure was used in the collection of primary data. Data were subjected to budgetary analysis, oil pollution index and Logit regression model. Budgetary analysis revealed that average net income from farming/fishing activities is ₦159,624.00, net loss is N175, 350.00. Households that made income losses from farming/fishing activities were 22.66% more than those who did not lose. Households who were poor in polluted areas (60.20%) depended more on income from farming/fishing livelihood activities. The Logit analysis showed that household size ($t = 2.32$; $p < 0.01$), farming/fishing income ($t = 2.71$; $p < 0.01$), expenses on food ($t = 2.59$; $p < 0.01$), access to credit ($t = 3.42$; $p < 0.01$) and economic loss ($t = 2.76$; $p < 0.05$) in yield are explanation variables identified as the determinations of poverty. This paper revealed that crude-oil exploration activities have had a negative impact on primary livelihood activities of farming/fishing activities of the host communities. This was reflected in the low outputs and low income earned. Income earned from these activities has not helped to meet basic needs and this has perpetuated poverty. Hence, boosting other sources of livelihood activities can go a long way in helping many households increase their incomes, meet basic needs and move out of poverty.

Keywords: Economic loss index; Environmental Degradation Nexus; Logit regression Analysis; Crude-Oil Exploration; Livelihood Activities, Ondo State.

JoST. 2010. 1(1): 9-21.
Accepted for Publication, April 29, 2010

INTRODUCTION

The growth of an economy, in terms of increased output, provision of infrastructures, and/or urbanization, depends on the exploitation of natural resources that often result in its degradation. Rapid depletion and over exploitation of natural resources in recent times have led to environment dilapidation. This is injurious to the livelihood activities of the people that dependent primarily on these natural resources for survival. Livelihood activities, such as crop farming and fishing, are badly affected, giving the farmers in return, low outputs, low incomes and hence, poverty. For this reason, there is a cause-effect relationship between poverty and environmental degradation. Of the World's 5.6 billion people, about 1.4 billion live in absolute

[1] Correspondence to: Apata, A.O.: dayoapata@yahoo.com

poverty, with a further 1.1 billion at subsistence levels (World Stats and Facts 2004). Majority of these poor lived and derive their livelihood activities from, by relying on these resources for sustenance (Pender *et al*; 2002). Ohlsson (2000), Owabukeruyele (2000); Forsyth and Scoone (1998) and Rozelle, *et al*; (1997) revealed that the major cause of prevailing poverty in developing countries is the skewed appropriation of natural resource bases by the minority – the rich and the powerful (20%) while the remaining (80%) rely, in some way or another, on whatever that is left for their source of livelihood. In fact, the higher this reliance is, the higher is the probability of the lower end of 80% being pushed into poverty. This situation is further worsened by a combination of greed, power and wealth that causes environmental degradation in the developing countries (Duraiappah, 1996).

Recently some studies have attempted to establish correlations between poverty in agriculture and environmentally vulnerable and/or degraded areas. It is noted that nearly 80 percent of those involved in agricultural production are the poor in Latin America, 60 percent in Asia and 81 percent in Africa. These areas are characterized by low productivity and high vulnerability to environmental degradation (Bifani 1995; Pender *et al* 2002). Food and Agricultural Organization (FAO) (1984) noted a coincidence of poverty with areas seriously affected by deforestation, erosion, desertification and mineral resource exploitation.

The poor have traditionally taken the brunt of the blame for causing society's many problems including, more recently, environmental degradation (Duraiappah, 1996). There is a general consensus that poverty is a major cause of environmental degradation. For example, in one of the conclusions of the Brundland Commission Report, which incidentally has been accepted as the blue print for environmental conservation, it was explicitly stated that, poverty is a major cause of environmental problems and ameliorating poverty, it is a necessary and central condition of any effective programmes addressing the environment. It is generally accepted that environmental degradation, rapid population growth and stagnant production are closely linked with the fast spread of acute poverty in many countries of Asia (Jalal 1993). The World Bank joined the consensus when in the 1992 World Development Report, the Bank explicitly stated that, 'poor families who have to meet short term needs might result to excessive cutting of trees for firewood and failure to replace the cut trees' (World Bank 1992).

However, there has been a rising trend in the economic literature which disputes the conventional theory and argues that simple generalizations of this multi-dimensional problem are erroneous and that a more complex set of variables are in play (Duraiappah 1996; Leach and Mearns 1995). These studies point to demographic, cultural and institutional factors as important variables in the poverty-environmental degradation nexus. An intricate web of factors plus the existence of feedback loops from environmental degradation of poverty makes the process of identifying causality links, if any, between environmental degradation and poverty a difficult exercise (Duraiappah 1996; Leach and Mearns 1995). However, these studies have been few and isolated and it is interesting to note that until recently, there has been very little in-depth coordinated empirical research in the economics of environmental degradation-poverty causality relationships (Ohlsson 200; Owabukeruyele 2000; Rozelle et al; 1997).

Consequently, this paper examines the relationship between crude-oil pollution as a form of environmental degradation and livelihood activities of the people in the host community of Ondo State. The next section presents the problem statement. The third section discusses the methodology adopted; it also provides empirical evidence of the relationship between poverty and environmental degradation. The fourth section contains results and discussions and concluding remarks as the last section.

Problem Statement

There is increasing global concern about the implication of environmental degradation on the sustainability of livelihood security, especially on the rural farmers/fishermen. Vosti and Reardon (1997) argued that agricultural production could not sustain people's livelihood while at the same time the natural resources that agricultural production depends on is destroyed or polluted. Recently, some studies (Forsyth and

Scoones 1998; Malik 1999; Ohlsson 2000; Pender *et al.*, 2002)) have attempted to establish correlations between poverty and environmental degradation areas.

It is noted that nearly 80 percent of the poor in the Latin America, 80 percent in Africa are living in marginal areas characterized by low productivity and high vulnerability to environmental degradation (Leonard 1989). FAO (1984) hinted that there are strong links between environmental degradation and poverty. The question; is poverty really the main underlying causes of environmental degradation or vice-versa? (Landy 1982). This hypothesis requires quantification in the light of crude-oil pollution in Nigeria and as argued by Bifani (1996), Ibeanu (1999), Owakubuyele (2000) and Pender *et al* (2002).

The quantification of this link between livelihood activities loss and environmental degradation can provide a structural handle for policy makers in making relevant policies. Studies by Etteng (1997) and Ssewanyana (2002) revealed that people are migrating from the crude-oil exploration areas to a better place for sustenance and survival (Stanley, 1990; NDDC 2002). There is therefore, the need to examine empirically the extent of damage and what can be done to alleviate the unhealthy situation in the Crude-oil exploitation areas.

This brings us to the purpose of this paper. Both poverty and environmental degradation have been increasing in many developing countries (Scherr, 1999; Rozelle *et al*., 1997). Hence, there is a pressing need first to evaluate and analyze the poverty-environmental degradation nexus, and second, to prescribe policy options to mitigate these problems. Accordingly, the primary objective of this paper is to analyze the economic loss in yield/income from farming/fishing activities due to oil pollution as a form of environmental degradation. Also, to assess the effects of oil pollution and socio-economic factors on income generated from farming/fishing activities. Finally to identify factors and socio-economic variables that influence poverty status of the households in the study area.

METHODOLOGY

Area of Study

The study was carried out in Ondo State, located in Southern Western Nigeria. The 2006 National population estimated the state population as 3,441,024. The state lies between longitudes 4.00 E and 6.00E and latitudes 5.45 N and 8.15 N. The state covers an area of over 14,595 square kilometers and divided into 18 Local Government areas (Ondo State Demographic Statistics 2000).

Ondo State was chosen as the study area because of the report carried out by Federal Government in conjunction with United Nations Development Projects (UNDP, 1978) on the assessment of poverty in selected six States of the country – Sokoto, Bauchi, Cross-river, Enugu, Kaduna, and Ondo, Ondo State ranked the poorest. Also, from the poverty profile of the Niger-Delta areas conducted by the Niger-Delta Development Commission (NDDC) in 2002, Ondo State ranked the poorest, among the oil producing States in Nigeria[1]. Some of the indicators used were functional industries, presence of post-secondary schools, and level of infrastructures among others. The State recorded the least of all these indicators and ranked the poorest.

Sources of Data and Sampling Techniques

Primary and secondary data were collected for the study. The primary data were obtained through structured questionnaires and were administered on rural households identified. Secondary data were obtained from the Central Bank of Nigeria (CBN), Nigeria Bureau of Statistics (NBS), Oil companies' offices in Ondo and Lagos State, Department of fisheries of Ondo State and Local Governments respectively. Focus Group Discussions FGD that cut across age and sex on the perception of pollution and its effects on their livelihood and environment, also personal observation during pre and post data collection were incorporated in the over-all study.

Based upon the available information of the population size, the sampling procedure employed was Multi-stage random sampling. The first stage was the selection of the petroleum exploration areas and also where

the effects spread to in the State (3 Local Governments, Ilaje, Ese-odo and Irele). The second state was the selection of areas considered as oil pollution affected areas[2]. The third stage was the selection of the rural household s that are into cropping and fishing activities from a list of rural households obtained from ADPs, Local Governments and a local guide[3]. The fourth stage was the random selection of 340 households taken from a compiled list of about 3400 rural households in polluted areas. In the selection of the sample, population at each location was considered (Tables 1). A total of 300 observations were suitable and retained for analysis.

[1] Delta, Bayelsa, Rivers, Cross-river, Ondo, Akwa-Ibom, Imo, Abia and Edo States.

[2] Criteria use as guides to select areas considered as oil pollution affected areas were obtained from the list of oil polluted areas collected from oil companies, oil pollution monitoring agencies like environmental offices of Niger Delta Development Commission OSOPADEC in Akure, Local Government offices in Ilaje-Igbokoda and Ese-odo in Igbekebo and Ministry of Environment and Minerals resources in Akure. Also, used were observations during a pre-survey study on the community perceptions of pollution like Coastal erosion, Oil spills on agricultural land and incursion into Freshwater that led to aquatics resources depletion, loss of livelihood in fishing (as some fishes become extinct that leads to low fish catch), high cost involved to improved soil fertility and high family labour used in production. Based upon these guide above the areas were classified into polluted areas.

[3] There was the use of a local guide as a key informant in each area to verify the list of compiled households used for the study.

Table 1: Distribution of Sample size in the Study area

Town	Local Govt.	Population	Sample size
Ayetoro	Ilaje (1)	18,146	60
Awoye	Ilaje	2,301	45
Molutehim	Ilaje	1,597	45
Arogbo	Ese-odo (2)	10,362	60
Igbekebo	Ese-odo	2,299	45
Iju-Osun	Irele (3)	2,383	45

Ondo State Demographic Variables Statistics (2000)

ANALYTICAL TECHNIQUES

Budgetary Analysis

This method of analysis was used to measure the profitability/loss of farming on land and fishing on water resources in the area of study. This was used to assess the profitability (Economic benefit) or Loss from farming and/or fishing livelihood activities.

The Net revenue (NR) derived from production is explicitly stated as:

$NR_i \sum P_i Q_{ij} - C_i$ where $_i = 1,2,\ldots,n$ ---------- (1)

Where NR_i = Net revenue from household I (from farming/fishing activities) measured in Naira (N)

P_i = The market price of the ith output (N)

Q_i = The annual yield of the ith output (Kg)

C_i = Imputed cost in producting the ith output (N)

j = Pollution control technique adopted such as

(a) Buying of orgnic/inorganic fertilizer to improve soil fertility or use to decrease the effect of oil spills on agricultural land.

(b) By mulching; process by which dry/fresh leaves were used to absorb oil spills on farming area.

(c) Buying of more fishing inputs: such as fishing nets, fishing cages to increase area covered during fishing period.

Oil Exploration Index

Further analysis was required to assess the effect of the introduction crude-oil exploration on livelihood activities in crop farming and fishing and income made in the area. This is done to determine the degree of relationship, whether a negative or positive relationship exists between the introduction of oil exploration and livelihood activities in crop farming and fishing in the affected areas. Therefore, Index of Oil Exploration was computed to assess this relationship, taking a cue from Kennedy (1986); Bruck (2001) and Ssewanyana (2002):

$$IOE = \sum K_i \text{ Log } K_i^{-1} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \ (2)$$

Where $K_i = yi/xi$ and $i = 1, 2, 3, \ldots, n$

Where IOE = Oil Exploitation Index

K_i = proportion of income from fishing/crop farming

yi = income derived from the sales of output i (#)

xi = imputed cost of producing output i (#)

Economic Loss as Crude-oil Pollution Index: Measurement

The method proposed by Zanain et al (1992) for estimating yield loss due to weed infestation was modified to estimate the economic loss in yield/output from farming/fishing due to oil pollution in the area of study.

This is expressed as

$$EcY = \sum_{1-1}^{n} Yij \; Pi \quad \text{------------------------------} \ (3)$$

Where $Yij = \left[\frac{Yi\,(max) - Yij}{Yi(max)}\right] \times 100$

Where EcY = Economic loss in yield

Yij = Quality of output i loss using control j

Pi = Price of output i

Yij% = Percentage yield loss of the i out using control j

Yi (max) = Maximum yield of the i output before oil pollution i.e. Yi (max) = Yij +

∂ = Proportion of output loss due to oil pollution

Yij = yield of the i output obtained using control method j

The Logit Model

The basic principle of discrete choice models in econometric modeling consists in confronting two alternatives. There are mutually exclusive situations for example being considered as poor or not. In this instance the sample is dichotomized into two categories based on the poverty line denoted as Z (the dichotomization criterion). The households which record an income level inferior to the poverty line (Z) are considered poor. Those households which record income level superior to Z present a respectable level of living and are consequently not poor. A dummy variable depicting the household poverty status is thus obtained as poor = 1, otherwise = 0.

Where Z is the poverty line calculated, using Food Energy Intake FEI method. This burrows from the work of Greer and Thorbecke (1986) and Okurat *et al*; (2002). Any households below this are considered as poor.

The FEI poverty line is represented as

$Z = e^{(a+bk)}$ ---------- (4)

Where Z= Food Poverty Line

K = Recommended daily allowance of calories intake[4] (World Bank)

a and b are estimated parameters to be obtained from equation (3) below.

The parameters are obtained from the relationship

$\ln Ei = a + bCi$ ---------- (5)

Ei[5] = total food expenditure per adult equivalent by household i

Ci = total calorie consumption for different household per adult equivalent by household i

[4] 2,350 Kcal is the daily per capita household food energy intake recommended by the World Bank for the study of poverty (see Schubert, 1994)

[5] For Ei computation, see appendix

a and b are parameters to be estimated a = intercept, b = coefficient

Ci is the calorie equivalents of the different types of foods consumed[6] by the different households converted to calories.

Model Specification

The Logit model adopted in this study is for the identification of those variables that best characterized the poverty status of the households.

The basic Logit model is given by

$$Pi(Di = 1) = \frac{1}{1+e^{ii}} \quad \text{..... (6)}$$

Where Ii is a linear combination of the explanatory variable of interest in this study (X_1 to X_{23}). Therefore,

$$Ii = ß_0 + ß_1 X_1 + ß_2 + X_2 +, \ldots, + ß_{23} X_{23} \text{ ..... (7)}$$

However,

$$Pi(Di = 0) = 1 - Pi(Di = 1) \text{ ..... (8)}$$

$$1 - Pi(Di = 1) = \frac{e^{-z}}{1+e^{-z}} \quad \text{..... .....(9)}$$

Dividing equation (11), the probability expressions can be transformed to determine the log-odds in favour of being poor or not. This manipulation results into:

$$\frac{Pi(Di = 1)}{[1 - Pi(Di = 1]} = \frac{1}{e^{-Ii}} \quad \text{..... (10)}$$

But $\frac{1}{e^{-Ii}} = e^{-Ii}$

Therefore; $\frac{Pi(Di = 1)}{[1 - Pi(Di = 1]} = e^{-Ii}$ ..... (11)

In; $\frac{[Pi(Di = 1)]}{[1 - Pi(Di = 1)]} = {}^{-Ii}$ ..... (12)

In the context of equation (17), the left hand side is the odd ratio of the probability of being poor to the probability of not being poor.

The estimating logarithmic equation is

$Ii = ß_0 + ß_1 In_1 X_1 + ß_2 In_2 2X_2 +, \ldots, + ß_{23} In_{23} X_{23}$ ……. (13)

The dummy variable (Y) is Di = 1 if poor and Di = 0, otherwise.

The use of the Logit model in this borrows from the works of Rodriquez and Smiths, (1994) and Ghazouani and Goaied (2001).

[6]Here few assumptions were made, 1. The quality of difference of each food item is ignored. 2. The food items under consideration were assumed to be homogeneous for all households. 3, local units were assumed to be fixed per community, although they may vary across communities.

The explanatory variables used in the Logit Models and hypothesized as determinants of households poverty status are: Poverty status (POVSTATU), (X_1)if poor = 1, otherwise = 0, LDI (Livelihood Diversification Index) (X_2) index, Household size (HHSIZE) (X_3) number, Level of education (EDUCAT) (X_4) in years, Age (AGE) (X_5) in years, Farming/fishing experience (FA-FIE) (X_6) in Naira, Hired labour (HIRLA) (X_7) in Naira, Farming/fishing input (FA-FI) (X_8) in Naira, Expenses on food (EX FOO) (X_9) in Naira, Opportunity cost of own labour (OWNLA) (X_{10}) in Naira, Farming/fishing income (FAFII) (X_{11}) in Naira, Farm size (X_{12}) in Hectares (Ha), Agricultural land (X_{13}) in Hectares (Ha), Expenses on fertilizer (EXFER) (X_{14}) in Naira, Expenses on improved seed (IMSED) (X_{15}) in Naira, Expenses on non food item (EXOF) (X_{16}) in Naira, Expenses on chemicals (EXCHE) (X_{17}) in Naira, Non-farm Rural Activities Income (NFRA) (X_{18}) in Naira, Income Consumed Outputs (OUTPU) (X_{19}) in Naira, Market facilities (MKTFA) (X_{20}) Dummy, if access = 1, otherwise = 0, Access to extension facilities (ACEXT) (X_{21}) Dummy, if access = 1, otherwise = 0, Access to credit facilities (ACCRE) (X_{22}) in Naira and Economic loss in yield (ECONLOSS) (X_{23}) index

RESULTS AND DISCUSSION

Income per-capita of Respondents

The annual per capita income ranges from N9, 500.00 – N14, 500.00. About 45% of the respondents earned per capita income that wa below or equal to N45, 000.00 (equivalent of less than N4,000.00 per month) (Table 2). These ranges are still less than minimum wage of government workers in Nigeria. This suggests that income to household might not be able to meet family basic needs and hence perpetuate poverty.

Results of the analysis showed that households that made profit from farming and/or fishing activities were 184 (61.33%) and those that made losses were 116 (38.67%). Further examination revealed that majority of the households, 152 (82.61%) made profit between N1,000 – N10,000 (Table 3). Thus, leaving only 32 households (17.39%) with a profit of N10,000 and above, while 68 (58.22%) made losses between N1,000 – N10,000, 48 (41.38%) made losses of over N10,000 and more (Table 3).

Table 2: Percentage distribution of households by income groups

Income group (N)	Respondent (N)	Percentage
Below 15,000	35	11.67
15,000-30,000	52	17.33
30,001-45,000	48	16.00
45,001-60,000	95	31.67
60,001-75,000	58	19.33
Above 75,000	12	4.00
Total	300	100.00

Source: Field Survey (2006)

This result suggests that the returns to factor of production are quite low (as measured from the relationship between revenue earned and the cost used. Further analysis revealed that for every Naira N1 derived from the sales of output i, N2,202 was used for the cost of producing output i.
This finding revealed that farming/fishing activities in the study area was no longer financially rewarding and most of the times, the production cost were being augmented from other sources of income outside farming/fishing activities. Supporting this finding, majority of the people that participated in the Focus Group Discussion FGD clearly stated that declining revenue from farming/fishing was as a result of oil pollution. It is incursion into fresh water often killed the fishes and oil spills on agricultural land thereby, rendering the soil unproductive, leading to a decrease in yield from farming.

Logit Regression Analysis of the Determinants of household poverty status

Logit regression models were used to identify significant determinants of poverty. This technique was chosen because of the discrete dichotomous nature of the outcome variable, the poverty status of the household. Table 4 presents the results of the logit regression analysis. The result of the analysis shows that household income, agricultural land, expenditure on food, farm/fishing income, access to credit and economic loss in yield are explanatory variables identified as the determinant of poverty.

The results indicate that HHSIZE (X_3) had a significant positive effect on poverty. This result suggests that the larger the household size, the poorer the household becomes. The result also reveals that agricultural land (X_{13}) has a significant negative effect on poverty. In other words, large farms or farm expansion are less determinant of poverty, this is because the more the agricultural land cultivated, the less tendency for the farmland to be polluted by oil spills. Therefore, the more agricultural land cultivated the less poverty.

Table 3: Distribution of Revenue (Profit/Loss) in farming and fishing

		N = 300 (100%)			
Revenue (N)	Number	Percentage (%)	Mean income	Standard error	C.V (%)
Above – 10,000	48	16			
- 10,000 __-7,501	28	9.33			
- 7,500 __-5,001	17	5.67			
- 5,000 __-2,501	8	2.67			
- 2,500 __-1,001	7	2.67			
- 1,000 __-01	7	2.33			
1- 1,000	9	3.00			
1,001 – 2,500	19	6.33			
2,501 – 5,000	58	19.33			
5,001 – 7,500	39	13.00			
7,501 – 10,000	27	19.00			
Above – 10,000	32	10.67			
Highest Revenue	N515,750.00				
Mean Revenue	N356,126.00				
Net Income	N159,624.00		73,784.00	35,416.00	48
Least Revenue	N363,750.00				
Average Cost	N538,500.00				
Net Loss	(N175,350.00)		- 68,147.00	42,251.00	62
Estimated Household who made profit (61.33%)					
Estimated Household who made losses (38.67%)					

Field Survey 2006

Also, economic loss as a result of interaction between crude-oil pollution and livelihood activities in primary occupation has a positive significant effect on poverty. This suggests that with increase in economic loss, poverty tends to increase too. This result indicates that the more time allocated to farming/fishing income (X_{11}) had a significant positive effect on poverty. This thus, suggests that with increase in the household participation in farming/fishing, poverty tends to increase. This is because time, energy, and resources used for productive ventures that could get them revenue were being dissipated in farming/fishing activities, which are not financially beneficial. Other significant positive variables are expenses on food and access to credit.
Extension service is negative and statistically significant. These findings reveal that accessibility to extension services could help to reduce the likelihood of poverty. Thus, extension facilities/services were not available in all the study area. Expenses on fertilizer, improved seed and farming/fishing inputs had to be dropped due to the presence of multi-co linearity between each of the variables (Table 4).

Table 4: Logit Regression Estimates of Poverty Determinants

Variable	Estimate	t-value
HHSIZE	.090E-02	2.324*
EDUCAT	.308E-01	.8923
AGE	.487E-02	1.3472
FARMSZ	-.161E-01	-.3461
FA_FIE	-.8851	-.2883
LAND	-.6272	-2.7061*
LDI	.5783	.7412
FAMLAB	.22E-05	1.1371
HIRLA	933E-06	.2011
OWNLA	.323E-05	.6692
EXFER	.135E+11	4.4262
IMSED	.135E+11	4.4262
FA_FI	-.135E+11	-4.4262
EXNOF	.5196E-04	2.5931*
EXCHE	-.1162	-.1201
EXFOO	.2364	.3472
OUTPU	.1012	.7963
FAFI I	.3681	2.7272**
NFRA	-140E-05	-1.233
MKTFA	.827E-07	-.194
ACEXT	-.4211	3.421***
ACCRE	923E-01	2.122*
ECONLOSS	.717	2.762**

Source: Logit Regression Analysis
*** = Significant at p<0.001, ** = Significant at p<0.005, * Significant at p<0.001
Log-likelihood function: -198.86, Significance level: .7951 Constant = 0.6292

CONCLUSION

The study found a positive relationship between rural-poverty and environmental degradation in the form of crude-oil pollution. The exploration of crude-oil adopted in the area of study is 'unsustainable practices'

which in turn marginalize the host community livelihood activities in crop farming and fishing which eventually put them in poverty. Unsustainable size of natural resources inevitably caused poverty. The findings of this study reveal that crude-oil pollution led to economic loss in yield in crop farming and fishing activities. This reveals that returns to factors of production from crop farming/fishing activities were quite low and livelihood in farming/fishing activities was no longer financially rewarding. To meet family and other basic needs, incomes were supplemented from non-farm/non-fish sources.

Therefore, the study suggests that policy to promote household involvement in the identified productive activities that give higher return is urgently needed. In this regard, an active involvement of extension officers/services may be useful as the study reveals that access to extension facilities is a likely to lead to poverty reduction. Thus, such participation may, however, bring an additional income generating activities and a reduction in the level of poverty. To solve the problem of poor income realized from farming/fishing livelihood activities, policy must focus more on the development of non-farm income generating activities policies and less on environmental policies.

REFERENCES

BIFANI, P. (1995). Environmental degradation in rural areas, cited in The Environment, Employment and Development Work edited by Bhalla, ILO office Geneva.

BRUCK. T. (2001) Determinants of Rural Poverty in Post-War Mozambique: Evidence from a Household Survey and Implications for Government and Donor Policy. A Report to the Department for International Development March 2001. htt://www.qeh.ox.ac.uk/

DURAIAPPAH, A. (1996) 'Poverty and Environmental Degradation: A Literature Review and Analysis' International Institute for Environmental and Development, working paper series No.8, London Institute for Environmental Studies. Amsterdam.

ELLIS, F. (1998) 'Household strategies and Rural Livelihood Diversification'. *Journal of Development Studies* **35** (1) Pp 1-38.

ETTENG, I. A. (1997). 'The Nigerian State, Oil exploration and Community interest, Issues and Perspectives' Unpublished Msc. Thesis, University of Port-Harcourt, Nigeria, Xii 215pp

FEDERAL OFFICE OF STATISTICS (FOS) (1999). 'Poverty and Agricultural Sector': The Incidence of Poverty of Farmers in Nigeria. *Annual Bulletin of FOS JUNE, 2000*

FORSYTH, L. and SCOONE, P., (1998). Poverty and environment, priorities for research and policy. Prepare for the UNDP and EC, Institute of Development Studies, Falmer, Sussex, September.

GHAZOUANI, S. and GOAIED, M., (2001).' The determinant of Urban and Rural Poverty in Tunisia' Laboratoire d'Eonometrie Appliquee (LEA) faculte des Sciences Economiques et de Tunis.

GREER, J. and THORBECKE E. (1986). 'A methodology of measuring food poverty, applied to Kenya. *Journal of Development Economics,* **24**: Pp 59-74.

GROOTAERT, C. (1997) 'The determinants of Poverty in Cote d'ivorie in the 1980s. *Journal of African Economies,* **6. no. 2**: 169-196.

IBEANU, O. (1999). 'Oil resource flow and conflict in rural Nigera' In TillaRitta Granfelt (ed) Managing the globalized Environment, local strategies to secure livelihoods, New York, IT Publishers, Pp 9-13 B25.

JALA, K.F. (1993). Sustainable Development, Environment and Poverty Nexus. Occasional Papers No. 7 Asian Development Bank.

KENDDDY, J. (1986): Dynamics programming, applications to agriculture and natural resources. Elservier applied science publishers Essex London.

LANDY, J. P. (1982) 'Tropical forests resources' FAO Forestry paper No. 3 Rome.

LEACH, M. and MEARNS, R., (1995). Poverty and Environment in Developing countries. An Overview Study. Institute for Development Studies, University of Sussex.

LEAONARD, H. J. (1989) 'Environment and the poor: Development strategies for a common agende. Washinton, D.C. www.worldbank.org

MALIK, S. J. (1999). Rutal poverty and land degradation: What does the available literature suggest for priority setting for CGIAR? Report prepared for the Technical Advisory committee of the CGIAR, Vienna, Virginia.

OHLSSON, L. (2000) livelihood conflicts – linking poverty and environment as causes of conflict, Stockholm Sweden: SIDA. Environment policy unit.

OKURAT, F. N., ODWEE, J.O. and ADESINA, A. (2002). 'Determinants of regional poverty in Uganda: African Economic Research Consortiums AERC Research Papers No. 122.

ONDO STATE DEMOGRAPHIC STATISTICS, (2000). Compiled by Ministry of Information.

OWABUKERUYELE, W.S. (2000). 'Hydrocarbon exploitation, environmental degradation and poverty in the Niger-Delta region of Nigeria. Unpublished PhD Thesis in the Department of Economic Lund University Lumes, Sweden.

PENDER, J. P., P. HAZELL and J. L. GARRET (2002)' Reducing poverty and protecting the environment. The overlooked potential of less-favoured lands. Unfinished Agenda IFPRI publication (2002) for IFPRI's 2020 vision initiatives.

RODRIGUEZ, A. and S. SMITH (1994). A comparison of Determinants of Urban, Rural and Farm poverty in Costa-Rica. World Development Vol. 22 pp 381-387

ROZELLE, S., HUANG, J. and ZXHANG, L. (1997). Poverty, Population and Environmental degradation in China. *Food policy.* **22**(3), pp 229-251.

SCHEER, S. J. (1999): Poverty – Environment Interactions in Agriculture: Key factors and policy Implications. Paper prepared for the United Nations Development Programme UNDP.

SCOONES, I. (1998). Sustainable rural livelihoods: a framework for analysis IDS discussion paper No. 72 Brighton Institute of Development studies, University of Sussex.

SSEWANYANA, S.N. (2002). Sustainability of livelihood security among rural households in Uganda' Issues in African Development Monograph series No. 31 August, 2002

STANLEY, W.R. (1990). Socio-Economic impact of oil in Nigeria' Geography journal, Vol. 22 No 1, pp 35-47.

UNITED NATIONS DEVELOPMENT PROGRAMME UNDP (1988, 1990 & 1998). Human Development Reports Nigeria Oxford University Press Nigeria.

VOSTI, S. T. and REARDON, E.D. (1997). Sustainability, Growth and Poverty Alleviation: A Policy and Agro ecological perspective. Johns Hopkins University Press Baltimore, MD.

ZANNIN, G., BERTI, A. and GIANNINI, M. (1992): Economics of herbicide use on arable crops in North Central Italy. *Crop Protection*, **11**(2) 153-159.

WORLD STATS and FACTS (2004). 'Areas and Population of Countries, mid-2004 estimates. www.factmonster.com

Appendix

Table 1: Conversion factors for Calorie Requirement for different Age groups

Age group	Male	Female
Less than 10 years	0.6	0.6
10 – 13 years	0.8	0.8
14 – 21 years	1.0	0.75
Above 21 years	1.0	0.75

Source: Culled from *Stock et al* (1991)

(a) Total value of food (E*i) consumed by each household, which is equal to the sum of value of purchased food (V*j) and the value of own production consumed (K*j) were determined as

$$E^*i = V^*j + K^*j \quad \text{---------- (1)}$$

Where $V^*j = \sum Dij\ Pij$ ---------- (2)

$$K^*j = \sum Mij\ Pij \quad \text{---------- (3)}$$

Where V*j = value of purchased food consumed by the jth household.
Dij = the quantity of ith food items purchased by the jth household.
Pij = the local price paid by the jth household for the ith food item.
K*j = the value of own output by the household.
Mij product of own production (consumption from what they produced)
The quantity Mi is the imputed value of consumption.

(b) The adult equivalent Hj for each household were being proxies by the household size.

(c) While the total value of food consumed per Adult equivalent, were derived by dividing the total value of food by household adult equivalent.

$$Ei = \frac{E^*i}{Hj} \quad \text{---------- (4)}$$

Where
E*I = total value of food consumed by the jth household
Hj = adult equivalent for jth household (proxy by the household size)
Xj = total value of food consumed per adult equivalent units.

Table 2: Monthly Food Per Capita Consumption N=300)

Food Item	Monthly Consumption (Kg). (a)	Calories Per Kg. (b)	Total Calories Consumed (a*b)	Prices # Per Kg. (c)	Food Expenditure (a*c)
Cassava	9.4	3510	32994	45.25	425.35
Yam	3.5	1235	4322.5	105.25	368.38
Melon	0.25	5689	1422.25	180.15	45.04
Rice	2.85	3640	10374	100.71	287.02
Plantain	0.30	750	225	78.25	24.48
Vegetables	.0950	250	237.5	25.28	24.02
Okro	.075	321.9	241.4	40.25	30.19
Onions	1.75	410	717.5	30.85	149.1
Tomatoes	1.95	220	429	90.25	175.99
Pepper	1.32	940	1240.8	120.15	158.6
Maize	2.50	3570	8925	45.28	113.20
Fish Dried	2.20	2890	6358	285.23	627.51
Fish Fresh	2.50	1320	3300	250.15	625.38
Poultry	1.45	1290	1870.5	350.25	507.86
Meat	1.85	2500	4625	275.82	510.27
Pork	.45	3760	1692	325.15	146.32
Milk	.055	650	375.5	125.5	69.03
Sugar	1.2	3870	4644	100.5	120.60
Beverages	0.25	260	65	200.15	50.04
Palm-oil	2.52	8750	22050	175.15	441.38
Ground-oil	0.55	8540	4697	180.25	99.14
Fruits	2.75	430	1182.5	60.15	165.41
Beans	4.10	3420	14022	140.25	575.03
Total			125992.45		5739.34

Source: 1 Digest of Agricultural Statistics, Dept. of Research and Statistics, Ministry of Finance Economics Planning and Budget, Akure Ondo State. June 2001.

2 Aigbokhan, (2000)' Poverty, Growth and Inequality in Nigeria: A case study

3 Olayemi (1995) 'FAO Nutritional studies, conversion table for Calorie and Protein contents of food.

4 Nutrient Composition of Commonly Eaten foods in Nigeria (Edited by Oguntona & Akinyele)

Note: Supplementary price data were also collated for major commodities. All prices were expressed in Naira.