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# Measuring Poverty with Demographic Variables in Crude Oil and Gas Polluted Crop Farms in Rivers State, Nigeria

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**ABSTRACT:** This study focused on measuring poverty with demographic variables in crude oil and gas polluted crop farms in Rivers State Nigeria. A total of 296 questionnaires were used for analysis. The results showed that extent of poverty ($P_0$) on age of household heads was highest in crude oil polluted crop farms (64.20%) as compared to 53% in non-polluted and 57.80% in all crop farms surveyed. The $P_0$ ratio on gender of household heads indicated that more male headed households were poor (72.20%) in the crude oil polluted crop farms as against 55.30% in non-polluted and 55.80% in all crop farms surveyed. The $P_0$ measure on marital status of household heads in crude oil polluted crop farms was higher (69.10%) as compared to 49.8% in non-polluted and 59.60% in all crop farms surveyed. In conclusion, there was higher level of poverty experienced among crop farmers in crude oil and gas polluted areas in Rivers State, Nigeria.

**Keywords**: Household heads poverty, headcount, poverty gap, poverty severity, FGT, demographic variables, crude oil and gas polluted crop farms, Rivers State Nigeria.

## 1.0 INTRODUCTION

In the Niger Delta region of Nigeria millions of barrels of crude oil had been spilt into the environment. Leaking pipelines, running through villages, farms, creeks and rivers of the area, are a major source of crude oil pollution, sickness and economic ruin for the people of the region (Okoli, 2006; Platform, 2012). Farmland polluted by crude oil had destroyed livelihoods and are rarely rehabilitated (Ugbomeh and Atubi, 2010, Platform, 2012). As at today, these spillages are a regular feature of life in the Niger Delta. The burgeoning trade in stolen oil means that local people tap into lines and wells damaging them or leaving them leaking. Sabotage of pipelines is common, often by local people hoping to get cash compensation.

Gas flaring in the Niger Delta had become a source of pollution for the local people and the biggest single source of $CO_2$ in Africa (Platform, 2012). As oil production increased, Nigeria has become the world's biggest flarer both proportionally and absolutely, with more than 2 billion standard cubic feet per day being flared. Local people within the Niger Delta region, living around the gas flares (many of which are close to villages and agricultural land), feel the impacts which include food insecurity, increasing risks of diseases and rising costs of extreme weather damage (Dung, Bombom and Agusomu, 2008). The flares contribute to acid rain and villagers have continued to complain of the rain corroding their roofs and buildings (Nkwocha and Pat-Mbano 2010; Ekpoh and Obia, 2010; Nwaichi and Uzazobona, 2011; Platform, 2012). They live alongside the flares with no protection, fishing and farming. The oil boom had become a doom, and an epitome of hunger and poverty.

### 1.1 The problem of the study

Nigeria is among the fifteen poorest countries in the world and 70% of its people live below the poverty line, despite its being the leading oil and gas producer and earner in the region. There is perhaps no greater example of the resource curse than Nigeria (Platform 2012). In 1958, the first tanker of oil left Nigeria for London. In 1965, the first signs that local people were disturbed by the industry's impact on their lives became apparent. However, the Niger Delta inhabitants had hoped that a solution would be found for the crude oil and gas pollution caused by oil and gas drilling in the area, that served to ruin the livelihoods of those that depended on the land. But after more than 50 years of oil exploration and exploitation in the Niger Delta region the area remains mired in poverty and embroiled in conflict too difficult for the Nigerian government to handle (Platform, 2012).

Onwuka (2005) reported that crude oil and gas activities in the Niger Delta had damaged the fertility

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of the soil, and destroyed wildlife and breeding ground and gas. Consequently, the indigenous people had been impoverished, with attendant increase in environmental abuse occasioned by their struggle for survival. Onyenekenwa (2011) findings showed that poverty indicators were worse in the Niger Delta region, where petroleum oil corporations operate than in other geo-political zones of the country, where there is no oil exploration, hence the attendant restiveness in the Niger Delta.

Ugbomeh and Atubi (2010) observed that crude oil exploration, exploitation and distribution had created huge land and water scarcities that has under pinned family, intra-communal, inter –communal and inter-ethnic feuds, conflicts and war. The crude oil economy has disinherited and dislocated the local people who are dependent on the primary economies on farming, fishing and hunting. Therefore, the people were impoverished.

The problem of this study therefore, is to measure and ascertain the level of poverty that exists using demographic variables in crude oil polluted crop farms in Rivers State, Nigeria. Crude oil and gas pollution in this text include oil spilled farmland, areas of farmland occupied by flow stations, oil well, gas flaring sites, borrow pits, pipeline laying, and other crude oil and gas exploration and exploitation activities. The Niger Delta region of Nigeria consist of the following states: Abia, Akwa Ibom, Bayelsa, Cross Rivers, Delta, Edo, Imo, Ondo and Rivers States. The demographic variables intended for use in this study include age, gender and marital status. Crude oil pollution will include crude oil and gas pollutions (spillage, damages and acquisitions).

### 1.2 The significance of the study

Literature mentioning poverty and impoverishment of the indigenes and people living in the Niger Delta exist (Ekanem, Ejue, Amini and Adalikwu, 2010; UNEP Report, 2011; Platform, 2011). Scientific researches that dealt with the effect of crude oil and gas pollution in Nigeria on impoverishment of the people living in the Niger Delta region exist (Mubana, 1978; Okoli, 2006; Onyenekenwa, 2011). However, none of these researchers had given details of the measurement of poverty level using demographic variables in crude oil polluted crop farms in Rivers State, Nigeria.

The United Nations Environmental Programme (UNEP) Reports (2011) on Ogoniland (eastern part of Rivers State, Nigeria) oil assessment revealed the extent of environmental contamination and threats to human health. The UNEP Report (2011) showed that pollution from over 50 years of oil operations in the Niger Delta region has penetrated further and deeper than many may have supposed. When an oil spill occurs on land, fires often break out, killing vegetation and creating a crust over the land, making remediation or re-vegetation difficult (Otitoloju, Are and Junaid, 2007). At some sites, a curst of ash and tar has been in place for several decades (making farming activities, impossible). It is unacceptable that the oil companies continue to deny responsibility, while pushing the host communities deeper into poverty (Platform, 2011).

Ekanem et al. (2010) reported that the Niger Delta land had been ravaged through oil exploration, the women had been raped by soldiers, their leaders had been murdered and youths stained by state security operatives. The trans – national companies operating in the region carryout their operations without due considerations being given to the quality of living of the people in the area, with their deteriorating living condition, deprived means of livelihood through pollution of their sources of water (rivers), destruction of their farmland through spillages from oil pipelines, and exploration activities.

Okoli (2006) informed that Ogba/Egbema/Ndoni local government area of Rivers State, Nigeria was one of the largest reservoirs of crude oil in Nigeria and has experienced oil exploration and exploitation activities for many decades. The exploration of crude oil and gas in Nigeria is a major industrial development but its negative consequences concern the destruction of delicate ecology, which is a main source of livelihood in the oil bearing communities. In the process of oil exploration, land are acquired where pipeline terminals and platforms are sited. When land is cleared for the laying of pipes for example, agricultural land and ponds are usually destroyed. The effects of these completely changed the social, economic and cultural life of the communities where crude oil exploration is taking place.

Onyenekenwa (2011) reported that poverty has become a persistent challenge to development in developing countries including Nigeria the most populous African nation. Inspite of huge revenue from the petroleum industry, Nigeria remains among the poorest countries in the world (Platform, 2012). About 92.4% of the Nigerian population live in poverty on less than $2 per day, while 70.8% lives in extreme poverty on less than $1 per day. Absolute poverty incidence rose persistently from 27% of the population in 1980 to 42.7% in 1992, 65.6% in 1996, 70% in 1999 and 70.8% in 2006 (Onyenekenwa, 2011).

### 1.4 The objectives of the study.

The main objective of this study is to measure and compare poverty levels in crude oil polluted and non-polluted crop farms in Rivers State, Nigeria using demographic variables. The specific objectives are stated as follows:

(i) Measure and compare poverty levels by

age of household heads in crude oil polluted and non-polluted crop farms in Rivers State, Nigeria.

(ii) Estimate and compare the poverty levels by gender of household heads in crude oil polluted and non-polluted crop farms.

(iii) Determine and compare the poverty levels by marital status of household heads in crude oil polluted and non-polluted crop farms.

(iv) Suggest policy statements that could alleviate poverty in households with crude oil pollution on their farms.

## 2.0 LITERATURE REVIEW

Ravallion (1992) said that most important reason for measuring poverty is probably not the need for a single number for some place and data, but rather to make a poverty comparison. This is an assessment of which one of these situations has more poverty. Poverty comparison may be either qualitative or quantitative. The text provided a guide to the main ways that the analyst could fruitfully go about making poverty comparison. The expositions include measurement and derivations of poverty lines, measurement of poverty using the three Foster, Greer and Thorbecke (1984) (FGT) measures of headcount, poverty gap and severity of poverty.

Coulombe and Mckay (1996) used household characteristics as explanatory variables which included demographic, education and sector-specific variables to determine poverty in Mauritania. Appleton (1996) argued that there was gender inequalities in educational attainment which disadvantaged women in general and women headed households ceteris parious in Uganda. Second, for some women headed households, this disadvantage was off set by high remittance receipts.

Shaffer (1998) surveyed households in Republic of Guinea in relationship to gender, poverty and deprivation. The survey considered gender and consumption poverty with particular attention to measurement issues, incidence, intensity and severity of poverty using Foster et al. (1984). The results obtained showed that P % values at all poverty lines proposed were higher for men headed households than female headed households. Omonona (2001) examined poverty and its correlated among rural farming households in Kogi State, Nigeria. The data were analysed using FGT weighted poverty index. The results showed that 58% of the households surveyed were poor, 21% were deep in poverty while severity of poverty was 10% among farmers in Kogi State, Nigeria.

Barrientos, Gorman and Heslop (2003) provided a perspective on old age poverty. It reviewed available evidence on the incidence of old age poverty emerging from survey data analysis and from qualitative participatory studies, which indicated that old age poverty was a significant issue in the developing countries. Bokosi (2007) used demographic variables to determine household poverty dynamics in Malawi applying such variables as marital status, age, sex and number in the households below the age of 10 years and number in the households above the age of 10 years respectively, though the result were not significant.

Owuor, Ngigi, Ouma and Birachi (2007) results showed that age was among the variables that significantly reduced the probability of the household staying below the poverty line. On the contrary, female gender increased the probability of households remaining below the poverty line. Owuor et al. (2007) further discussed that household age showed negative and significant effect of age at the 1% level of significance, implying that the older the decision maker, the lower the probability of such households remaining in poverty. This indicated that older decision makers, have accumulated more wealth over time making them relatively richer as compared to younger decision makers. Besides, age is conventionally used as a quasi for farming experience, whereby many years in farming is associated with better management and higher expected output. Households headed by females on the other hand had a higher probability of staying below poverty, echoing the nature of structures of many rural communities in Africa. Majority of females in Africa have no legal right to property making them unable to offer asset security in either credit or product market. Such differential access to productive assets and inputs leads to inequality in welfare. Consequently women led households continue to languish in poverty.

Medeiros and Costa (2008) proposed two different concepts of feminization of poverty and analyzed household survey data to verify if there was an ongoing feminization of poverty in eight Latin American countries according to each of these concepts. They concluded that poverty may be higher among women, but there is no clear evidence of a recent and widespread feminization of poverty in the countries studied.

Bello, Toyebi, Balogun and Akanbi (2009) used demographic variables to assess poverty alleviation programmes in Kwara State, Nigeria. The demographic results showed that 53.6% of the respondents were males, 46.4% female, with the majority found within the age range of 25 and 40 years while only 46.4% was found in the age range of 41 – 60years. Eighty percent of the total population was married, 13% single, 1.3% widowed and 0.3% divorced. The data were analyzed using FGT poverty

measures. Ogunleye (2010) said gender was a prevalent factor in poverty escalation. Overall, women in Nigeria had access to fewer economic resources and have far less social and political power than do men, which greatly restricts their opportunities to climb out of poverty.

Gasparini, Alejo, Haimovich, Olivieri and Tomarolli (2010) studied poverty among older people in Latin America and Caribbean, based on household survey micro data from 20 countries. The situation of the older people was characterized in terms of income, education, health and access to services vis-à-vis the rest of the population.

Okoli (2006) observed that the advent of crude oil has caused a lot of havoc to the general social and moral life standards especially of the youths from the oil producing communities. The results showed various impacts of oil exploitation on health of the inhabitants with 38.10% of the inhabitants reporting that they were affected by fever due to heat generated by gas flares and pollution of their environment including their waters, 23.81% and 19.05% of them indicated that they suffered from various gastro-enteric disorders contacted by drinking rain water, water from polluted rivers and streams or consumption of fish from polluted water bodies.

Chovwen, Alarape and Asagba (2009) reported that the Niger Delta region of Nigeria had been plagued with recurrent crisis emanating from perceived injustice, degradation and neglect of residents in such areas. The study investigated the influence of personal and social variables such as locus of control and social support on adjustment to stressful life event resulting from incessant crisis. The findings indicated that females perceived their experiences to be more stressful than males.

## 3.0 METHODOLOGY

### 3.1 Data collection

This study was conducted in 17 local government areas (LGAs) of Rivers State, Nigeria in 2003. The state is blessed with abundance of majority of Nigeria oil and gas deposits. The oil fields, their production and exploration are scattered in all LGAs of Rivers State.

Data were collected for this study using a multistage sampling procedure. The primary data were collected through personal interviews and observations with the crop farmers, and structured questionnaires distributed among crop farmers in crude oil polluted and non-crude oil polluted farmland of an affected community in the state. The first stage of the multistaged technique involved the selection of 17 LGAs out of the existing 23 LGAs in Rivers State, Nigeria. These 17 LGAs were selected based on the fact that they were more crop farming inclined than others. The LGAs under consideration include, Abua/Odual, Ahoada East, Ahoada West, Andoni, Asaritoru, Degema, Eleme, Emohua, Etche, Gokana, Ikwerre, Khana, Obio-Akpor, Ogba/Egbema/Ndoni, Omuma, Oyigbo and Tai LGAs.

The second stage involved the stratification of farmland in an LGA into two sampling units namely crude oil polluted and non-crude oil polluted. This stratification of the farming population into two sampling units was based on the fact that information was needed from both crude oil polluted and non-polluted areas. This stage was accomplished using the list of farmers whose farmland was polluted between 2001 and 2003.

The third stage involved the random sampling of ten (10) farmers from crude oil polluted farmland in a selected LGA and a corresponding number of ten (10) farmers from non-crude oil polluted farmland in the some locality (community) in the given LGA. This summed to twenty (20) farmers interviewed per selected LGA in the state. Ten farmers only were sampled for easy surveying and enumeration during random sampling, cost effectiveness and ensuring that the differences in crop production in the number of crude oil polluted and non-polluted farmland in the different LGAs can easily be compared.

Thus, a total of 340 questionnaires were distributed among crop farmers in the 17 LGAs selected in the state. Out of the 340 questionnaires sampled, due to difficult terrain, politicking of oil pollution issues and youth restiveness (Chowen et al., 2009; Ekanem et al., 2010) in the state as at the time of the survey, only 326 questionnaires that were retrieved. Furthermore, 30 questionnaires were found inconsistent with the set objectives of this study, therefore only 296 questionnaires were retained as suitable for analysis.

### 3.2 Poverty measurement

Rather than discuss all of the measures of poverty used or proposed in poverty measurement, this study focused on three main measures, all of which are members of the class of measures proposed by Foster, Greer and Thorbereke (1984). They are: the headcount index H ($P_0$), the poverty – gap index PG ($P_1$) and the Foster – Greer – Thorbecke (FGT) $P_2$ measure (severity of poverty). However, rather than treat these measures as alternative measures, they had been interpreted as measures of three different things: the headcount index ($P_0$) which is a measure of the prevalence ( or incidence) of poverty, the poverty – gap index ($P_1$) is a measure of the depth of poverty, while the $P_2$ measures the severity of poverty.

The simplest (and still most common) measure is the headcount index of poverty, given by the proportion

of the population for whom consumption expenditure (or another suitable measure of living standard) y is less than the poverty line z. Suppose q people are poor by this definition in a population of size n. Then the headcount index is

$H = q/n$ …….. Eq. (1)

i.e proportion of total population deemed to be poor. The headcount index is easily understood and communicated. And for certain sorts of poverty comparisons, such as assessing overall progress in reducing poverty, it may be quite adequate (though preferably always calculated for at least two poverty lines). However, for some purposes, including analyses of the impacts on the poor of specific policies, the head-count index has a serious drawback. To see why, suppose that a poor person suddenly becomes very much poorer. What will happen to measured poverty? Nothing. The headcount index is totally insensitive to differences in the depth of poverty.

A better measure is the poverty gap based on the aggregate poverty deficit of the poor relative to the poverty line. This gives a good indication of the depth of poverty, in that it depends on the distances of the poor below the poverty line.

To see how this measure is defined, let consumption expenditures be arranged in ascending order, the poorer has $y_1$, the next poorest $y_2$, etc, with the least poor having $y_q$, which is (by definition) not greater than the poverty line z. Then, the poverty gap index can be defined as follows (Ravallion, 1992).

$$PG = \frac{1}{n} \sum_{i=1}^{q} \left( \frac{z - yi}{z} \right) \quad \text{.....Eq (2)}$$

i.e. mean proportionate poverty gap across the whole population (zero gap for the non-poor). One drawback of the poverty gap measure is that it may not convincingly capture differences on the severity of poverty $P_2$).

A measure of the severity of poverty which is additive is the Foster – Greer – Thorbecke (FGT) $P_2$ measure whereby the poverty gaps of the poor are weighted by those poverty gaps in assessing aggregate poverty. Thus, Ravallion (1992) presented the formula as:

$$P_2 = \frac{1}{n} \sum_{i=1}^{q} \left( \frac{z - yi}{z} \right)^2 \quad \text{.....Eq (3)}$$

i.e. mean of squared proportionate poverty gaps.

The FGT poverty measure for a given poverty index (%) was defined over a continuous variables of which has support in non-negative real numbers (Ravallion, 1992; Duclos, Araar and Fortin, 2002).

$$P\% = \int_{0}^{q} \left( \frac{z - y}{z} \right) dy \quad \text{.....} \quad \text{Eq. (4)}$$

where, P% = weighted poverty index
q = the number of households in poverty
y = the per adult equivalent expenditure of household
z = the poverty line
% = 0,1,2 (i.e. the degree of concern for the depth of poverty, where % = $H_0$ (or $P_0$); $\%_1$ = PG (or $P_1$) ; $\%_2$ = $P_2$).

## 4.0 RESULTS AND DISCUSSIONS.

Measurement of poverty levels by age, gender and marital status were discussed in Tables 1 – 3 respectively. Estimates of the extent of poverty (headcount ratio, $P_0$), depth of poverty (poverty gap, $P_1$) and severity of poverty (intensity, $P_2$) had been generated on the Tables 1 – 3. Also generated with these poverty measures is the percentage frequency of poverty for the poor and non-poor crop farmers and the contributions to each poverty measure to overall population (McKinley and Alarcom, 1995).

### 4.1 Poverty levels by age of household head

The measurement and comparison of poverty by age of household head in the study area are shown on Table 1. The table presents the percentage frequency amongst different age groupings, the poverty measures and contribution of each measure to overall

population that is poor. Table 1 shows that majority of poor farmers in all farms surveyed in Rivers State were between the ages of 40 years and above. The table also shows that 57.09% of them were poor using age as a variable; while 42.91% of them were non-poor. T-test analysis was conducted on all decomposed variables while figures in parentheses in Table 1 were standard error values.

In order to more concretely understand the extent (prevalence or incidence), depth or severity of poverty, we decomposed the age of household heads as in Table 1. For each of the groups, estimates were generated for the extent (headcount), depth (poverty gap) and severity (intensity) of poverty, and the contributions of each poverty measure to the whole population.

**(Place Table 1 here)**

Table 1 shows that in the headcount ($P_0$) poverty measure in all farms surveyed category, about 77.8% of the household heads within the age group of 20 – 29 years were poor, about 72.6% of household heads within the age bracket of 60 years and above were poor, whereas up to 64% of the crop farmers households in the age bracket of 30 – 39 years of age were poor (all significant of 1% level). The highest contributions to the overall poverty from the headcount measure were those within the age group of 60 years and above (31.78%), 40 – 49 years of age (29.86%) and 50 – 59 years age (24.01%).

The poverty gap gives a good indication of the depth of poverty, in that it depends on the distances of the poor below the poverty line (Ravallion, 1992). Table 1 shows that about 19.7% of the household heads within the age bracket of 20 – 29 years were deep in poverty (significant at 1%) while 11.6% of household heads within the age group of 60 years and above were involved in deep poverty (significant at 1%). The latter age group of farmers contributed about 32.18% in poverty gap ($P_1$), followed by 40 – 49 years of age (30.87%) and 50 – 59 years of age (23.24%). This study found out that the likelihood of poverty gap is expected to be greater in households headed by younger or elderly persons as earlier observed by Rodriguez and Smith, (1994); Barrientos et al., (2003); Owuor et al. 2007; Gasparini et al (2010).

In the poverty severity index ($P_2$) about 2.2.% of the age group (i.e. 30 – 39 years) were severely poor, that means they belonged to the poorest of the poor group of farmers, statistically significant at 5% level of significance. Also severely poor were the oldest group interviewed (60 years and above) with 4.3% poverty severity (significant at 5%). The latter group contributed about 35.86% to the total poverty in $P_2$ measurement. Others whose contributions were significantly higher were 40 – 49 years of age (31.28%) and 50 – 59 years of age bracket (20.38%). These three age brackets discussed above contributed 87.52% of the entire poverty in the poverty severity $P_2$ section, 85.65% in the extent of poverty ($P_0$) and 85.29% in the poverty depth levels. Reasons for this contribution could be that old age reduces labour productivity. These results showed that poverty was wide spread in Rivers State. Nigeria among households heads involved in crop farming (Onyenekenwa, 2011).

In crude oil polluted crop farms 64.24% of the farmers were poor while 35.76% were not poor. The headcount ($P_0$) estimate (0.642) significant at 1% level confirmed the frequency percentage calculation mentioned above. In the $P_0$ poverty measure in crude oil polluted crop farmers household heads, the results of the decomposed groupings showed that poverty ranged from 59.5% in 40 – 49 years age grouping to 91.7% in 20 – 30 years grouping (all significant at 1% level). However, household heads who were above 40 years contributed up to 82.1% of the poverty that existed in the headcount ($P_0$) measurement.

The poverty gap (depth) $P_1$ measured among crude oil polluted crop farmers household heads results showed that depth of poverty ranged from 9.2% in 30 – 39 years age grouping to 17.8% among 20 – 29 years of age significant between 1% - 5% respectively. Majority of the poverty gap measured (83.25%) was contributed by household heads who were 40 years and above in the crude oil polluted crop farms. Poverty severity index ($P_2$), showing the poorest of the poor showed results ranging from 1.7% to 4.9% (results were significant between 1% - 10% for crop farmer household heads age groupings of 30 – 39 years and 20 – 29 years respectively. Again crop farmers whose age were above 40 years contributed significantly (86.48%) to the overall poverty in the $P_2$ measure. This goes to say that in the crude oil polluted crop farmer households, the household heads who were 40 years and above contributed significantly towards the overall poverty situation as earlier observed in all farms surveyed. However, poverty was very high among 20 – 29 years of age household heads in the three poverty measures of $P_0$, $P_1$, $P_2$ used.

Among the non-polluted crop farmer household heads, percentage frequency of poverty showed that 51.47% of the farmers were poor while 48.53% were not poor. The cumulative total of headcount ($P_0$) measure estimated was 0.530 (53%), statistically significant at 1%. There was a case of absolute poverty (1.0 ) or 100%poor among the age grouping of 20 – 29 years of age. This is a surprising result in the non-polluted crop farmers household. However, poverty measures by headcount (prevalence) ranged

from the coefficient of 0.391 (39.1%) to 1.0 (100%), all statistically significant at 1%. In the poverty gap measure, household heads poverty ranged from 0.055 (5.5%) among 50 – 59 years of group to 0.235 (23.5%) among the 20 – 29 years age, statistically significant between 1% – 10%. In the contributions to the overall poverty situation in non-polluted crop farm household heads, in $P_{0,}$ those crop farmers who were 40 years and above contributed 89.22% of poverty existing and 88.69% at the $P_1$ level. In the poverty severity ($P_2$) measure, the coefficients estimated ranged from 0.016(1.6%) among the 50 – 59 years of age (significant at 10% ) to 0.055 (5.5.%) among the age grouping of 20 – 29 years (statistically significant at 1%). Again the contribution to overall poverty situation in the measurement of poverty in $P_2$ group was highest amongst those household heads that were above 40 years of age (89.14%). These results are similar to Omonona (2001).

Comparing the three groups of crop farms used for the study, the results showed that the percentage frequency of poverty measured in crude oil polluted crop farms households was highest (64.29%) as compared to 51.4% and 57.09% in non-crude oil polluted crop farms and all crop farms surveyed households categories respectively. The study also showed that the household heads not poor during the period of survey were least in crude oil polluted crop farms category (35.76%) as against 48.53% and 42.91% non – poor crop farmers in non polluted crop farms and all crop farms surveyed households respectively. The extent of poverty (incidence, prevalence or headcount) index showed that cumulative total result of the estimated coefficients of poverty, $P_0$ measure, in crude oil polluted crop farms revealed that 0.642 (64.2%) poverty existed among the household heads, while poverty prevalence was lower among non-polluted crop farmers (0.530) 53.0% and 0.578 (57.8%) among all farms surveyed. This confirms the fact that crude oil polluted crop farmer households were more affected by poverty, which had a serious economic welfare effect.

From the ongoing analysis this study states that poverty existed in Rivers State, Nigeria despite its crude oil richness during the period of survey by age of household heads parameter. Poverty was highest amongst the youth (20 – 29 years) using all poverty measures of $P_0$, $P_1$ and $P_2$ respectively in all categories of farm households considered (Owuor et al. (2007). This could explain the youth restiveness later observed by Okoli (2006), Chovwen et al. (2009). This study also found out that the highest level of poverty was contributed by household heads 40 years and above in all poverty measures used and in all categories of farm household heads studied (Barrientros et al., 2003. Gasparini et al., 2010). However, the results deferred from that of Owuor et al (2007) who said the older the decision maker, the lesser the probability of remaining in poverty. There was higher level of poverty in crude oil polluted crop farms household heads than in other categories of crop farms household heads studied.

### 4.2 Poverty level by gender of household head.

The measures of poverty by gender of household heads in the study area are presented in Table 2. In all farms surveyed a total of 57.09% of the household heads were poor while 42.91% were categorized as non-poor. The table results showed that more of the males were affected by poverty (49.32%) whereas more women were said to be non-poor (14.19%) compared to 7.77% said to be poor. In the FGT poverty measures, the headcount ratio indicated that there was more prevalence of poverty among the females headed households (61.5%) than among the males headed households (55.8%), both significant at 1%. This result is similar to the results of Appleton (1996), Owuor et al. (2007). However, their contribution to poverty in the population amongst the women headed households (38.28%) was by far lower than that of the men headed households (61.72%). The depth and severity of poverty results were almost the same; males (9.8% and 2.8%) and females (9.6% and 2.5%), respectively. The contributions of males to overall poverty gap increased from 64.43% in $P_1$, to 66.30% in $P_2$, whereas the contribution of women to total poverty reduced from 35.57% in $P_1$ to 33.70% in $P_2$ level respectively. This is to say that poverty was very severe among male headed households than in the females headed households (Shaffer, 1998; Omonona, 2001).

**(Place Table 2 here)**

Table 2 also showed that crude oil polluted crop farms had total number of household heads that were poor as 64.57% and non poor, 35.43%. More male headed households were poor (61.42%) as against the female headed households (3.15%). The incidence of poverty ($P_0$) occurrence among males headed households was 72.2%, significant at 1% and 21.1% in females headed households (significant at 5%). Men's contribution to overall poverty in the population was 90.70%. The poverty gap ($P_1$) and poverty severity ($P_2$) results showed that males headed households had the highest level of poverty 11.3% and 3.5%, both significant at 1% level respectively as against females headed households with $P_1$ (1.7%) and $P_2$ (0.2%), significant at 10% and 5% respectively. In their contribution to poverty in the population, male headed households contribution rose from 94.91% in poverty gap to 98.13% in poverty severity as against the reductions in females headed households from 5.09% in $P_1$ to 1.87% in $P_2$.

In the non-polluted crop farms category (Table 2), the

total number of poor household heads was 51.48% as against the non-poor households of 48.52%. The proportion of males headed households that were poor was 40.24%, though the number of poor women headed households also increased (11.24%). The headcount ratio showed that 55.3% of the men headed households were poor, while the women had a ratio of 41.3% (both significant at 1%). The men's percentage of contribution to overall population existing in poverty was 64.15% in non – polluted farms, whereas women contributed about 35.85%. The poverty gap and severity ratios for men headed households were 11.6% and 3.2% (both significant at 1%) respectively, while for women headed households the results were 5.6% for poverty gap and 1.3% for poverty severity (both were statistically significant at 1%). Men's proportional contribution to poverty in the population increased from 73.29% in $P_1$ to 76.09% in $P_2$, whereas the female contribution decreased from 26.71% in $P_1$ to 23.91% in $P_2$ respectively.

In comparison, the head count ($P_0$) ratio on Table 2 indicated that more male headed households were poor (72.20%) in the crude oil polluted farms as against 55.3% in the non-polluted farms and 55.8% in all farms surveyed. The contribution of the male headed household to overall sample in the crude oil polluted crop farms was very high (90.70%) (Platform, 2012) compared to the non-polluted crop farms (64.15%) and all farms surveyed (61.72%) respectively (Onyenekenwa 2011). This percentage contribution increased up to 94.91% in the crude oil polluted farms at the poverty gap ($P_1$) level as against 73.29% in non-polluted crop farms and 64.43% in all crop farms surveyed. At the intensified poverty level ($P_2$), the contribution of males headed households rose to 98.13% in crude oil polluted crop farms, whereas in non-polluted crop farms it was 76.09% and 66.30% in all crop farms surveyed respectively. These results of gender analysis had shown that the males headed households were the most affected by crude oil pollution in crude oil polluted farms and therefore were poorer than the females headed households. This surprising result could be because generally in Africa (Rivers State inclusive), women do not have permanent access to farmland, product market, credit, loan (Owuor et al., 2007), therefore any form of crude oil pollution on the land bothers the males more who have to share and reshare his remaining plots (non-polluted areas) to his wife (wives), sisters and children as the case may be.

### 4.3 Poverty level by marital status of household head.

The measures of poverty by marital status of household heads in all crop farms surveyed, crude oil polluted crop farms and non-polluted crop farms were discussed in Table 3 respectively. The marital status of the crop farmers under discussion were married, single (not married), divorced, widowed and single parents. The table shows that out of 57.1% of the poor household heads, 47.64% of them were married men and women, while out of 42.90% of the non-poor household heads, 34.80% were married. This could be because cases of divorce and single parentage were not very popular, as most women remain in their husband compounds or still answer their names, even when they are not living as husband and wife any longer.

The poverty incidence ($P_0$) results indicated that about 55.7% of married household heads, 64.30% of single (not married) households heads 68% of widowed household heads and 75% of single parent household heads in all crop farms surveyed category were poor (Table 3). These results were all significant at 1%. The poverty severity ($P_1$) results showed that 9.5% of the married (significant at 1%), 15.3% of single (not married) (significant at 1%), 12.0% of widowed (significant at 1% ) and 7.7% of the single parents (significant at 5%) were deep in poverty, with the married group alone contributing about 54.87% of the entire population poverty.

The results of poverty severity were intensified among the married household heads up to 2.5%, single (not married) 5.9% and widowed (3.5%), they are statically significant at 1% and 5% respectively, with their contribution to overall poverty as : married (52.39%), widowed (29.87%) and single (not married) 14.04% respectively. The single (not married) household heads surprisingly showed too high level of incidence, depth and severity of poverty among them. This could be as a result of the fact that they were mostly young in age, have little experience in farming and sometimes were "school – to- land" practicing farmers without adequate inputs and land holdings.

**(Place Table 3 here)**

In crude oil polluted crop farms category, 64.57% of the household heads were identified as poor, out of which the married group account for 48.8% of the poor. However, 35.43% of the entire households interviewed were non-poor, out of which 29.12% were married households. The incidence of poverty ($P_0$) results in crude oil polluted crop farms showed that 100% of divorced and single parent household heads were all poor, 83.3% of single (not married), 63.6% of the widowed and 60.8% of the married household heads were poor respectively (all statistically significant at 1%), with the married group alone contributing 47.69% of the overall poverty.

The poverty gap ($P_1$) results also showed high level of poverty manifesting in crude oil polluted crop farms during the survey as 28% of the divorced,

15.2% of the single (not married), 9.5% of the married, 6.7% of the single parents and 3.6% of widowed household heads were deep in poverty, with the married group contributing the highest (52.88%). All these results were statistically significant at 1% and 5% respectively.

Poverty severity ($P_2$) in crude oil polluted crop farms category was very severe amongst the divorced (11.6%), significant at 10%, single (not married) 5.1% (not significant) and married (2.8%), significant at 1%, and the married household heads contributed 52.30% of the overall sample that were severely poor.

The results of non-polluted crop farms category were also presented on Table 3. The results showed that 51.49% of respondents were estimated to be poor, with the highest contribution being accounted for by the married group (46.75%). The proportion of non-poor households (48.5%) in the non-polluted farms, was higher than in the crude oil polluted crop farms (35.43%). The headcount ($P_0$) poverty ratio in non-polluted crop farms showed that poverty incidence was high in single (not married) 62.50%, married (52.10%) and widowed household heads (50%), statistically significant at 1% and 5% respectively, with the married group contributing highest to the overall poverty (64.35%). However, this result surprisingly showed that poverty never existed among the single parents at the incidence, deep and severity ratios, while poverty was very low in the divorced headed households in the $P_0$ ratio (25%), though not statistically significant.

At the poverty gap ratio ($P_1$) poverty was deep in the single (not married) group 12.30%, married 10.1%, and widowed household heads (9.20%), all statistically significant at 1% level respectively. The married household heads contributed more to the overall poverty in the study with 64.54% in the non-polluted crop farms category.

As regards the poverty severity ($P_2$) results, poverty was more severe among married group (2.80%), single (not married) 2.70% and widowed household heads (2.40%), statistically significant at 1% and 5% respectively as in Table 3. The married household heads contribute most to the existing poverty (67.11%). These results indicated that poverty was higher in crude oil polluted crop farms than in non-polluted crop farms.

In comparison, the incidence of poverty ($P_0$) was higher in the crude oil polluted crop farms category where up to 60.80% of the married, 83.30% of the single (not married), 63.60% of the widowed group, 100% (all were poor) of the single parent and divorced household heads were estimated to be poor as compared to where 52.1% and 55.7% of the married, 62.50% and 64.30% of the singled (not married), 50% and 68% of the widowed, 25% and 44.44% of the divorced, 0% and 75% of the single parent household heads that were observed to be poor at the $P_0$ level among the non-polluted crop farms and all crop farms surveyed respectively. These results go to confirm that poverty was higher in the crude oil polluted crop farms category than in the non-polluted crop farms and all crop farms surveyed households. This confirms that crude oil pollution on crop farms helped to increase the poverty level of crop farmer households in Rivers State, Nigeria (Onwuka, 2005; Onyenekenwa, 2011; Platform, 2011; 2012).

It is important to note here that the single (not married ) and single parent groups were amongst the women and men groups stressed and ravaged as a result of crude oil exploration and exploitation activities in the various parts of Rivers State, hence were poorer as revealed by the study results discussed above (Chovwen et al., 2009; Ekanem et al., 2010)

## 5.0 Conclusion and Recommendations

### 5.1 Conclusion

The FGT poverty measures of extent of poverty (headcount) ($P_0$), depth of poverty (poverty gap) ($P_1$) and severity of poverty (intensity of poverty) ($P_2$) were estimated. The contributions of each poverty ratio to its overall poverty, the percentage frequency of poverty for the poor and non-poor crop farmers in the different categories of crop farmer household heads studied were highlighted in this study. This study found out that the extent of poverty ($P_0$) by age of household heads among crude oil polluted crop farms was highest (64.20%) as compared to the poverty level amongst non-polluted crop farmer household heads (53%) and 57.8% among the household heads in all crop farms surveyed by age groupings in River State, Nigeria.

Poverty was highest among the youth (20 – 29 years of age) by all poverty measures of $P_0$, $P_1$ and $P_2$ used respectively in all categories of crop farms studied using age of household heads. This could explain the youth restiveness later observed by Okoli (2006) and Chovwen et al. (2009). The highest level of poverty was contributed by household heads 40 years and above at $P_2$ ratio with 87.52% in all crop farms surveyed, 86.48% in crude oil polluted crop farms and 89.14% in non-polluted crop farms household heads respectively.

The head count ($P_0$) ratio on gender of household heads studied indicated that more male headed households were poor (72.20%) in the crude oil polluted crop farms as against 55.3% in the non-polluted crop farms and 55.80% in all crop farms surveyed. The contributions of male headed households to overall poverty in the crude oil

polluted crop farms were very high in all poverty ratios used: ($P_0$) = 90.70%; $P_1$ = 94.91%; $P_2$ = 98.13%) as compared to results of non-polluted crop farms ($P_0$ = 64.15%; $P_1$ = 73.29%; $P_2$ = 76.09% ) and all crop farms surveyed ($P_0$ = 61.72%, $P_1$ = 64.43%; $P_2$ = 66.30%). These results are similar to the results of Onyenekenwa, 2011 All results estimated showed that using the gender of household heads, poverty was most concentrated among males headed households in crude oil polluted crop farms than in non-polluted and all crop farms surveyed respectively. This could be due to the crude oil pollution effect on the crop farms (Dung et al., 2008; Ugbomeh and Atubi, 2010; Onyenekenwa, 2011).

The incidence of poverty ($P_0$) measure on marital status of household heads in crude oil polluted crop farms was higher among married households with 60.80% representation, single (not married) was 83.30%, widowed (63.60%), single parent (100%) and divorced (100%) as compared to where only 52.10% and 55.7% of the married household heads were poor at $P_0$, 62.50% and 64.30% of the single (not married were poor; 50% and 68% of the widowed, 25% and 44.4% of the divorced group, 0% and 75% of the single parent groups of household heads were poor at $P_0$ among the non-polluted crop farms and all farms surveyed household heads respectively.

These results goes to confirm the fact that poverty was higher amongst crude oil polluted crop farms household heads by age, gender and marital status than among non-polluted and all crop farms surveyed household heads. This has confirmed that crude oil pollution on crop farms worsened the level of poverty of crop farmers already existing in Rivers State, Nigeria (Onwuka, 2005; Platform 2011; 2012).

The case of single parent (men and women), divorced women, single (not married) men and women crop farmers who recorded high level of poverty at $P_0$, $P_1$, and $P_2$ poverty ratios confirmed that men and women groups were stressed and ravaged as a result of crude oil exploration and exploitation activities in the various parts of Rivers State, Nigeria, hence were poorer than those not cropping in such environment (Chovwen et al., 2009, Ekanem et al., 2010; Onyenekenwa, 2011). This study therefore states categorically that, there was higher level of poverty experienced by household heads in crude oil polluted crop farms using age, gender and marital status of household heads than those household heads in non-polluted crop farms. From ongoing analysis, it was clear that poverty existed in Rivers State, Nigeria despite its crude oil production and wealth accruable from it during the survey. However, this poverty was worse among household heads that did crop farming in crude oil and gas polluted areas of the state as per applied parameters.

### 5.2 Recommendations

This study recommends the following measures to ameliorate the effect of poverty on crop farmer households in Rivers State, Nigeria:

(i) That due to loss of arable farmlands, heavy economic losses associated and high cost of crop production incurred on spilled/polluted farmland (Onwuka, 2005; Ugbomeh and Atubi, 2010; Onyenekenwa, 2011; Platform 2012), this study recommends that adequate list of all crude oil pollution affected crop farmers be compiled and commensurate amounts of compensations be paid to them and promptly too in line with current economic trends in the country to help alleviate current poverty being faced by the crop farmers in crude oil polluted areas.

(ii) That before such compensations are paid to crop farmers, adequate and correct evaluations of crop and land areas lost should be properly determined by experts (Platform, 2011) as it affected each individual crop farmer in question. Such compensations should be paid by the oil companies responsible for the crude oil pollution/spillages, so as to alleviate the poverty crop farmers face as a result of crude oil production and extraction in Rivers State, Nigeria.

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Table 1: Measures of poverty by age of household head in the study area.

| Age of household head | Percentage frequency of poverty | | | Headcount ($P_0$) | Contribution to overall ($P_0$) % | Poverty Gap ($P_1$) | Contribution to overall ($P_1$) % | Poverty severity index ($P_2$) | Contribution to overall ($P_2$)% |
|---|---|---|---|---|---|---|---|---|---|
| | Poor | Non poor | Total | | | | | | |
| **All crop farms surveyed** | | | | | | | | | |
| 20 -29 years | 2.70 | 0.34 | 3.04 | 0.778*** (0.045) | 2.59 (2.05) | 0.197*** (0.054) | 3.08 (2.56) | 0.01 (0.22) | 2.93 (2.45) |
| 30 – 39 years | 9.46 | 8.78 | 18.24 | 0.641*** (0.131) | 11.76 (6.31) | 0.095*** (0.034) | 10.63 (6.17) | 0.022** (0.009) | 9.55 (5.93) |
| 40 – 49 years | 18.91 | 14.19 | 33.10 | 0.569*** (0.146) | 29.86 (11.40) | 0.098*** (0.034) | 30.87 (13.47) | 0.027** (0.013) | 31.28 (17.25) |
| 50 – 59 years | 12.84 | 14.19 | 27.03 | 0.500*** (0.172) | 24.01 (10.80) | 0.080*** (0.033) | 23.24 (11.53) | 0.020* (0.11) | 20.38 (12.50) |
| 60 years and above | 13.18 | 5.41 | 18.59 | 0.726*** (0.219) | 31.78 (18.00) | 0.116*** (0.041) | 32.18 (19.99) | 0.43** (0.017) | 35.86 (25.16) |
| Total | 57.09 | 42.91 | 100 | 0.578*** | 100 | 0.098*** | 100 | 0.027** | 100 |
| **Crude oil polluted crop** | | | | | | | | | |
| 20 – 29 years | 4.72 | 1.12 | 5.84 | 0.917*** (0.273) | 3.91 (3.18) | 0.178*** (0.054) | 3.62 (4.37) | 0.049*** (0.015) | 5.19 (4.19) |
| 30 – 39 years | 12.60 | 5.51 | 18.11 | 0.714*** (0.184) | 13.99 (8.96) | 0.092** (0.047) | 11.13 (8.52) | 0.017 (0.011) | 8.33 (6.75) |
| 40 – 49 years | 18.90 | 11.81 | 30.41 | 0.595*** (0.158) | 27.12 (14.19) | 0.098** (0.048) | 29.22 (18.52) | 0.044* (0.025) | 38.88 (26.92) |
| 50 - 59 years | 12.60 | 11.81 | 24.41 | 0.775*** (0.136) | 21.52 (13.26) | 0.120*** (0.032) | 22.05 (14.05) | 0.031** (0.014) | 17.37 (13.02) |
| 60 years and above | 15.75 | 5.51 | 21.23 | 0.705*** (0.186) | 33.46 (22.26) | 0.097*** (0.030) | 31.98 (22.60) | 0.028** (0.013) | 30.23 (23.08) |
| Total | 64.24 | 35.76 | 100 | 0.642*** | 100 | 0.096*** | 100 | 0.028** | 100 |
| **Non-polluted crop farms** | | | | | | | | | |
| 20 – 29 years | 1.18 | 0.00 | 1.18 | 1.000*** (0.000) | 1.02 (1.03) | 0.235*** (0.000) | 1.25 (1.26) | 0.055*** (0.000) | 1.05 (1.06) |
| 30 – 39 years | 7.10 | 11.24 | 18.34 | 0.521*** (0.119) | 9.76 (7.22) | 0.094*** (0.030) | 10.06 (7.05) | 0.021** (0.010) | 9.81 (7.68) |
| 40 – 49 years | 18.93 | 15.98 | 34.91 | 0.564*** (0.204) | 32.39 (15.01) | 0.116** (0.047) | 33.54 (16.71) | 0.029** (0.014) | 30.40 (16.94) |
| 50-59 years | 13.02 | 15.98 | 29.00 | 0.391** (0.154) | 26.28 (12.15) | 0.055* (0.030) | 23.52 (12.44) | 0.016* (0.009) | 21.24 (13.21) |
| 60 years and above | 11.24 | 5.33 | 16.57 | 0.775*** (0.065) | 30.55 (20.48) | 0.157* (0.53) | 31.63 (23.91) | 0.053** (0.022) | 37.50 (29.38) |
| Total | 51.47 | 48.53 | 100 | 0.530*** | 100 | 0.102** | 100 | 0.029** | 100 |

**Source**: Field Survey, 2003. *Asterisks indicates significant level: *** 1%; **5%; *10%. Figures in parentheses are standard errors.*

**Table 2:** Measure of poverty by gender of household head in the study area.

| Gender of household head | Percentage frequency of poverty | | | Headcount ($P_0$) | Contribution to overall ($P_0$) % | Poverty Gap ($P_1$) | Contribution to overall ($P_1$) % | Poverty severity index ($P_2$) | Contribution to overall ($P_2$)% |
|---|---|---|---|---|---|---|---|---|---|
| | Poor | Non poor | Total | | | | | | |
| **All crop farms surveyed** | | | | | | | | | |
| Male headed | 49.32 | 28.72 | 78.04 | 0.558*** (0.033) | 61.72 (4.28) | 0.098*** (0.009) | 64.43 (5.32) | 0.028*** (0.004) | 66.30 (7.07) |
| Female headed | 7.77 | 14.19 | 21.96 | 0.615*** (0.060) | 38.28 (4.28) | 0.096*** (0.016) | 35.57 (5.32) | 0.025** (0.006) | 33.70 (7.07) |
| Total | 57.09 | 42.91 | 100 | 0.579*** | 100 | 0.097*** | 100 | 0.027** | 100 |
| **Crude oil polluted crop farms** | | | | | | | | | |
| Male headed | 61.42 | 23.62 | 85.04 | 0.722*** (0.043) | 90.70 (4.34) | 0.113*** (0.014) | 94.91 (2.91) | 0.035*** (0.008) | 98.13 (1.41) |
| Female headed | 3.15 | 11.81 | 14.96 | 0.211** (0.094) | 9.30 (4.24) | 0.017* (0.009) | 5.09 (2.91) | 0.002** (0.001) | 1.87 (1.41) |
| Total | 64.57 | 35.43 | 100 | 0.589** | 100 | 0.088* | 100 | 0.026** | 100 |
| **Non-polluted crop farms** | | | | | | | | | |
| Male headed | 40.24 | 32.54 | 72.78 | 0.553*** (0.045) | 64,15 (5.99) | 0.116*** (0.12) | 73.29 (6.57) | 0.032*** (0.005) | 76.09 (8.80) |
| Female headed | 11.24 | 15.98 | 27.22 | 0.413*** (0.073) | 35.85 (5.99) | 0.056*** (0.015) | 26.71 (6.57) | 0.013*** (0.006) | 23.91 (8.80) |
| Total | 51.48 | 48.52 | 100 | 0.493*** | 100 | 0.090*** | 100 | 0.024*** | 100 |

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

Table 3: Measure of poverty by marital status of household head in the study area.

| Marital status of household head | Percentage frequency of poverty | | | Headcount ($P_0$) | Contribution to overall ($P_0$) % | Poverty Gap ($P_1$) | Contribution to overall ($P_1$) % | Poverty severity index ($P_2$) | Contribution to overall ($P_2$)% |
|---|---|---|---|---|---|---|---|---|---|
| | Poor | Non Poor | Total | | | | | | |
| **All crop farms surveyed** | | | | | | | | | |
| Married | 47.64 | 34.80 | 82.44 | 0.557*** (0.032) | 54.62 (4.98) | 0.095*** (0.008) | 54.87 (6.39) | 0.025*** (0.003) | 52.39 (8.73) |
| Single (not married) | 3.04 | 1.68 | 4.72 | 0.643*** (0.128) | 7.23 (2.34) | 0.153*** (0.050) | 10.17 (4.04) | 0.059** (0.029) | 14.04 (7.07) |
| Divorced | 2.03 | 1.01 | 3.04 | 0.444*** (0.166) | 4.82 (2.34) | 0.043 (0.028) | 2.75 (1.98) | 0.009 (0.007) | 2.02 (1.78) |
| Widowed | 3.38 | 5.07 | 8.45 | 0.680*** (0.093) | 27.31 (5.16) | 0.120*** (0.029) | 28.57 (6.76) | 0.035*** (0.013) | 29.87 (9.60) |
| Single parent | 1.01 | 0.34 | 1.35 | 0.750*** (0.217) | 6.02 (3.32) | 0.077** (0.031) | 3.64 (2.31) | 0.010** (0.005) | 1.68 (1.22) |
| Total | 57.10 | 42.90 | 100 | 0.596*** | 100 | 0.102** | 100 | 0.029*** | 100 |
| **Crude oil polluted crop farms** | | | | | | | | | |
| Married | 48.82 | 29.12 | 77.94 | 0.608*** (0.048) | 47.69 (6.66) | 0.095*** (0.014) | 52.88 (9.11) | 0.028*** (0.007) | 52.30 (14.66) |
| Single (not married) | 3.94 | 0.79 | 4.73 | 0.833*** (0.153) | 7.69 (3.30) | 0.152** (0.069) | 10.02 (5.73) | 0.051 (0.036) | 11.22 (8.63) |
| Divorced | 3.94 | 0.79 | 4.73 | 1.000*** (0.000***) | 11.54 (4.81) | 0.280*** (0.088) | 23.00 (10.11) | 0.116* (0.067) | 31.90 (16.68) |
| Widowed | 5.51 | 3.94 | 9.45 | 0.636*** (0.146) | 21.54 (6.83) | 0.036** (0.015) | 8.57 (4.32) | 0.004** (0.002) | 2.98 (2.13) |
| Single parent | 2.36 | 0.79 | 3.15 | 1.000*** (0.000) | 11.54 (6.07) | 0.067*** (0.21) | 5.53 (3.57) | 0.006*** (0.002) | 1.60 (1.21) |
| Total | 64.57 | 35.43 | 100 | 0.691*** | 100 | 0.097*** | 100 | 0.029** | 100 |
| **Non polluted crop farms** | | | | | | | | | |
| Married | 46.75 | 38.46 | 85.21 | 0.521*** (0.042) | 64.35 (7.18) | 0.101*** (0.011) | 64.54 (8.22) | 0.028*** (0.004) | 67.11 (9.25) |
| Single (not married) | 2.37 | 2.37 | 4.74 | 0.625*** (0.172) | 8.70 (3.72) | 0.123*** (0.038) | 8.88 (4.00) | 0.027*** (0.010) | 7.18 (3.57) |
| Divorced | 0.59 | 1.78 | 2.37 | 0.250 (0.217) | 2.61 (2.57) | 0.064 (0.055) | 3.44 (3.37) | 0.016 (0.014) | 3.29 (3.24) |
| Widowed | 1.78 | 5.31 | 7.09 | 0.500*** (0.134) | 24.34 (7.31) | 0.092*** (0.033) | 23.14 (8.37) | 0.024** (0.010) | 22.42 (9.37) |
| Single parent | 0.00 | 0.59 | 0.59 | 0.00 (0.00) | 0.00 (0.00) | 0.00 (0.00) | 0.00 (0.00) | 0.00 (0.00) | 0.00 (0.00) |
| Total | 51.49 | 48.51 | 100 | 0.498** | 100 | 0.096*** | 100 | 0.026*** | 100 |

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