International Journal of Development and Sustainability
ISSN: 2186-8662 – www.isdsnet.com/ijds
Volume 6 Number 7 (2017): Pages 463-487
ISDS Article ID: IJDS16071701

Estimating poverty dominance by occupational status of oil and gas polluted crop farms in rivers state, Nigeria

Thankgod Peter Ojimba *

Department of Agricultural Science, Ignatius Ajuru University of Education, Ndele Campus, P.M.B 5047, Port Harcourt, Rivers State, Nigeria

Abstract

This study focused on poverty and stochastic dominance estimation using occupational status of oil and gas polluted crop farmer households in Rivers State, Nigeria. Data was collected using multistage sampling technique in 17 out of 23 local government areas (LGAs) of the state. The results showed that there existed poverty among crop farming households with incidence of poverty (P_0) ranging from 45.50% - 62.50% in all farms surveyed, 30.80% -100% in oil and gas polluted, 37.50 - 66.7% in non-polluted crop farms respectively. The results also indicated that average P_0 was higher in oil and gas polluted (P_o = 63.5%) than in non-polluted crop farmer households (P_0 = 52.5%). By occupational status, poverty was worse in households that combined crop farming with fishing (P_0 = 100%) in oil and gas polluted crop farms as against P_0 = 66.70% in non- polluted crop farmland. The stochastic poverty dominance comparison revealed that poverty was higher in oil and gas polluted farmland than in non-polluted crop farms when the distribution curves of crop farming alone and households who combined fishing with farming were compared. Therefore, this study concluded that oil and gas pollution on crop farms, fishing and other natural occupations is detrimental and devastating. Hence, oil and gas pollution adversely affected the livelihood of the inhabitants, thereby escalating the existing poverty in Rivers State, Nigeria.

Keywords: Stochastic Poverty Dominance; Occupational Status; Oil and Gas Pollution; Crop Farming, Rivers State Nigeria

Cite this article as: Ojimba, T.P. (2017), "Estimating poverty dominance by occupational status of oil and gas polluted crop farms in rivers state, Nigeria", *International Journal of Development and Sustainability*, Vol. 6 No. 7, pp. 463-487.

* Corresponding author. *E-mail address:* thankgodojimba@yahoo.com

1. Introduction

Crude oil spillages are regular features of life in the Niger Delta region of Nigeria. They are rarely dealt with promptly when they occur. Sometimes minor leaks are abandoned for months by both the oil companies, and government agencies responsible, thereby resulting in major oil pollution incidences. Pipelines are used to collect and collate the oil and gas produced from different locations in the Niger Delta. These pipelines run through villages, farms, forest, rivers, creeks, mangrove and seas in the area, therefore leakages from them are a major sources of oil and gas pollutions (Platform, 2006a) and cause severe economic ruin for the inhabitants of the delta region.

Farmland polluted by oil and gas is hardly rehabilitated, thereby destroying the occupational livelihoods of the people. UNEP's Report (2011) on Ogoni land in Rivers State, Nigeria observed that fish tend to leave polluted areas in search of cleaner waters, therefore the fisheries sector is suffering due to the destruction of fish habitat by the constant contamination of many rivers and creeks by crude oil spillages. Areas where entrepreneurs established fish farms, their businesses had been ruined by the ever present layer of floating crude oil.

Platform (2012) reported that more gas is flared in Nigeria than anywhere in the world. In Western Europe, 99% of crude oil associated gas is used or re-injected into the ground. In Canada as far back as 1996, about 92% of gases were conserved or used in some other ways. The remaining 8% was flared (Ajibade and Awomuti, 2009). But in Nigeria, despite regulations introduced more than 20 years ago to outlaw the practice, most associated gas is still flared, causing local pollution and seriously contributing to climate changes. Nigeria, therefore, has become the world's largest gas flarer. This has affected various occupations including crop and animal production, hunting, fishing and other related agricultural activities in the Niger Delta (Enemugwem, 2009), the impact of which are already being felt in food insecurity, increasing risks of diseases and extreme weather change. The local people had observed that the roaring noise and intense heat from the flares are highly discomforting to life and agricultural production because they live and work alongside the gas flares without any form of protection (Platform, 2012).

1.1. Statement of problem

Okoji (2000) reporting on his field experience of the petroleum oil and the Niger Delta environment stated that the oil and gas industry appeared to be a bane of the Niger Delta environment because its production process, waste management and gas disposal are associated with environmental hazards. Okoji (2002) further research on the social implication of the petroleum oil industry in the Niger Delta found out that oil and gas industry gave the oil producing communities in the Delta region expectation of employment opportunities (outside their traditional occupations), social infrastructural facilities and improvement on their living conditions, all of which are unrealistic as at today. Because, in employment, the non-indigenes far exceed those from the oil producing communities, the same apply to contractors. Social amenities leave much to be desired. Secondly, the oil and gas company workers living in the host communities disregard the rural people's livelihoods and moral values that had existed for ages (Okoji, 2002). This inability of the oil and gas

industry to protect the environment, livelihood of the indigenous population and provide employment to the youths of the Niger Delta region, had led to the wide spread of poverty, backwardness and social devices among the inhabitants.

In support of above Okoji (2002) argument, Platform (2006b) stated that at the local level, oil and gas production damages people's livelihoods and health, through direct pollution, by threatening food production and water supplies, and through the spread of disease. Also Ojimba (2011) focused on the economic evaluation of crop farms acquired for crude oil production activity in Rivers State, Nigeria and found out that large area of existing crop farms in the state had been acquired for crude oil production activities. Due to the small nature of the crop farms in Nigeria many farmers were negatively affected, resulting into impoverishment of the crop farmers. Further, Ojimba and Iyagba (2012) researched into the effect of crude oil pollution on horticultural crops in Rivers State, Nigeria, and observed that both output and income of the horticultural crops in crude oil polluted farms were significantly lower than in non-polluted crop farms. Hence, they concluded that crude oil pollution had detrimental and negative effects on crop output, income and area of farmland cropped thereby increasing the existing poverty in the state. Therefore, this study intends to estimate the level of poverty and its dominance using occupational status of the crop farmers such as crop farming alone, crop farming combined with fishing, trading, government employed, private employment and others in the crude oil and gas polluted and non-polluted crop farms in Rivers State, Nigeria. Analytical tools to be used include Foster-Greer - Thorbecke (FGT) poverty measures and stochastic poverty dominance analysis. In the Niger Delta region are the following states of Nigeria: Abia, Akwa Ibom, Bayelsa, Cross River, Delta, Edo, Imo, Ondo and Rivers.

1.2. The significance of study

There is paucity of data on estimation of poverty dominance by occupational status of crop farmers in crude oil and gas polluted areas in Rivers State, Nigeria. However, scientific data exist on impact of petroleum hydrocarbons on soil fertility and crop cultivation (Osuji and Nwoye, 2007; Fernandez- Luqueno et al., 2012). Also available are literature on the effects of crude oil pollution (including gas flared) on various occupations of the inhabitant of Niger Delta of Nigeria, Rivers State inclusive (Okoli, 2006; Ogege and Ewhrudjakpor, 2009; Ekanem et al., 2010; Ugbomeh and Atubi, 2010; Onyenekenwa, 2011). At international level, literature exist that discussed occupational status in relation to poverty among crop famers (Owuor et al., 2007; Kuiper and Ruben, 2007; Maertens and Swinnen, 2009; Mkenda et al., 2010; Levine and Roberts, 2012).

Okoli (2006) assessed rural households' perceptions of the impact of crude oil exploration in Ogba/Egbema/Ndoni Local Government Area (LGA) of Rivers State, Nigeria and found out that crude oil pollution had impacted the environment, health and occupation of the habitants negatively. These negative impacts of the crude oil pollution had compelled the inhabitants to combine farming and fishing activities with trading as alternative survival strategy. The results of Okoli (2006) showed that 42.86% of the inhabitants were actively engaged in farming, 38.09% in fishing, 19.05% in hunting prior to crude oil exploration activities in the LGA while in 2006, years after crude oil started, only 19.05% were left as farmers, 14.29% were fishermen and 11.0% were left in hunting. As much as 26.0% of the indigenous population still

left in agricultural production combined fishing with trading while 28.57% combined farming with trading. In the same vein, Osuji and Nwoye (2007) observed in their appraisal of the impact of petroleum hydrocarbons on soil fertility three months after crude oil spillage) at Owaza, Abia State, Nigeria, that there was low soil fertility, which in turn implied low agricultural productivity, hence degrading of sources of livelihood.

Ajibade and Awomuti (2009) reported that farmers in Niger Delta are forced to turn to other occupations as a result of the degradation of their farmland. Farmers and fishermen who are so displaced and are unable to adjust, usually migrate to nearby urban centers in search of means of survival. This means that the petroleum industry offered little or no employment to the displaced farmers, hunters and fishermen (including others engaged in other primary and ancillary occupations) in their areas of operations. From the political angle, it is no exaggeration to say that the Niger Delta people, more than any other group, have suffered undue political manipulation, intimidation, degradation, victimization, oppression, neglect and injustice without regard to their loyalty support and contributions to the Nigerian economy (Ajibade and Awomuti, 2009). The beneficiaries of this research include researchers in the field of science, agriculture, social science, humanities, petroleum industry, etc. Others include the farmers, governments, NGOs and their agencies, economic development, policy and environmental outfits, oil and gas companies, their workers and related fields. This research expands the knowledge of the effects of crude oil pollution on crop farming as main source of income for farmers and additional source of income to majority of Nigerian workers.

Therefore, none of the authors listed above had researched on the current topic in details. Hence, there is the need and justification to research in details on the estimation of poverty dominance using occupational status of household heads of crop farmers whose farmland had been polluted by oil and gas industry in Rivers State, Nigeria. Crude oil and gas pollution in this context include crude oil spillages and gas flaring on farmland, area of farmland used for construction sites, for pipeline laying, sites for flow stations, oil wells, gas flaring, borrow pits etc.

1.3. Objective of the study

The main objective of the study is to estimate and compare the level of poverty and its stochastic dominance using occupational status of household heads in oil and gas polluted and non-polluted crop farms in Rivers State, Nigeria. The specific objectives are as follows:

i. To estimate and compare the poverty levels of crop farmer households using their occupational status in oil and gas polluted and non-polluted crop farms of Rivers State, Nigeria.
ii. To analyze and compare poverty stochastic dominance in oil and gas polluted and non-polluted crop farmer households using their occupational status in Rivers State, Nigeria.
iii. To proffer policy statements on how the effects of oil and gas pollution on crop farmer households could be ameliorated.

2. Literature review

Fernandez-Luqueno et al. (2012) observed that gasoline contamination of soils reduced seedling emergence, shoot length, root volume, root dry weight, shoot dry weight and the abundance of nodules. These observations of soil contamination are also true in the Niger Delta region. The region has witnessed massive oil and gas based environmental degradation (Ugbomeh and Atubi, 2010) which had destroyed and devastated enormous areas of land and water leading to loss of soil fertility, decline in agricultural production, loss of forest and its resources, heavy decline in fisheries production and general biodiversity depletion. These negative environmental impacts had created huge land and water scarcities that had underpinned family, intra-communal, inter-communal and inter ethnic feuds, conflicts and wars. Ugbomeh and Atubi (2010) went further to report that the exploration, exploitation and distribution of oil and gas has disinherited and dislocated the local people who are dependent on the primary economies like crop farming, fishing, gathering and hunting. The consequences of crude oil and gas gross degradation of the environment of the Niger Delta have been massive poverty, unemployment.

Ealier Ogege and Ewhrudjakpor (2009) had stated that the Niger Delta area of Nigeria had witnessed a remarkable upsurge in environmental resource crisis as a result of the presence of oil and gas multinationals operating in the zone. The youths whose occupational aspiration are blocked due to exploration, exploitation and production of hydrocarbon have resorted to violence as a response to the monumental deprivation and marginalization by the multinational crude oil and gas companies and the accomplice of the Nigeria government. Onyenekenwa (2011) reported that crop and fish farming activities in the Niger Delta accounted for close to 90% of all forms of occupational activities in the rural areas. He said 50-68% of the active labour force was engaged in one occupational activity or the other including fishing and crop farming. However, increased crude oil and gas exploration, exploitation and distribution activities had resulted to adverse environmental impact on the farmland, forest, rivers and water of the communities in the region. This has affected the peasant agriculture in many ways, creating the problems of environmental refugees. Further, the author observed that some farmers dispossessed of their farmland, migrated to other more fertile and peaceful land in other communities. This created serious pressure in scarce fertile land and the ecosystems of the unpolluted farmland. This contributed to deforestation through further encroachment on forests, farmland and ultimate reduction on bush fallowing systems. Onyenekenwa (2011), observed that some of the crude oil and gas displaced crop farmers, however, sometimes migrate to the urban areas in search of the non-existent alternative means of livelihood and this had resulted in high rate of poverty in the region.

Given the fact that agriculture is characterized by seasonal variations in production, followed by longer production cycles (which can early be distorted by man's activities on land), many households diversify their economy into non-farm investment which provides more steady and regular income. Others also take off-farm employment as part time activities. Owuor et al. (2007), said a large proportion of farmers in their sample combined farming with some off-farm activities which included small itinerant kiosks retailing at the market centres, as a factor that ameliorated persistent poverty in Kenya.

Kuiper and Ruben (2007) with a farm household micro- simultation model analysed three sets of policies for households in remote Ethiopian village. Their results showed that combating poverty with a single policy such as migration off-farm employment reduced poverty headcount (P_0).

Maertens and Swinnen (2009) observed that agriculture is the main source of income in Senegal and that two-third of the household incomes is derived from own farming. Their results showed that agricultural income which included wages earned in the export agro-industry accounted for 80% and others (20%). The income from non-agricultural sources included wages from non-agricultural employment, income from small businesses such as small trading activities and non - labour income (remittances). Their estimated incidence of poverty (P_0) was 42% among the participating farmers, which was considerably lower than the national rural poverty rate of 58%. Their estimated poverty was much higher (47%) among households who did not participate in the export production than among households employed in the programme (40%) and much lower (13%) amongst the contract farmers. The severity of poverty (P_2) was 12% in the surveyed region but it was much lower (5%) among households involved in the export promotion and 2% only among contract famers than among non-participating household which was 17%.

Anwar (1996) examined the actual changes in absolute poverty during the period of structural adjustment in Pakistan. It was observed that first order stochastic dominance tests suggested that not only the absolute poverty incidence but also the intensity and severity of poverty increased significantly by all poverty lines and measures over the period of adjustment. Poverty increased unambiguously amongst self-employed (including small scale holders on the informal sector) and unemployed who were affected adversely by the poor economic condition.

Mkenda et al. (2010) said the type of occupations is an attribute that can influence the welfare of an individual household. This is because the level of productivity differs across various economic activities. Their result indicated that poverty indices were higher for households which depended on farming, livestock and fishing, and those whose household heads were employed as unpaid family helpers in Tanzania. Those households whose heads were engaged in the civil service (both government and parastatals) were relatively better off.

Levine and Roberts (2012) applied the frame work of stochastic dominance to test the robustness of the estimates of change in poverty and inequality in post-independence Namibia. Their empirical results obtained showed that nearly 48% of those individuals residing in households dependent on subsistence farming live in poverty. Poverty incidence fell significantly in households where their main source of income was wages and salaries, which is one of the indication of creating employment to spur poverty reduction. Still, 20% of the population living in households where salaries and wages were main sources of income were poor. That is to say, a salaried income is by no means a guarantee of a life above the poverty line in Namibia.

Haji et al. (2013) using a propensity score matching model, the difference in total consumption expenditure between households who participated in the programme and those who did not, were evaluated. The result obtained was that the poverty incidence curve of participating households, at all points, lie below the curve of the non-participating households which meant participants were less poor than non participants.

3. Methodology

3.1. Study area and data collection

The study was conducted in Rivers State, Nigeria from August, 2002 to April, 2003. The state is located in the southern part of the Niger Delta region of Nigeria occupying latitudes 6^{OE} - 7^{OE} and longitudes 4^{ON}-6^{ON} respectively. The state is blessed with abundance of natural resources such as rich and fertile soils suitable for tropical agricultural production and majority of the nation's oil and gas deposits (Ekpo, 1981; Amadi, 1990; Mastaller, 1996; Osuji, 1998). The major occupations of the people of Rivers State, Nigeria are farming and fishing.

Data were collected from both the primary and secondary sources. The primary data were collected through personal interview and observations with local farmers. Efficiently structured questionnaires were distributed among the local crop farmers in crude oil and gas polluted and non-crude oil and gas polluted crop farms of an affected community in the respective local government area (LGA) of the state. Data collected provided the basis to make a comparative study and adequately determine the welfare of crop farming households in Rivers State, Nigeria.

The sampling technique used to obtain data for this study was the multistage sampling procedure. Crude oil and gas production, exploration and exploitation activities is widespread throughout the 23 LGAs in the state. The first stage was the selection of 17 LGAs out of the existing 23 LGAs in the state. The reason for selecting these 17 LGAs was because they were more crop farming inclined than others. The stratification of farmland in an LGA into two sampling units namely oil and gas polluted and non-oil and gas polluted formed the second stage of sampling procedure. The stratification of the farming population into two sampling units was based on the fact that information is needed from both crude oil and gas polluted and non-polluted areas. The third stage of sampling procedure involved the random sampling of ten (10) crop farmers from oil and gas polluted areas in a selected LGA and a corresponding number of ten (10) crop farmers from non-oil and gas polluted farmland in the same locality (community) in the given LGA. This summed up to 20 (twenty) crop farmer households interviewed and observed per selected LGA in Rivers State, Nigeria. The seventeen local government areas selected were: Abua/Odual, Ahoada East, Ahoada West, Andoni, Asaritoru, Degema, Eleme, Emohua, Etche, Gokhana, Ikwerre, Khana, Obio-Akpor, Ogba/Egbema/Ndoni, Omuma, Oyigbo and Tai LGAs.

Hence, a total of 340 questionnaires were distributed among the crop farmers in these 17 LGAs selected in the state. Out of the 340 questionnaires sampled, due to difficult terrain, politicking of oil and gas issues, youth restiveness (including rampant kidnapping) in the state and some questionnaires being inconsistent with the set objectives of the study, only a total of 296 questionnaires were retained as suitable for analysis.

3.2. Data Analysis

Data collected were analyzed using descriptive analysis such as percentages and frequencies. Other analytical tools and models used include Foster, Greer and Thorbecke (FGT) poverty measures and stochastic poverty dominance analysis.

3.2.1. Measurement of poverty

The Foster, Greer and Thorbecke (1984) weighted poverty index was used for the quantitative poverty assessment in this study to capture objective 1. This FGT is used due to its decomposability among sub-groups, when expenditure are ranked such that:

$Y_1i \leq \ldots Y_2i \leq Z \leq Y_{(q+1)}i \leq Y_{(q+2)}i \leq \ldots\ldots \leq Y_ni$

The FGT poverty measure for a given $\propto$ was defined over a continous variable Y which has support in the non-negative real numbers (Ravallion, 1992; Duclos et al., 2002; Kurosaki, 2003; Nyankori, 2009; Mkenda et al., 2010; Levine and Roberts, 2012).

$$P\propto = \int_0^q z - y\left(\frac{dy}{Z}\right)^{\propto} \qquad \text{(Eq 1)}$$

where,

$P\propto$ = weighted poverty index
q = the number of households in poverty
y = the per adult equivalent expenditure of household
z = the poverty line
$\propto$ = 0, 1, 2, (i.e the degree of concern for the depth of poverty), where $\propto_0 = H_c$ (headcount), $\propto_1$ = PG (poverty gap), $\propto_2 = P_s$ (poverty severity).

An estimate of equation (1) in discrete term is

$$P\propto = \frac{1}{N}\sum_{i=1}^{q}\left(\frac{z-yi}{Z}\right) \quad ,\text{f} = 1, 2, \ldots\ldots, q \ldots\ldots\ldots\ldots \text{(Eq 2)}$$

where,

N = total number of households surveyed (296 samples).

The FGT measure for the decomposable property of $P\propto$ is considered here in relation to occupational variables (Ojimba et al,. 2015).

3.2.2. Stochastic dominance

Stochastic dominance is a popular tool for discrete choice efficiency analysis. It makes pair wise comparisons of probability distributions, F_A and F_B from a finite set of choices in order to determine if one is inefficient and should be discarded from the efficient set (Kramer and Pope, 1981). Stochastic dominance performs well when there is a finite and hopefully, small number of choices. It achieves this by comparing the attributes of an entire distribution of outcomes to that of another (Zacharias and Grube, 1984). Stochastic dominance analytical tool had been used in various studies such as agricultural production research (Anderson, 1974);

returns from soil conservation from low income farmers (Shively, 1999); dominance test in poverty analysis (Ravallion, 1992). Most recently other studies include an analysis of poverty in 10 developing countries (Quisumbing et al., 2001); poverty in Tanzania (Mkenda et al., 2004); testing restricted stochastic dominance (Davidson and Duclos, 2013); early child development (Figueroa, 2013); child wellbeing in the Democratic Republic of Congo (Nanivazo, 2014).

3.2.2.1. Stochastic poverty dominance analysis

Standard tests of welfare poverty dominance to compare distributions of welfare indicators make ordinal judgments on how poverty changes for a wide range of poverty measures over an interval of poverty lines. This analytical tool is used to capture objective 2.

This study considered two distributions of welfare indicators with cumulative distribution functions, F_A and F_B, with support in non- negative real numbers. F_A represent cumulative distribution function (CDF) of non-crude oil and gas polluted crop farmer households and F_B represent CDF for crude oil and gas polluted crop farmer households. This study also utilized Ravallion (1992) and Duclos et al., (2002) formulations as stated below:

$$D_A^1(X) = F_A(X) = \int_0^x dF \quad (dy) \ldots\ldots\ldots (Eq\ 3)$$

where,
$D_A^1(X) = P\propto_A$ = weighted poverty index $_A$
X = Z = poverty line
F_A, F_B = cumulated distribution function

If $D_A^1(X) \leq (<) D_B^1(X)$ for all $X\ \varepsilon\ R$ (ie F_A is everywhere to the right of F_B), then distribution A is said to be (strictly) first order stochastic dominance (F.S.D) in relation to distribution B. In terms of welfare economics, the interpretation is that up to the poverty line X, A is a better distribution than B for the given welfare function that is both increasing in the welfare variables (i.e. household consumption expenditures) and anonymous, in the sense that we do not care that one particular households welfare falls, as long as another rises by more than enough to compensate. If we can say this for a broad range of poverty lines, then we have a quite general conclusion that A (non-crude oil and gas polluted crop farm households) is preferable to B (crude oil and gas polluted crop farm households).

As $D_B^1(X)$ is also the poverty headcount ratio (P_0) where X is also the poverty line, it follows that first order (degree) stochastic dominance (F.S.D.) implies that poverty as measured by P_0 is lower in distribution A (non-crude oil and gas polluted crop farms) than for distribution B (crude oil and gas polluted crop farms) regardless of the poverty line chosen. Stochastic poverty dominance results can also be considered up to a maximum allowance of poverty line, if we are not concerned with relative changes in the upper-ends of the distribution.

In case two distribution cross within the range of poverty lines that was considered relevant, the first degree stochastic dominance (F.S.D) does not hold, and the different poverty lines and measure rank the distributions differently. Therefore, depending on the poverty lines or measure chosen, it could be

simultaneously concluded that poverty increased or decreased. A fairly general welfare statement could be made if second order stochastic dominance (S.S.D) holds. In particular, if A (non-polluted crop farms) second order (degree) dominates B (crude oil and gas polluted crop farms), then A is a better distribution than B for all welfare functions that are increasing, anonymous, and that favour equality. The second degree stochastic dominance was defined by this study letting $D_A^2(X)$ to be the area under F_A up to X.

If $D_A^2(X) \leq (<) D_B^2(X)$ for X (i.e. the area under F_A up to X), then distribution A (non-polluted crop farms) is said to (strictly) second order (degree) dominate distribution B (crude oil and gas polluted crop farms). This formulation makes it easy to see that second degree stochastic dominance (SSD) implies that the poverty gap (depth) P_1 is less in distribution A than in distribution B for all possible poverty lines.

Hence, $D_A^3(X) \leq (<) D_B^3(X)$ for all X (i.e. distribution A) is said to (strictly) dominate distribution B at the third order stochastic dominance (TSD). This also implies that third degree stochastic dominance (TSD) is an unambiguous change in the severity of poverty (P_2).

Stata (2000) and Duclos et al. (2002) showed that $D^3(X)$ can be equivalently expressed as

$$D^s(X) = \frac{\int_0^x (x-y)^{s-1}\, df(y)}{(S-1)!} \quad \text{.....(Eq 4)}$$

where,

y = per adult equivalent expenditure for a household

s = an integer $s \geq 2$

To generalize, welfare dominance of order *s* implies that the Foster-Greer-Thorbecke poverty measure P_{s-1} fourth order stochastic dominance is less for distribution A than for distribution B for all possible poverty lines.

4. Results analysis and discussions

Occupational characteristics are the conditions that qualify a person's labour market participation. The specific occupational variables used in this study were whether the household head is a crop farmer only, crop farmer combined with fishing, crop farmer combined with trading (including petty trading), crop farmer combined with government employment (civil service), crop farmer combined with private company work and crop farmer combined with other activities such as tailoring, barbing, mechanic, driving, welding, hair dressing, carpentry, mason etc. These crop production combinations were used for estimation because crop farming is an important source of income to semi-urban and rural dwellers in Rivers State, Nigeria as at the time of survey in 2003.

Poverty reduces in a household if the head of the household is securely employed and takes crop farming as a supplementary occupation, or there is an additional income flowing in from off-farm activities. The probability of poverty is expected to increase if the household head does only small –scale crop farming (especially arable cropping) and is an itinerant fisherman or other petty informal employment (Anwar, 1996; Mkenda et al., 2010; Levine and Roberts, 2012).

4.1. Poverty levels by occupational status of household head

Table 1 shows the measures of poverty by the various occupational statuses of heads of households in all crop farms surveyed in the state, in crude oil and gas polluted and non –polluted crop farms respectively. The table indicates that 57.08% of the household heads were poor and the remaining 42.92% were not poor in all crop farms surveyed in Rivers State, Nigeria. The bulk of the poor were concentrated in crop farming alone (34.12%) out of the total of 57.08% recorded. Considering the headcount (incidence of poverty) (P_0), it was observed that poverty was highest among those crop farming households that combined crop farming with other minor activities (with 62.5% of the group poor), followed by crop farming combined with fishing (60%) and crop farming alone (57.7%) all statistically significant at 1%.

At depth of poverty level (P_1), those heads of households that combined crop farming with government employment (civil servants) had about 11.7% of them deeply in poverty, followed by crop farming combined with other activities (11.5%) and crop farming alone (9.4%), all statistically significant at 1% level.

The result in Table 1, also showed that severity of poverty (P_2) was higher among household heads who combined crop farming with civil service work (3.6%), followed by crop farming combined with other engagements (3.0%), both statistically significant at 1% and 5% respectively, and crop farming combined with private company activities (2.9%), though not statistically significant.

In crude oil and gas polluted crop farms, the incidence of poverty (P_0) was highest among crop farm households who combined crop farming with fishing (100%), significant at 1%. This is a peculiar case in that some of the farmland, streams, rivers, creeks and estuary with adjourning forests and mangroves had been polluted with crude oil and gas spillages, exploitation, exploration and production of oil and gas activities in Rivers State, Nigeria. This result is similar with the observations of Ugbomeh and Atubi (2010) and Onyenekenwa (2011), that the exploration activities increased the poverty level in the Niger Delta area of Nigeria. Other occupation affected with severe incidence of poverty (P_0) include household heads who combined crop farming with other activities (71.4%), crop farming alone (67.6%), crop farming combined with government employment (66.7%) and crop farming combined with private company works (66.7%), all statistically significant at least at 5% level. However, the share of crop farming combined with civil service contribution to the overall poverty was 43.01%, crop farming alone (25.80%) and crop farming combined with other activities (16.13%) whose total sum is about 84.94%. The poverty gap (P_1) result showed that about 11.9% of the household heads who practiced crop farming alone were deeply poor, 11.20% of those crop farmers who combined private companies activities with crop farming were deep in poverty, followed by 10.2% of crop farmers who added fishing to their occupation (all statistically significant at 1% and 5% respectively). The results on Table 1 further showed that crop farming alone contributed 33.51%, while crop farming with government employed contributed 42.77% of overall poverty in the poverty gap (P_1) category.

Following the results on Table 1, about 3.9% of the household heads that did crop farming alone, 2.5% of those that added civil service work to crop farming were severely poor at P_2 level in crude oil and gas polluted crop farms. They also contributed more than 84% to overall poverty in poverty severity category (P_2).

Table 1. Measures of poverty by occupational status of household heads in Rivers State, Nigeria.

Occupational status of household head	Percentage frequency of poverty			Head-count (P_0)	Contribution to overall P_0 (%)	Poverty Gap (P_1)	Contribution to overall P_1 (%)	Poverty Severity P_2	Contribution to overall P_2 (%)
	Poor	Non poor	Total						
All crop farms surveyed									
Crop farming alone	34.12	26.04	60.16	0.577*** (0.037)	28.38 (3.29)	0.094*** (0.009)	25.51 (3.88)	0.025*** (0.004)	23.78 (5.00)
Crop farming & fishing	1.35	0.34	1.69	0.600*** (0.219)	1.62 (0.93)	0.068* (0.040)	1.01 (0.80)	0.013 (0.009)	0.66 (0.56)
Crop farming & trading	2.70	4.05	6.75	0.526*** (0.115)	8.11 (2.48)	0.069*** (0.022)	5.87 (2.30)	0.014* (0.008)	4.22 (2.47)
Crop farming & Govt. employed	13.51	8.78	22.29	0.571*** (0.062)	38.92 (4.84)	0.117*** (0.019)	44.05 (6.32)	0.036*** (0.009)	47.87 (8.87)
Crop farming & private company	2.36	1.35	3.71	0.455*** (0.150)	6.76 (2.89)	0.086* (0.045)	7.04 (4.03)	0.029 (0.020)	8.44 (5.94)
Crop farming & other activities	3.04	2.36	5.40	0.625*** (0.121)	16.21 (4.50)	0.115*** (0.032)	16.52 (5.48)	0.030** (0.013)	15.03 (6.64)
Total	57.08	42.92	100	0.570***	100	0.101***	100	0.028*	100
Crude oil and gas polluted Crop farms									
Crop farming alone	37.80	18.11	55.91	0.676*** (0.56)	25.80 (4.39)	0.119*** (0.019)	33.51 (7.10)	0.039*** (0.010)	40.64 (12.32)
Crop farming & fishing	2.36	0.00	2.36	1.000*** (0.000)	3.23 (1.86)	0.102** (0.049)	2.45 (1.85)	0.018 (0.13)	1.55 (1.49)
Crop farming & trading	3.15	7.09	10.24	0.308** (0.129)	6.45 (3.15)	0.029** (0.018)	4.55 (3.05)	0.005 (0.004)	2.89 (2.64)
Crop farming & Govt employed	15.75	7.87	23.62	0.667*** (0.086)	43.01 (6.92)	0.090*** (0.024)	42.77 (9.27)	0.025* (0.013)	43.85 (14.89)
Crop farming & private company	1.57	0.79	2.36	0.667** (0.273)	5.38 (3.68)	0.112** (0.052)	6.66 (4.76)	0.020* (0.011)	4.47 (3.69)

Crop farming & other activities	3.94	1.57	5.51	0.714** (0.171)	16.13 (6.36)	0.060** (0.032)	10.06 (6.16)	0.011 (0.007)	6.60 (4.92)
Total	64.57	35.43	100	0.635***	100	0.086**	100	0.023*	100
Non-polluted crop farms									
Crop farming alone	31.36	31.94	63.30	0.495*** (0.048)	27.60 (4.47)	0.098*** (0.013)	28.27 (5.46)	0.027*** (0.005)	29.10 (6.87)
Crop farming & fishing	0.59	0.59	1.18	0.667** (0.273)	2.08 (1.47)	0.101** (0.048)	1.62 (1.23)	0.017* (0.010)	1.01 (0.86)
Crop farming & trading	2.37	1.78	4.15	0.571*** (0.188)	6.25 (3.04)	0.067** (0.031)	3.79 (2.24)	0.011* (0.006)	2.29 (1.56)
Crop farming & Govt. employed	11.83	9.47	21.30	0.556*** (0.083)	41.67 (6.37)	0.097*** (0.020)	37.49 (7.85)	0.024*** (0.008)	34.80 (9.79)
Crop farming & private company	2.96	1.78	4.74	0.625*** (0.172)	13.02 (5.31)	0.183*** (0.056)	19.61 (7.83)	0.058*** (0.021)	23.15 (9.65)
Crop farming & other activities	2.37	2.96	5.33	0.375*** (0.172)	9.38 (5.05)	0.072* (0.043)	9.22 (6.06)	0.020 (0.013)	9.65 (6.50)
Total	51.48	48.52	100	0.525***	100	0.102***	100	0.028**	100

***Source**: Field survey, 2003. Asterisks indicate significance level: *** 1%, ** 5%, *10%. Figures in parentheses are standard errors.*

In the non-polluted crop farms category, 31.36% of crop farming alone respondents were poor out of the total of 51.48% that were estimated poor, while 48.52% were non-poor. In the headcount ratio (P_0) category, only 66.7% of the household heads that combined crop farming with fishing were poor, 62.5% of crop farming combined with private work were engulfed in incidence of poverty and 57.1% of the crop farmers that added petty trading to their business were headcount poor (all statistically significant at 1% and 5% respectively). The crop farming alone category and crop farming with government work joined together contributed most to the overall poverty in the population (69.27%).

At the poverty gap level (P_1) in non-crude oil and gas polluted areas, 18.3% of the crop farmers that combined private work, 9.8% of those who practice crop farming alone and 9.7% of those that added government employment to their business were deep in poverty, all statistically significant at 1% level, while they contributed about 85.37% to the overall poverty in the population at P_1 level. A view at the poverty severity level (P_2) on Table 1 in non-polluted crop farms indicates that 5.8% of the crop farmers who added private company activities, 2.7% of those who crop farmed alone and 2.4% of those who combined crop farming with government employment were severely poor (data were significant at 1% level), while they contributed more than 87% to the overall population that suffered severity of poverty at P_2.

From the data analyzed using the various categories of occupations practiced in Rivers State, Nigeria, there was poverty among the crop farmers, independent of the category of farms studied. The incidence of poverty (P_0) in this study ranged from 45.5% - 62.5% in all crop farms surveyed. In the crude oil and gas polluted crop farms, the incidence of poverty (P_0) ranged from 30.8% - 100%, while in non-polluted crop farms the range was 37.5% - 66.7%. These high range of figures obtained proved that poverty existed in Rivers State, Nigeria among crop farmers.

However, the results of this study also showed that poverty was higher in crude oil and gas polluted crop farms with an average P_0 of 63.5% as against 52.5% in the non-polluted crop farms. There was 100% (maximum) headcount poverty (P_0) indication in crude oil and gas polluted crop farms households category where respondents combined fishing with crop farming activities. These two occupations were severely prone to crude oil and gas pollution, hence the high level of incidence of poverty obtained as against the 66.7% obtained in non-polluted crop farms group. Hence, this study concludes that crude oil and gas pollution on crop farms is detrimental and devastating to the economy of the crop farmers and their household members. This is to say that the high level of poverty experienced in crude oil and gas polluted crop farms was as a result of the effect and presence of crude oil and gas pollution on the crops and the environment. These findings are similar to Ugbomeh and Atubi (2010), Ogege and Ewhrudjakpor (2009), Fernandez-Luqueno et al. (2012). However, the results of incidence of poverty (P_0) obtained in this study using occupational statuses statistics, are higher than the results of poverty headcount (P_0) of Maertens and Swinnen (2009) in Senegal and the results of Levine and Roberts (2012) in Namibia. The results of severity of poverty (P_2) obtained in this study were considerably low compared to the results of Maertens and Swinnen (2009) as earlier discussed in the literature.

4.2. Stochastic poverty dominance analysis

The stochastic poverty dominance measure by occupational statuses in Rivers State, Nigeria was presented in this subsection. The stochastic poverty dominance among household heads solely engaged in crop farming was tested at the poverty incidence level (P_0) and the result was ambiguous at the first-order stochastic dominance (FSD). So, the second-order stochastic dominance (SSD) was tested and the result was unambiguous as in Figure 1.

This result obtained showed that the crude oil and gas polluted distribution curve lies everywhere above the non-polluted distribution curve. This goes to say that there was higher level of poverty experienced in crude oil and gas polluted crop farmer households than in non-polluted crop farmer households in Rivers State, Nigeria.

When the household heads that practice crop farming in combination with fishing were compared, the stochastic poverty dominance results at the poverty incidence level (P_0) showed that the first order stochastic dominance (FSD) results were inconclusive and obviously not clear in its behavior. For this reason the second-order stochastic dominance (SSD), third-order stochastic dominance (TSD) and the fourth order stochastic dominance were analyzed respectively.

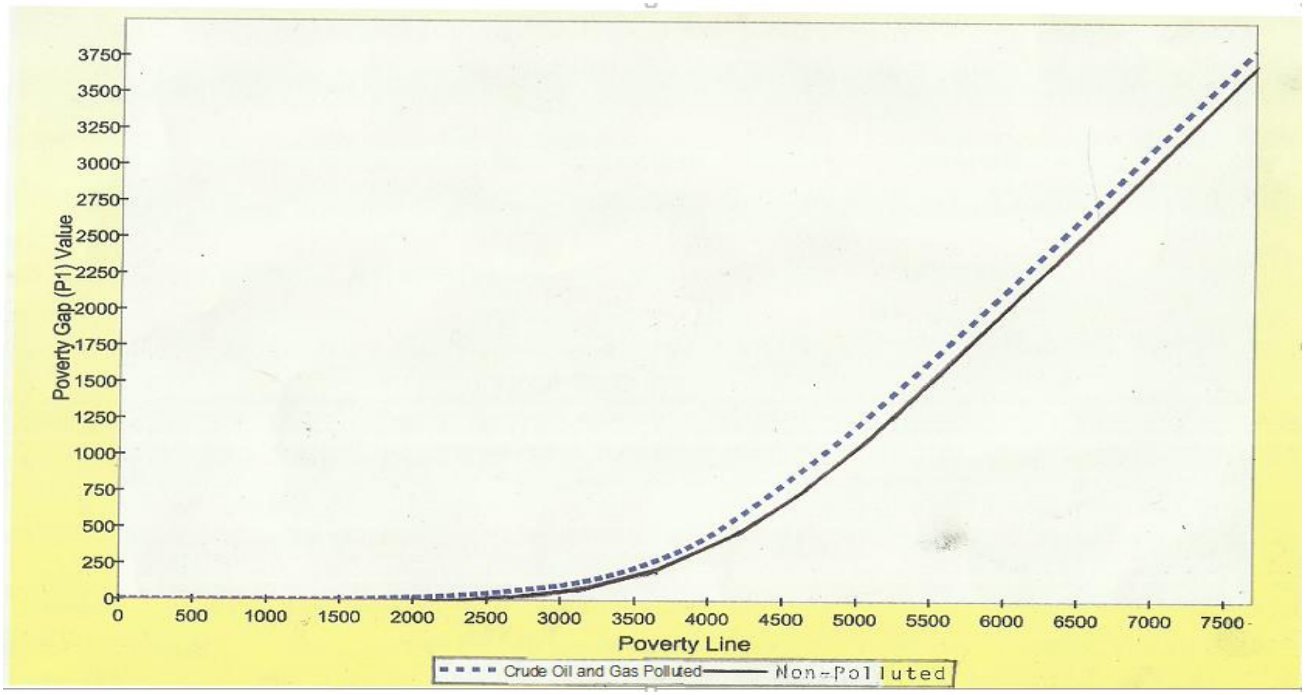

Figure1. Stochastic poverty dominance of household heads that practiced crop farming only at P_1 (SSD)

The fourth-order stochastic poverty dominance condition held at P_3, showing that at various poverty lines the household heads that practiced crop farming together with fishing in the non-polluted areas distribution curve completely dominated those household heads in the crude oil and gas polluted areas (Figure 2). This means that there was higher level of poverty in crude oil and gas polluted areas than in non-polluted areas of the state, using this occupational status. Both occupations are vulnerable to crude oil and gas pollution as the crop farmers and fishermen depended on the rivers, streams, creeks, oceans, forests and arable farmland, for their livelihood (Okoli, 2006; Osuji and Nwoye, 2007).

In Figure 3, the stochastic poverty dominance, of the household heads that did crop farming in conjunction with trading (including petty trading) was presented. The figure shows that at the headcount (P_0) poverty measure level, stochastic poverty dominance was not clear. This made this result at P_0 to be inconclusive and further information was sought at the poverty depth (P_1) (second-order stochastic dominance, SSD) and poverty intensity (P_2) (third-order stochastic dominance, TSD) levels.

At the TSD level, the household heads in crude oil and gas polluted areas dominated those from the non-polluted crop farms. This means that there was more poverty experience by the non-polluted crop farms using this occupational status. This was an unexpected result. However the reason for this result could be that somehow more money was made available to household heads in crude oil and gas polluted farmland, as a result of financial compensations sometimes paid for pollution damages by oil companies (which is sometimes paid to crop farmers whose crop farms were affected). This payment is most a times politically hijacked, and the affected crop farmers receive little or nothing compared to the colossal damage. Such

compensation if received and appropriately channeled into trading businesses, outside crop farming and fishing, could really place the crop farmers in a stronger financial position. This result from combining crop farming with trading is similar with the results and discussions of Okoli (2006); Ajibade and Awomuti (2009); Owuor et al. (2007); Kuiper and Ruben (2007).

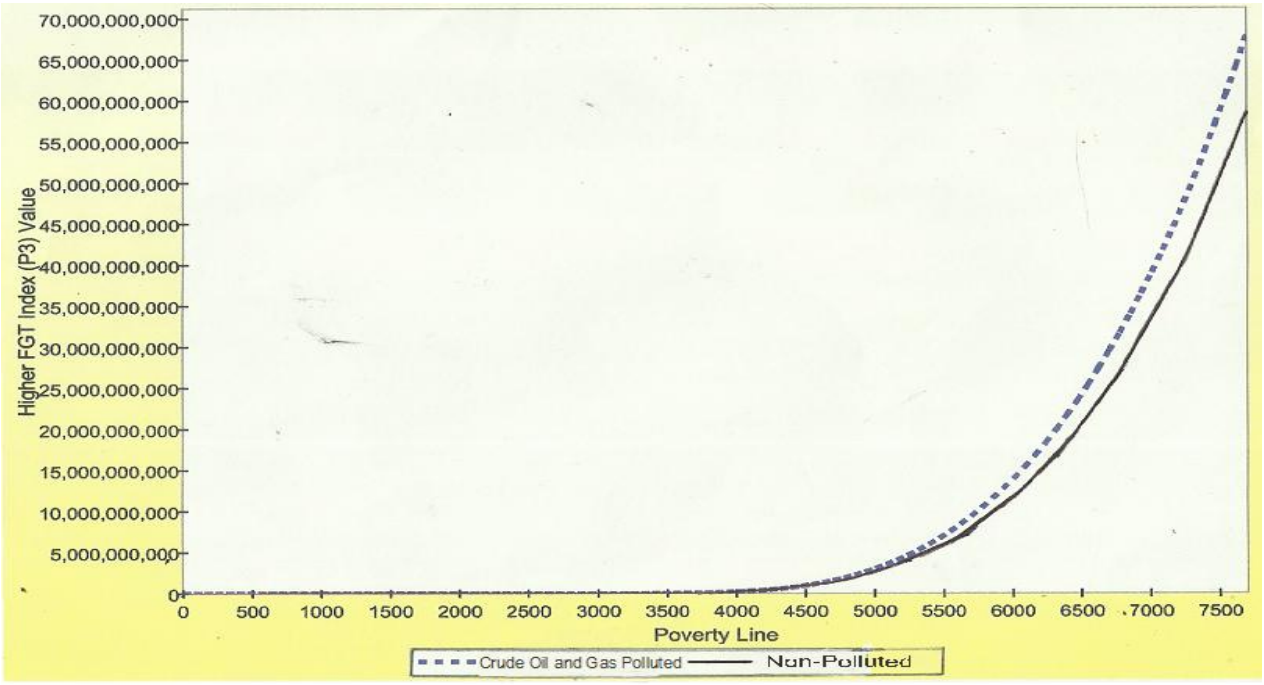

Figure 2. Stochastic poverty dominance of household heads that combined crop farming with fishing at P_3 (fourth order)

The test for stochastic poverty dominance among the household heads that combined crop farming with civil service (government employed) jobs at the higher poverty level P_3 (fourth-order stochastic dominance) was shown on Figure 4. The FSD condition was very ambiguous, which led to the testing for higher orders of stochastic poverty dominance, which did not hold either at SSD or TSD levels respectively. The fourth-order stochastic poverty dominance condition analyzed was not specific on which of the two categories of crop farms (crude oil and gas polluted or non- polluted) dominated as shown in Figure 4. This could be because the salaries received as off-farm earnings by such household heads clearly supplemented the household earnings from the crop farms. It is worthy to note here that a civil servant in Rivers State, Nigeria as at 2003 went home with a minimum salary of N7,500 when the Federal Government and many other states in the federation paid N4,500 only as their minimum wage. This take home was high enough to cushion the effect of poverty of the crop farmer but did not create much difference. This result differs from the results of Mkenda et al. (2010) in Tanzanian but much in line with the results of Kurosaki (2009) as earlier discussed.

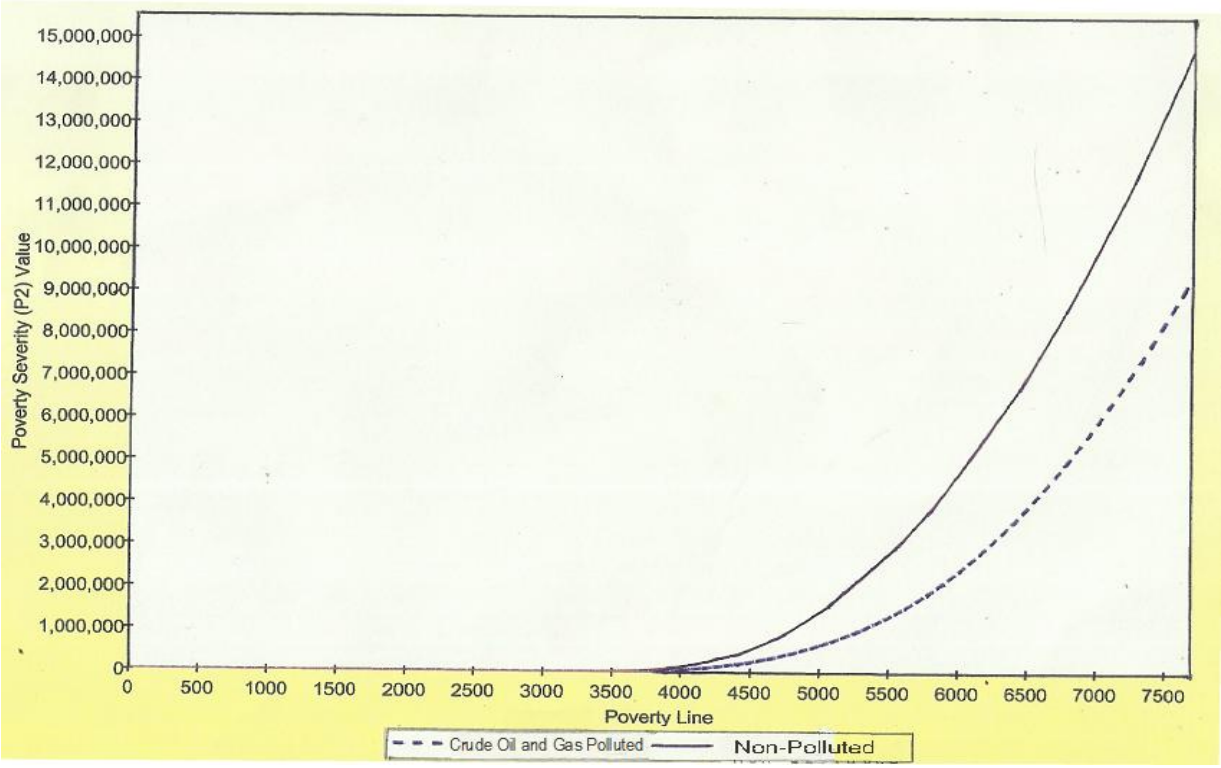

Figure 3. Stochastic poverty dominance of household heads that combined crop farming with trading at P_2 (TSD)

Figure 5 shows the analysis of stochastic poverty dominance among crop farmer household heads that combined crop farming with private company employment. These were mainly junior categories of workers who worked in small and medium sized establishments. Their net pays were most atimes smaller than that of the civil service referred to above. The first-order stochastic dominance (FSD) at P_0 was completely ambiguous. For this reason, higher order was tested at SSD (P_1) which showed a more consistent result of dominance (Figure 5). This SSD clearly indicated that the household heads in the crude oil and gas polluted crop farms dominated those in the non-polluted crop farms. The reason for this type of behavior can not easily be interpreted, as the opposite was expected to be the result. However, the result agrees with the results of Levine and Roberts (2012) that a salaried income is by no means a guarantee of a life above poverty line.

The tests on stochastic poverty dominance among the household heads who were engaged in crop farming and other activities (menial jobs) such as barbing, tailoring, hair dressing saloons, mechanics, welding, masons, and others are shown on Figures 6 and 7. The FSD failed to hold at the poverty headcount level (P_0) as in Fgure 6. The distributions for crude oil and gas polluted crop farms and the non-polluted crop farms were quite incongruous (Figure 6).

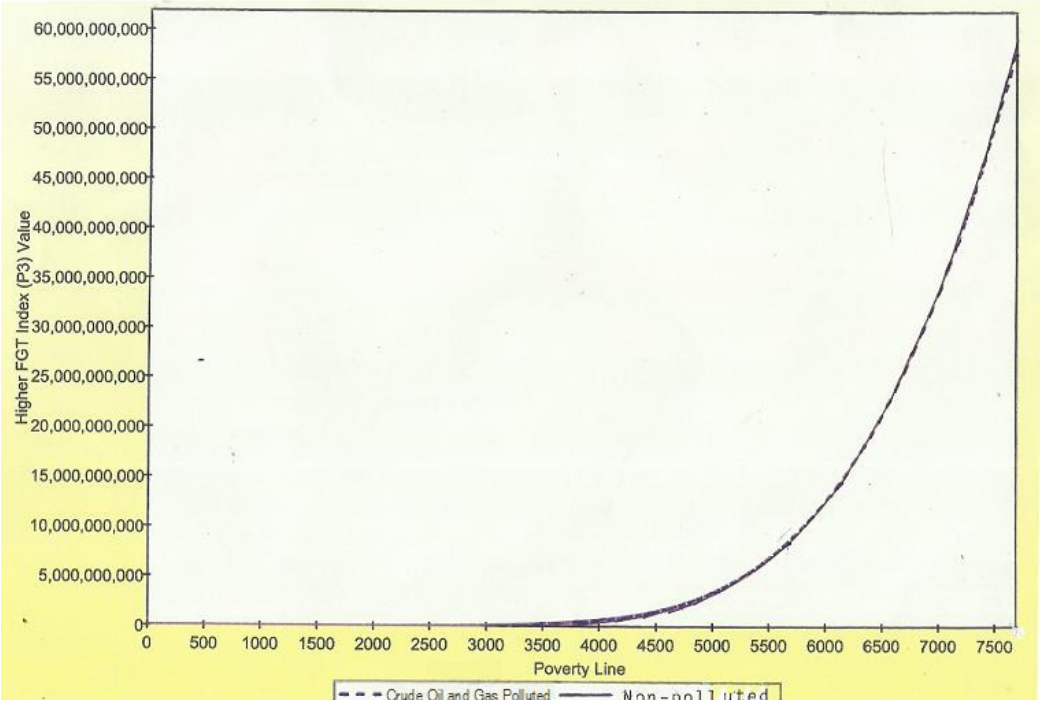

Figure 4. Stochastic poverty dominance of household heads that combined crop farming with government employed at P_3 (fourth-order)

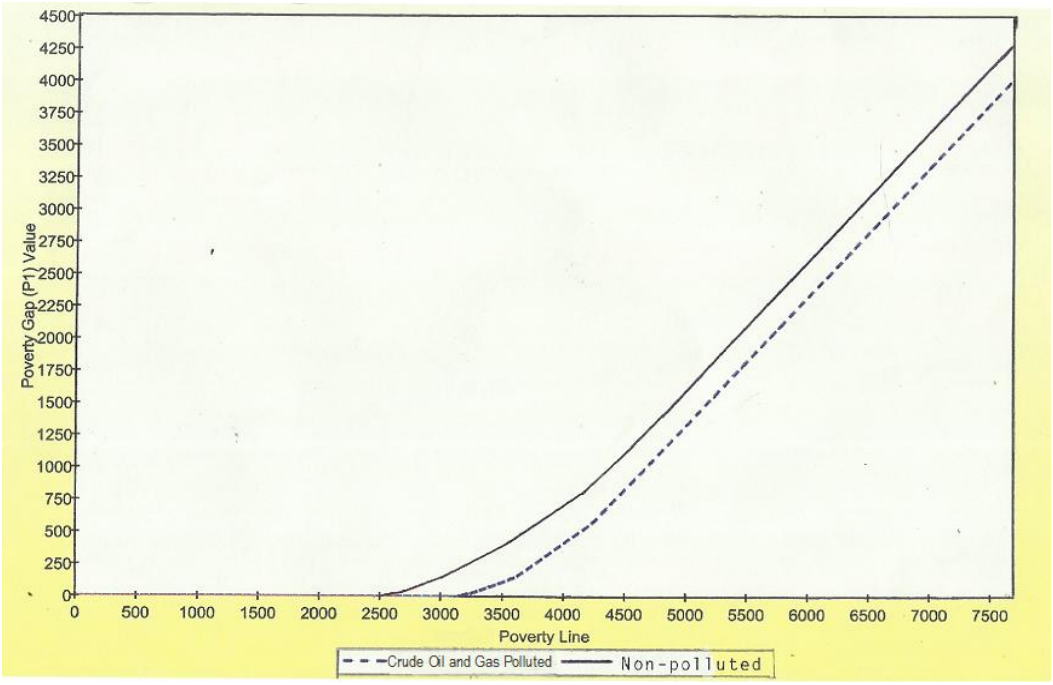

Figure 5. Stochastic poverty dominance among crop farming combined with private company employed household heads at P_1 (SSD)

The incongruity of the results came from the fact that at first it seemed that the crude oil and gas polluted crop farms distributions dominated the unpolluted crop farms, but later, it changed, showing that the non-polluted crop farms distributions dominated the crude oil and gas polluted crop farms curve, and later again this event changed to the former position. This inconsistency made the FSD not to hold at P_0 level (Figure 6). However, higher stochastic dominance tests were tested up to the fourth-order stochastic dominance at P_3 which also failed to be unambiguous but still behaved like the first-order stochastic poverty dominance as shown in Figure 7. The results of the stochastic poverty dominance analysis on this occupational status of combining menial jobs with crop farming clearly showed that poverty existed in Rivers State in both crude oil and gas polluted crop farming households and non-polluted crop farming households respectively. This result affirms the results of Anwar 1996; Levine and Roberts (2012) respectively.

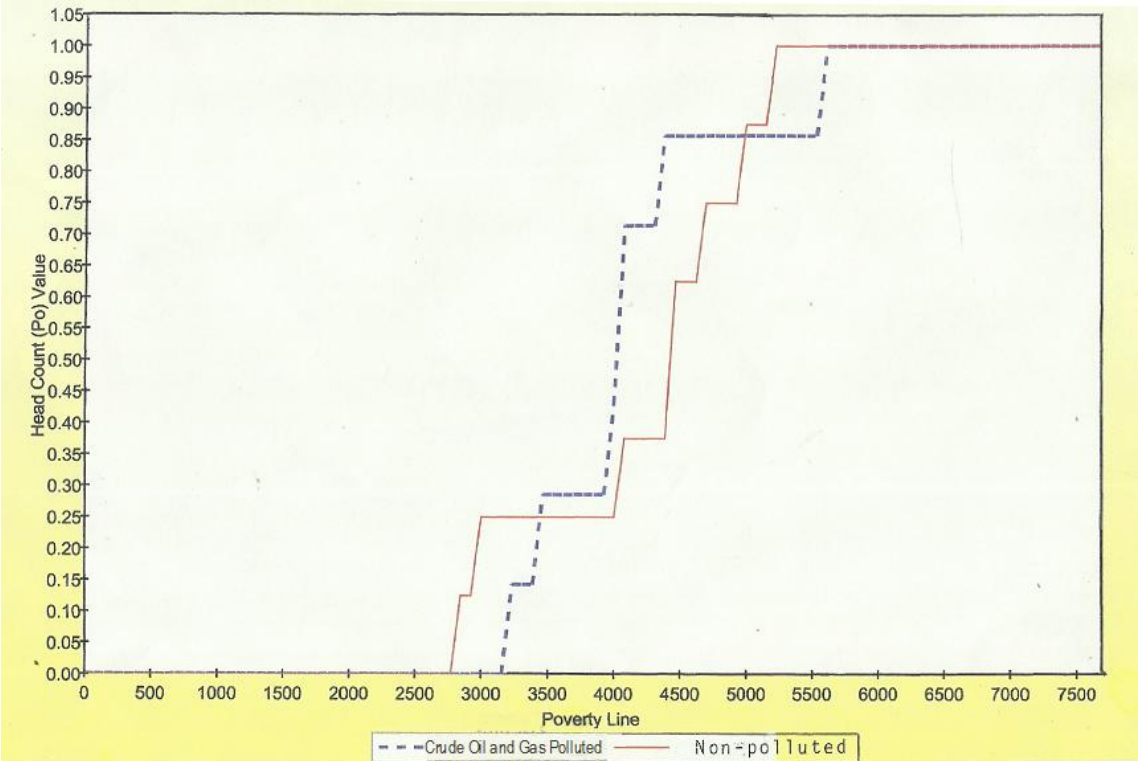

Figure 6. Stochastic poverty dominance of household heads that combined crop farming with other activities at P_0 (FSD)

However, poverty was more experienced in crude oil and gas polluted crop farming households than in non-polluted households; especially in the two main occupations that were popular in Rivers State, crop farming and fishing, during the period of this survey in 2003. Further the stochastic poverty dominance results showed that if fund is available from payment of compensation to diversify the means of livelihood, especially into trading, the poverty in the crude oil and gas polluted households seemed to be ameliorated.

Other occupation activities because of their menial nature and poor pay being received (including the civil service) could not really ameliorate the poverty level.

Therefore, this study concludes that crude oil and gas pollution on crop farms and fishing activities is detrimental and devastating to the livelihood of the rural and semi-urban inhabitants of Rivers State, Nigeria. Diversification of resources available (including payment of compensations to crop farmers whose crop farms had been adversely affected with crude oil and gas pollution) can afford the crop farmers the opportunity to invest in businesses that are far from crude and gas spillages and/or pollution (Okoji, 2002; Enemugwem, 2009; Ogege and Ewhrudjakpor, 2009; Ugbomeh and Atubi, 2010; Onyenekenwa, 2011).

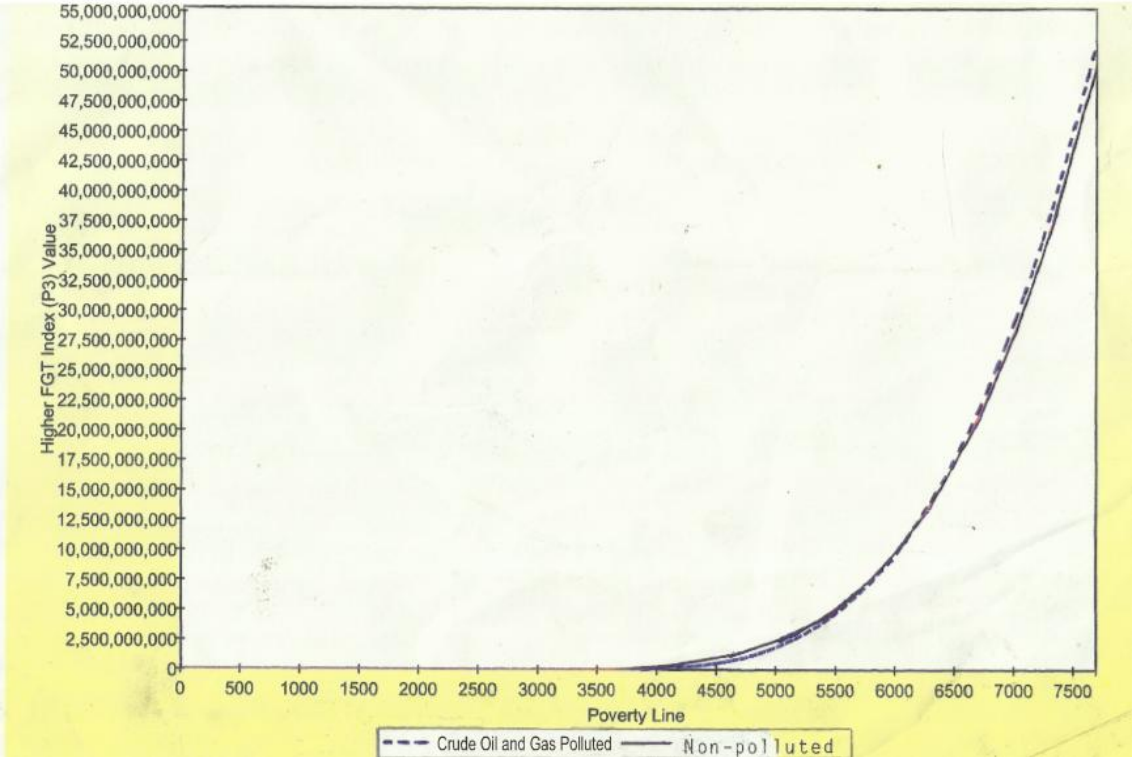

Figure 7. Stochastic poverty dominance of household heads that combined crop farming with other activities at P_3 (fourth order)

5. Conclusion and recommendations

5.1. Conclusion

The results analysed in this study using the various categories of occupations practiced by crop farmers in Rivers State, Nigeria found that there was poverty among crop farmers independent of the category of farms studied. In all crop farms surveyed, incidence of poverty (P_0) ranged from 45.5% - 62.5%, in crude oil and gas

polluted crop farms, 30.8% - 100% and in non-polluted crop farms, 37.5% - 66.7%. These high range of headcounts poverty indices proved that poverty existed in Rivers State, Nigeria.

Secondly, this study found out that poverty was higher in crude oil and gas polluted crop farmer households with an average P_0 of 63.5% as against 52.5% in the non-polluted crop farmer households. Poverty was worse in household that combined crop farming with fishing (P_0 = 100%) in crude oil and gas polluted area as against 66.7% in non –polluted farmland. Therefore, crude oil and gas pollution on farmland, streams, rivers, creeks, mangrove etc impoverished the inhabitants of Rivers State, Nigeria by destroying, devastating and adversely affecting the main occupations and hence the economy of the people.

Thirdly, the results of the stochastic poverty dominance revealed that poverty was higher in crude oil and gas polluted crop farming households than in non-polluted crop farms using the occupational statuses of those that did crop farming alone and those who combined it with fishing at P_1 (SSD) and P_3 (fourth-order stochastic dominance). These results supported the fact that crude oil and gas pollution on crop farms and rivers reduced, devastated and destroyed the productive capacity of crop farming and fishing, which are favourable occupations of the inhabitants of Rivers State, Nigeria.

Fourthly, the stochastic poverty dominance test on trading found out that if financial compensation were paid to crude oil and gas polluted crop farmers, thereby, empowering them to relocate from their polluted sites, and where possible, change occupations to trading and other off-farm activities that are not easily affected by crude oil and gas pollution, the affected crop farmers become financially stronger and therefore are better off compared to their non-polluted counterparts. The other activities because of their menial nature and poor pay received (including the civil service) could not really reduce the poverty level that existed.

Therefore, in conclusion, crude oil and gas pollution on crop farms, fishing activities and other natural occupations in Rivers State, Nigeria is detrimental, devastating and adversely affect the livelihood of the semi-urban and rural inhabitants of the state. However, relocation and diversification of available resources and their proper usage can ameliorate the high poverty levels experienced in this study.

5.2. Recommendations

To ameliorate the high level of incidence of poverty experienced in crude oil and gas polluted crop farmer households, this study recommends the followings:

i. The Rivers State crop farmers have no options than to continue to live with the problems of crude oil and gas pollution as far as our country Nigeria prospect for oil and gas and derive higher benefits from the oil industry than is obtainable from agriculture. This study therefore, recommends comprehensive scientific rehabilitation programmes for unavoidably polluted farmland (UNEP's Report, 2011; Platform, 2012).

ii. Due to loss of arable farmland, other heavy economic and environmental losses incurred by the inhabitants of Rivers State, Nigeria as a result of crude oil and gas pollution and/or spillages, this study recommends that adequate list of crude oil and gas pollution/spillages affected crop

farmers should be compiled and commensurate amount of compensations paid to such crop farmers promptly and in line with current economic trends in Nigeria. The compensations should be based on correct evaluations of crops and land area lost, which can be determined by experts (UNEP's Report, 2011). The compensations should be paid by oil and gas companies responsible for oil and gas exploration, exploitations and production activities and/or crude oil spillages at current prices.

iii. The study also recommends that such compensations should be properly utilized, so as to place the crop farmer in fairly stronger financial advantage. The crop farmer could relocate to an environment that is crude oil and gas pollution/spillage free and purchase another farmland and establish him/herself. To be more secured, the farmer could leave farming altogether and begin a fresh business such as trading that is far from crude oil and gas pollution.

Acknowledgement

I humbly acknowledge the Department of Agricultural Economics Postgraduate Coordinators, Faculty of Agriculture and Forestry and its Postgraduate Committee; and the Postgraduate School, all of University of Ibadan, Nigeria for their thorough review and co-ordination of my Ph.D thesis from where this research study is being reported. I also want to appreciate the management of Ignatius Ajuru University of Education, Rumuolumeni, Port Harcourt, Nigeria for keeping me on their employment list from where the financial resources for the conclusion of the research work was obtained. My best regards to other colleagues who made this research topic a concluded study at last.

References

Ajibade, I.T. and Awomuti, A.A. (2009), "Petroleum exploitation or human exploration? An overview of Niger Delta oil producing communities in Nigeria", *African Research Review,* Vol. 3 No. 2, pp. 111-124.

Amadi, A. (1990), "Effects of petroleum hydrocarbons on the ecology of the soil microbial and performance of maize and cassava", An unpublished Ph.D Thesis, Department of Agronomy, University of Ibadan, Ibadan, Nigeria

Anderson, J.R. (1974), "Risk efficiency in the interpretation of agricultural production research", *Review of Marketing and Agricultural Economics*, Vol. 42, pp. 131-184.

Anwar, T. (1996), "Structural adjustment and poverty: The case of Pakistan", *The Pakistan Development Review*, Vol. 35 No. 4, pp. 911-926.

Davidson, R. and Duclos, J. (2013). "Testing restricted stochastic dominance", *Econometric Reviews*, Vol. 32 No. 1, pp. 84-125.

Duclos, J., Araar, A. and Fortin, C. (2002), "DAD 4.2: A software for distributive Analysis/analyse distributive MIMAP programme", International Development Research Centre, Govt of Canada and CREFA, Universite Laval, August.

Ekanem, S.A., Ejue, B.J., Amimi, P.B. and Adalikwu, R.A. (2010), "Living with oil: Towards an ethics of the environment in the Niger Delta," *African Research Review*, Vol. 4 No. 3, pp. 17-30.

Ekpo, S.E. (1981), "Well-head subsidence: An emergent oil exploration problem in the Niger Delta Area", *Journal of Mining and Geology*, Vol. 18 No. 1, pp. 81-85.

Enemugwem, J.H. (2009), "Oil pollution and eastern Obolo human ecology, 1957-2007", *African Research Review*, Vol. 3 No. 1, pp. 136-151.

Fernandez-Luqueno, F., Corlay-Chee, L., Robledo - Santoyo, E., Pineda-Pineda, J., Vazquez-Alarcon, A., Miranda-Romero, L.A., Cabrera-Lazaro, G., Mendez-Bautista, J., Lopez-Valdez, F. and Dendooven, L. (2012), "Growth and development of common vetch (vicia sativa L.) in a gasoline-polluted soil amended with organic or inorganic amendments", *African Journal of Agricultural Research*, Vol. 7 No. 8, pp, 1259-1267.

Figueroa, J.L. (2013), "Distributional effects of opportunities on early child development," Universiteit, Gent, Working Paper 2013/840, pp. 1-37.

Foster, J., Greer, J. and Thorbecke, E. (1984), "A class of decomposable poverty measures", *Econometrica*, Vol. 52, pp. 761-766.

Haji, J., Aman, M. and Gebo, A. (2013), "Impact of integrated urban housing development programme on household poverty alleviation: Adama City, Oromia Regional National State, Ethiopia," *Asian Journal of Empirical Research*, Vol. 3 No. 3, pp. 237-250.

Kramer, R.A. and Pope, R.D. (1981), "Participation in farm commodity programs: A stochastic dominance analysis", *American Journal of Agricultural Economics,* Vol. 63, pp. 119-128.

Kuiper, M. and Ruben, R. (2007), "Poverty targeting, resource degradation and heterogeneous endowments-A micro simulation analysis of a less-favoured Ethiopian village", *Agricultural Economics*, Vol. 37 No. 2-3, pp. 151-158

Kurosaki, T. (2003), "Measurement of chronic and transient poverty: Theory and application to Pakistan", *Discussion Paper Series A No. 436*, Hitotsubachi University, Institute of Economic Research (IER), Tokyo, Japan. March. Accessed 14/7/14.

Kurosaki, T. (2009), "Vulnerability in Pakistan 2001-2004", Institute of Economics Research (IER), Hitotsubachi University, Tokyo, Japan. March. Accessed 14/7/14.

Levine, S. and Roberts, B. (2012), "Robust estimates of changes in poverty and inequality in post-independence Namibia, International Policy Centre for Inclusive Growth (IPC). *Working Paper No. 102,*. pp. 1-30. www.ipc.undp.org.Accessed 27/08/2014.

Maertens, M. and Swinnen, J.F.M. (2009), "Trade standards and poverty. Evidence from Senegal", *World Development*, Vol. 37, Issue 1, pp. 161-178

Mastaller, M. (1996), "Destruction of mangrove wetlands-causes and consequences", *Natural Resources and Development*, Vol. 43/44, pp. 35-57.

Mkenda, A.F., Luvanda, E.G. and Ruhinduka, R. (2010), "Growth and distribution in Tanzania: Recent experience and lessons". *Final Report submitted to REPOA*, March 2010.

Mkenda, A.F., Luvanda, E.G., Rutasitara, L. and Naho, A. (2004). "Poverty in Tanzania: Comparisons across administrative regions," *An Interim Report of Govt. of Tanzania*, Vol. 4, pp. 1-21.

Nanivazo, M. (2014), "First order dominance analysis:, child well-being in the Democratic Republic of Congo", *WIDER Working Paper 2014/15.* United Nations University (UNU-WIDER), pp. 1-22. wider.unu.edu

Nyankori, J.C.O. (2009), "Beyond food production. The role of agriculture in poverty reduction", *American Journal of Agricultural Economics*, Vol. 91 No. 1, pp. 294-295.

Ogege, S.O. and Ewhrudjakpor, C. (2009), "The dynamics of sustained environmental resource crisis in the Niger Delta region of Nigeria: A theoretical periscope*," African Research Review,* Vol. 3 No. 2.

Ojimba, T.P. (2011), "Economic evaluation of crop farms acquired for crude oil production activities in Rivers State, Nigeria", *African Research Review* , Vol. 5 No. 2, pp. 279-292.

Ojimba, T.P. and Iyagba, A.G. (2012), "Effects of crude oil pollution on horticultural crops in Rivers State, Nigeria", *Global Journal of Science Frontier Research,* Vol. 12, Issue 4, pp. 37-44.

Ojimba, T.P., Okoruwa, V.O. and Omonona, B.T. (2015), "Poverty and Stochastic dominance comparison using educational status of crude oil polluted crop farms in Rivers State, Nigeria", *Asian Journal of Agricultural Extension, Economics and Sociology*, Vol. 7 No. 4, pp. 1-19.

Okoji, M.A. (2000), "Petroleum oil and the Niger Delta environment", *International Journal of Environmental Studies,* Vol. 57, Issue 6, pp. 713-723.

Okoji, M.A. (2002), "Social implications of the petroleum oil industry in the Niger Delta", *International Journal of Environmental Studies*, Vol. 59, Issue 2, pp. 197-210.

Okoli, C.G. (2006), "Rural households' perception of the impact of crude oil exploration in Ogba/Egbema/Ndoni Local Government Area of Rivers State, Nigeria. *Journal of Agriculture and Social Research* (JASR), Vol. 6 No. 2, pp. 86-91.

Onyenekenwa, C.E. (2011), "Crippling poverty amidst corporate social action: A critique of peripheral corporate community involvement in the Niger Delta region of Nigeria", *Asian Journal of Rural Development,* Vol. 1 No. 1, pp. 1-20.

Osuji, L.C. (1998), "Some environmental effects of crude oil spillage in two sites in Rivers State of Nigeria," An unpublished Ph.D Thesis, Department of Crop Protection and Environmental Biology, University of Ibadan, Ibadan, Nigeria.

Osuji, L.C. and Nwoye, I. (2007), "An appraisal of the impact of petroleum hydrocarbon on soil fertility: the Owaza experience". *African Journal of Agricultural Research*, Vol. 2 No. 7, pp. 318-324.

Owuor, G., Ngigi, M., Ouma, A.S. and Birachi, E.A. (2007), "Determinants of rural poverty in Africa: The case of small holder farmers in Kenya," *Journal of Applied Science*, Vol. 7, pp. 2539-2543.

Platform (2006a), "Nigeria: Oil pollution in the Niger Delta", www.carbonweb.org/showitemasp?article=73...7.. Accessed 22/08/2009.

Platform (2006b), "Oil and poverty", available at: www.carbonnweb.org/showitemasp?article=73…7, Accessed 22/08/2009.

Platform (2012), "What is the carbon web. Places, Nigeria. Oil pollution in the Niger Delta"; Platform, 26th May, 2012 Accessed 14/03/2013.

Quisumbing, A.R., Haddad, L. and Pena, C. (2001), "Are women over represented among the poor? An analysis of poverty in ten developing countries", Food Consumption and Nutrition Division, International Food Policy Research Institute (IFPRI), Washington DC. USA, Fund Discussion Paper No. 115, pp. 1-66.

Ravallion, M. (1992), *"Poverty Comparisons: A Guide to Concepts and Methods"*, Living Standards Measurement Study Working Paper, No. 88, Washington DC. USA, World Bank.

Shively, G.E. (1999), "Risk and returns from soil conservation: Evidence from low-income farms in the Philippines", *Agricultural Economics,* Vol. 21 No. 1, pp. 53-67.

Ugbomeh, B.A. and Atubi, A.O. (2010), "The role of the oil industry and the Nigerian State in defining the future of the Niger Delta region of Nigeria", *African Research Review,* Vol. 4 No. 2 pp. 103-112.

UNEP's Report (2011), "UNEP Ogoniland oil assessment reveals extent of environmental contamination and threats to human health," United Nations Environmental Programme (UNEP), August 4, 2011, Accessed 12/03/13.

Zacharias, T.P. and Grube, A.H. (1984), "An economic evaluation of weed control methods used in combination with crop rotation: A stochastic dominance approach", *North Central Journal of Agricultural Economics*, Vol. 6, No. 1, pp. 113-120.