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# PERCEIVED SEVERITY OF ENVIRONMENTAL HAZARDS AND AGROCHEMICAL USE AMONG FARMERS IN IDO LOCAL GOVERNMENT AREA, IBADAN, NIGERIA

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## ABSTRACT

Agrochemical use is a *sine qua non* for agricultural production but such use has significant negative consequences for environmental conditions. Still, the role of environmental concern in agrochemical use among farmers is under explored. This study was therefore designed to examine perceived severity of environmental hazards and agrochemical use among crop farmers in Ido Local Government (LGA) Area, Ibadan, Nigeria. The study was cross-sectional survey which featured the administration of 209 copies of structured questionnaire among randomly selected respondents, via structured interview. Multi-item measures were used to assess variables while chi-square was used to depict significance of associations between pairs of variables. Contingency co-efficient was used to examine extent of significant association. Univariate distributions shows that perceived severity of environmental hazards was high, moderate and mild among 48.8%, 45% and 6.2% of respondents, respectively. Agrochemical use was low, moderate and high among 15.8%, 26.8% and 57.4% of respondents, respectively. Herbicides (82.8%) and fertilizers (77.5%) were most popularly used among respondents. Sex and agrochemical use were significantly associated ($p< 0.05$) but age and education were insignificantly associated with same ($p> 0.05$). There is significant, positive and fairly strong relationship between perceived severity of environmental hazards and use of agrochemicals ($r = 0.567$, $p< 0.05$).Age and education are insignificant factors in agrochemicals use but sex is. Male farmers are significantly more predisposed to use of agrochemicals. The stronger the perceived severity of environmental hazards, the higher the use of agrochemicals, suggesting that the two variables are not manifesting in a fashion that benefits the cause of environmentalism among crop farmers in the study area.

**Keywords**: Environmentalism, agrochemical use, farmers, perceived severity.

## Introduction

The natural environment is the work place of the farmer, making farmers central to concerns for the conservation and improvement of the environment. Environmental challenges including air and water pollution, climate change, loss of biodiversity, greenhouse gas emission, and so on are probably the greatest challenge facing mankind in the twenty first century (Harris, 2005). Yet, man's behaviour is ultimately responsible for this threat (Doran and Zimmerman, 2009; IPCC, 2014). The general behaviour of the farmer as a worker in the natural environment is an essential focus of study because of their use of agrochemicals (inorganic fertilizers such as inorganic compounds of nitrogen (N), Phosphorus (P) and potassium (K), herbicides, pesticides, and

so on). This use is of great significance to human survival.

Globally, the use of fertilizers and pesticides enabled the world to cope with unprecedented increase in human population. World population was around 1.5 billion in 1900 but this tremendously increased to about 6.1 billion in 2000 (Carvalho, 2017).Global production of pesticides for instance increased from 0.2 million tons in the 50s to over 5 million tons by the year 2000 (FAO, 2017). In addition, Nigeria is one of the greatest users of pesticides in Africa south of the Saharan, utilizing about 125,000-130,000 metric tons of pesticides annually (Mazlan *et al*., 2017). The parallel increase in the use of agrochemicals is a major support for soaring human population. Apart from supporting increased food production, agrochemical use is even more important to farmers in developing countries where modern agricultural technologies are minimally utilized. The use of agrochemicals makes pest management and weed control easier (Olayinka, 2019; Issa and Kagbu, 2017).Agrochemicals promotes work efficiency and enables production of tasty products (Kughur, 2012).

However, agrochemicals are typically toxic, and their use even in lower quantity, is major threat to the optimal functioning of the ecosystem (Mazlan *et al*., 2017; Chagnon *et al*., 2015; Gilbert 2016). Pesticide deposits in the environment causes loss of living organisms including pollinating insects, bees, amphibians, small mammals, and birds (Köhler and Triebskorn 2013; Paoli *et al*., 2015; WHO, 2017). Perhaps, the greatest environmental danger posed by agrochemical use is cultural eutrophication, which occurs as nitrogen and phosphorus residues runs off into water bodies such as rivers, lakes and coasts (Beusen *et al*., 2016).The incremental levels of nutrients lead to the production of plant biomass, which steadily leads to decreasing penetration of light in water bodies (Claussen *et al*., 2009). Eutrophication results to dysfunctional aquatic ecosystems: adaptive opportunistic plant species become propagated thereby replacing original species and causing structural changes in the structure and functioning of phytoplankton, zooplankton, fish and so on (Le Moal *et al*., 2019). The degradation of opportunistic plants or algal blooms by bacteria depletes oxygen in the aquatic environment or even results in toxic emissions such as carbon dioxide, hydrogen sulphide and methane (Ibid). With eutrophication, biodiversity loss due to colossal death of aquatic organisms is almost inevitable. Eutrophicationis a global challenge and menace to the environment as well as human health (Von Blottnitz *et al*., 2006; Sutton *et al*., 2011). Although eutrophication is typically prompted by a number of human-social dynamics including urbanization, phosphorus mining and manufacture of chemicals (Smith and Schindler, 2009), agriculture is a major contributor to same. Globally, agriculture as nutrient source of nitrogen and phosphorus increased from 20% to 50% and 35% to 55% respectively from 1900 to 2000 (Beusen *et al*., 2016).

Apart from environmental health, human health is strongly and negatively affected by agrochemical use. Exposure to pesticides is predisposing to the development of respiratory diseases like asthma and reducing sperm quality (Hoppin *et al*., 2002; Tuc *et al*., 2007). The findings of Oseghale *et al*. (2019) shows that perceived health impairment associated with agrochemical use include coughing which was reported by 55.9% and61.5% of respondents in Niger and Ogun States of Nigeria respectively. Estimates by

the World Health Organization (2019) shows that globally, accidental poisoning through access to toxic chemicals is responsible for the death of 355, 000 people annually. Of this estimate, two-thirds are recorded in developing countries. Indeed, agrochemical use is currently a unique challenge in developing countries (Bhandari, 2014) like Nigeria where regulations and its enforcement are typically poorer. For instance, eutrophication has been reduced successfully in Europe and North America but the problem lingers predominantly in developing countries (Wurtsbaugh *et al*., 2019).In addition, the use of environmentally persistent pesticides like 1,1,1-trichloro-2,2-bis (4-chlorophenyl) ethane (DDT) has been banned in developed countries but such use is still persistent in developing countries because they are available, inexpensive, or handed out by developed countries (Fianko *et al*., 2011).The Nigerian National Agency for Food and Drug Administration and Control (NAFDAC) banned the use of some pesticides but some farmers still utilize same (Mazlan *et al*., 2017). Up to 72% of farmers in Nigeria get their agrochemical inputs from the open market thereby increasing the chance of accessing adulterated products (World Bank-WAAPP, 2013).

The use and propensity to use agrochemicals in developing countries like Nigeria attracts fair scholarly attention. The frequency and intensity of pest attacks, extent of soil depletion and seasons are among factors affecting the use of agrochemicals (Nonga *et al*., 2011). Socio-economic considerations including price of agrochemicals, economic value of crops planted, farmer education, farming experience, access to, and adequacy of access to extension services, are central to farmers' decision to use agrochemicals (Sharma and Thaker, 2011). Unfortunately, scholarly endeavours have largely eschewed the role that environmentalism plays in the utilization of agrochemicals. This occurs even as agrochemical use bear huge consequences for environmental challenges. Hence, this study was designed to examine perceived severity of environmental hazards and agrochemical use among crop farmers in Ido Local Government Area(LGA), Ibadan, Nigeria.

## Methodology

The study population was the people of Ido Local Government Area (LGA)of Ibadan, Nigeria while farmers were specifically targeted in this cross-sectional survey. Ibadan, the capital city of Oyo State in Southwestern Nigeria is a large *Yorùbá* city with people of other ethnicities residing vastly in the town. Ido LGA is among the six peri-urban LGAs in Ibadan, with a land mass of 800 $km^2$. There are ten political wards, many small towns and villages in Ido LGA. The people engage in farming extensively. According to the National Population Commission (2007), the population of the LGA is 103, 261. Projections by the National Population Commission (2016) shows that the population of Ido LGA is 146,200. This is taken as the total population (N) for the study. This is because the people are largely farmers.

Sampling procedure was multi-staged, random and systematic. Using a sample size calculator, and given a total population (N) of 146,200, the required sample size at 95% confidence level and confidence interval of 6.75 was 210. Three out of the ten wards in Ido LGA were randomly selected. The selected wards were Batake, Akinware and Akufo. Two communities were randomly selected from each selected ward, including Idiya, Ajeerun, Omu-aran, Adetola, Adegbolu, and Abegunrin. Systematic

sampling principle was invoked to select thirty-five respondents in each of the six communities.

Structured questionnaire was used to collect data. This was administered via structured interview. The questionnaire was translated into *Yorùbá* language to secure the cooperation of respondents who do not understand English language. Respondents were treated with utmost respect. Two hundred and ten copies of the questionnaire were administered but one respondent declined to participate shortly after beginning to participate in the study. Hence, two hundred and nine copies of the questionnaire were used in data analysis. Response rate was 99.52%. *Perceived severity of environmental hazards* was assessed with a six-item author-constructed Likert scale. Examples of items in the scale are 'environmental problems can cause human death and destruction?', 'environmental problem is insignificant of all the risks we face today'. Responses were scored 1 to 5, such that total score could range from 6 to 30. Respondents' lowest and highest score after the study was 13 and 30 respectively. Their perceived severity of environmental hazards was categorized as mild, moderate and high if they scored 13-18, 19-24 and 25-30 respectively. *Agrochemical use* was assessed with a six-item author-devised index assessing respondents' 'ever use of agrochemicals' and 'current use of agrochemicals', etc. Respondents were required to be affirmative or otherwise and the former response was scored 1 while the later was scored 0. Total score could range from 0 to 6. Respondents' use of agrochemicals was categorized as low, moderate and high if they scored 0-2, 3-4, and 5-6 respectively.

Frequency counts and percentages were used to examine distributions of data. Cross-tabulation and chi-square were used to show distributions and significance of associations between pairs of variables respectively. Where significant associations were recorded, contingency co-efficient was used to examine extent of the association. Spearman rank correlation coefficient was used to assess relationship between perceived severity of environmental hazards and agrochemical use.

## Results and Discussions

### Socio-demographic characteristics of sampled farmers at Ido LGA

Table 1 indicates that an overwhelming majority (77.5%) of respondents were males but female respondents (22.5%) were adequately represented in the study. Farming is still more of masculine occupation in the study area. Most respondents (79.9%) were married. This imply that 4 out of every 5 farmers were married in the study area. In addition, a marginal proportion (2.4%) of respondents were divorced. This speaks well of marriage stability among farmers in the study area. Noticeable proportions (9.6% and 8.1%) were single and widowed respectively. Most respondents (41.6%) had no formal education; and 31.1% of respondents achieved primary schooling. These educational data are quite poor and imply that about 4 and 3 of every 10 farmers in the study area achieved no formal schooling or the most basic formal education respectively. The distribution of respondent's age across sub-groups is U shaped and reached a peak of 24.9% at 50-59 years sub-group. This distribution indicates aging population of farmers in the study area. The distribution of socio-demographic characteristics of respondents is shown on table 1.

**Table 1: Socio-demographic characteristics of sampled farmers at Ido LGA**

| Socio-demographic characteristic | Sub-group | Frequency | Percentage |
|---|---|---|---|
| Sex | Male | 162 | 77.5 |
| | Female | 47 | 22.5 |
| Marital status | Single | 20 | 9.6 |
| | Married | 167 | 79.9 |
| | Divorced | 5 | 2.4 |
| | Widowed | 17 | 8.1 |
| Education | No formal education | 87 | 41.6 |
| | Primary school certificate | 65 | 31.1 |
| | Secondary school certificate | 34 | 16.3 |
| | NCE/OND/HSC/A LEVEL | 16 | 7.7 |
| | BSC/HND | 7 | 3.3 |
| Age | 20-29 | 22 | 10.5 |
| | 30-39 | 30 | 14.4 |
| | 40-49 | 42 | 20.1 |
| | 50-59 | 52 | 24.9 |
| | 60-69 | 33 | 15.8 |
| | 70 years and above | 30 | 14.4 |

**Perceived severity of environmental hazards among sampled farmers at Ido LGA**

The distribution of levels of respondent's perceived severity of environmental hazards indicates this perceived severity is high and moderate among 48.8% and 45% of respondents respectively. This finding indicates that about 1 in every 2 farmers in the study area subscribe to the notion that environmental hazards that man faces today are highly severe. Meanwhile, the percentage of those who perceive this threat to be moderate is noticeably high. A noticeable proportion of respondents (6.2%) also believe that the threat in question is mild. These are bases of seeking to promote the appreciation of the fact that environmental hazards are high, among farmers in particular. The distribution of levels of perceived severity of environmental hazards is presented in table 2.

**Table 2: Perceived severity of environmental hazards among sampled farmers at Ido LGA**

| Levels of perceived severity | Frequency | Percentage |
|---|---|---|
| Mild | 13 | 6.2 |
| Moderate | 94 | 45.0 |
| High | 102 | 48.8 |
| Total | 209 | 100 |

**Agrochemical use among sampled farmers at Ido LGA**

The distribution of levels of agrochemical use shows that this use is high among 57.4% of respondents and moderate among 26.8% of same. These are indications that farmers in the study area are taking serious advantage of the benefits that agrochemical use has to offer. However, this also indications that the farming environment in the study area has been meted with the negative consequences of agrochemical use. These findings are quite contrary to the findings of Adeyemo *et al*. (2017) who conducted a survey to examine the demand for selected agrochemical inputs among oil palm farmers in Edo state, Nigeria. They reported that 24%, 47% and 14% of their respondents never, occasionally and often use agrochemicals respectively (15% did not respond). The highest proportion of respondents (47%) in the study of Adeyemo *et al*. (2017) were occasional users of agrochemicals while in the current study, the highest proportion of respondents (57.4%) were high users of agrochemicals. This is probably a reflection of greater use of agrochemicals among crop as opposed to oil palm farmers. On the other hand, current findings are comparable with the findings of Amujoyegbe *et al*. (2016) who surveyed the use of agrochemicals among cocoa farmers in the innovation platform of the humid tropics programme in Southwestern Nigeria. Amujoyegbe *et al*. (2016)reported that their respondent's rate of agrochemicals use in their four research sites were 96%, 78%, 72.5% and 56%. This is probably an indication that agrochemical use is typically high among farmers of southwestern Nigeria. The distribution of levels of agrochemical use is show on table 3.

**Table 3: Agrochemical use among sampled farmers at Ido LGA**

| Levels of agrochemical use | Frequency | Percentage |
|---|---|---|
| Low | 33 | 15.8 |
| Moderate | 56 | 26.8 |
| High | 120 | 57.4 |
| Total | 209 | 100 |

**Types of agrochemicals used among sampled farmers at Ido LGA**

The use of herbicides was most common among respondents (82.8%). This was closely followed by the use of fertilizers (77.5%). A fairly large proportion of respondents (31.6%) also use pesticides. These distributions are close to the distributions reported by Adeyemo *et al*. (2017). Adeyemo *et al*.

(2017) found that the use of herbicides, fertilizers and pesticides were practiced by 85.0%, 78% and 14% of their respondents respectively. Similarly, Olayinka *et al*. (2019) reported that 80%, 14% and 6% of their respondents use herbicides, insecticides and fungicides respectively. Indeed, the use of herbicides is most prominent among farmers. The distribution of the types of agrochemicals used by respondents is shown on table 4.

**Table 4: Types of agrochemicals used among sampled farmers at Ido LGA**

| Types of agrochemicals used | Frequency | Percentage |
|---|---|---|
| Herbicides | 173 | 82.77 |
| Fertilizers | 162 | 77.51 |
| Pesticides | 66 | 31.57 |
| Insecticide | 15 | 7.17 |
| Fungicide | 8 | 3.82 |
| Nematicide | 4 | 1.91 |

**Socio-demographic characteristics and agrochemical use**

**Sex and agrochemical use**

Table 5 shows that among respondents whose agrochemical use was high and moderate, males were 85.7% and 78.3% respectively. Indeed, males are dominant at moderate and high levels of agrochemical use. In contrast, females were dominant (60.6%) among those whose agrochemical use were low. The chi-square of this cross tabulation was 7.619 ($p<$ 0.05). There is significant association between sex and agrochemical use. Being male is significantly more predisposing to greater use of agrochemicals among famers in the study area. This is probably a reflection of women's protectiveness towards the environment. However, Amujoyegbe *et al*. (2016) reported that sex was not a significant determinant of agrochemical use among cocoa farmers in Southwestern Nigeria. The contingency coefficient of this analysis shows that the extent of the association between sex and agrochemical use is 18.8%.The cross-tabulation of sex and agrochemical use is shown on table 5.

**Table 5: Cross-tabulation of sex and agrochemical use among sampled farmers at Ido LGA**

| Agrochemical use | Sex | | |
|---|---|---|---|
| | Male (%) | Female (%) | Total |
| Low | 39.4 | 60.6 | 100 |
| Moderate | 78.3 | 21.7 | 100 |
| High | 85.7 | 14.3 | 100 |

Chi-square = 7.619, $p$ =0.022; Contingency co-efficient = 0.188, ($p$ =0.000)

**Age and agrochemical use**

Table 6 shows that the distribution of low and high agrochemical use is U shaped across subgroups of age. These distributions reached their peaks at the 50-59 age subgroup respectively. Among respondents whose agrochemical use was moderate, the 40-49 age subgroup were dominant at 32.1%. The chi-square of this analysis was 12.690 ($p$> 0.05). There is no significant association between age and agrochemical use. Age is not a significant factor in agrochemicals use among famers in the study area. People use and will use agrochemicals irrespective of their age. This is contrary to the findings of Adeyemo *et al.* (2017) who reported that age was a significant determinant of demand for agrochemical inputs among oil palm farmers in Edo state, Nigeria. Nevertheless, current finding is similar to the findings of Amujoyegbe *et al*. (2016) who also reported that age was an insignificant determinant of agrochemical use among cocoa farmers in Southwestern Nigeria. The cross-tabulation of age and agrochemical use is shown on table 6.

**Table 6: Cross-tabulation of age and agrochemical use among sampled farmers at Ido LGA**

| Agrochemical use | Age | | | | | | |
|---|---|---|---|---|---|---|---|
| | 20-29 (%) | 30-39 (%) | 40-49 (%) | 50-59 (%) | 60-69 (%) | 70-above (%) | Total |
| Low | 15.2 | 12.1 | 21.2 | 24.2 | 18.2 | 9.1 | 100 |
| Moderate | 12.5 | 10.7 | 32.1 | 19.6 | 8.9 | 16.1 | 100 |
| High | 8.3 | 16.7 | 14.2 | 27.5 | 18.3 | 15.0 | 100 |

Chi-square = 12.690, $p$ =0.239

**Education and agrochemical use**

Table 7 shows that increasing education is associated with lower use of agrochemical. For instance, among respondents whose agrochemical use was high, 45% of them had no formal education. Similarly, among respondents whose agrochemical use was moderate, 42.9% also had no formal education. Just 3.3% and 5.4% of respondents whose agrochemical use were high and moderate respectively were B. Sc. /HND holders. The distribution of moderate and high agrochemical use across subgroups of education increased with none and lower levels of education. The chi-square of this analysis was 7.304 ($p$> 0.05). There is no significant association between education and agrochemical use. Education is not a significant associate of agrochemicals use among famers in the study area. Education is neither significantly predisposing towards, nor protective against agrochemical use. The pattern of association between education and agrochemical use was similarly reported by Amujoyegbe *et al*. (2016) in their study among cocoa farmers in Southwestern Nigeria. However, Amujoyegbe *et al*. (2016) reported that education was a significant determinant, as opposed to what current findings indicate. There is the need for more studies in order to establish the role of educational attainment on agrochemical use. The cross-tabulation of education and agrochemical use is shown on table 7.

**Table 7: Cross-tabulation of education and agrochemical use among sampled farmers at Ido LGA**

| Agrochemical use | Education | | | | | |
|---|---|---|---|---|---|---|
| | No formal education | Primary education | Secondary education | NCE/OND/HSC/A LEVEL | B. Sc, /HND | Total |
| Low | 27.3 | 45.5 | 21.2 | 6.1 | 0.00 | 100 |
| Moderate | 42.9 | 30.4 | 14.3 | 7.1 | 5.4 | 100 |
| High | 45.0 | 27.5 | 15.8 | 8.3 | 3.3 | 100 |

Chi-square = 7.304, $p$ =0.504

**Perceived severity of environmental hazards and use of agrochemicals**

The Pearson's $r$ in table 8 (0.567, $p< 0.05$) indicates there is significant, positive and fairly strong relationship between perceived severity of environmental hazards and use of agrochemicals. This is very instructive. The stronger the perceived severity of environmental hazards, the higher the use of agrochemicals among farmers in the study area. This is counter-environmentalism, suggesting that perceived severity of environmental hazards is not protective against greater use of agrochemicals. The two variables, though significantly related, are positively related, and therefore not manifesting among farmers in the study area in a fashion that benefits the cause of environmentalism. Perceived severity of environmental hazards is not manifesting in a manner that protects the environment in this instance— lowered use of agrochemicals among farmers. Result of this bivariate correlation is shown in table 8.

**Table 8: Spearman rank *r* indicating relationship between perceived severity of environmental hazards and use of agrochemicals**

| | | Perceived severity of environmental hazards | Agrochemical use |
|---|---|---|---|
| Perceived severity of environmental hazards | *R* | 1 | .567 |
| | *p* value | | .040 |
| Agrochemical use | *R* | .567 | 1 |
| | *p* value | .040 | |

**Conclusions**

The distribution of levels of respondent's perceived severity of environmental hazards is largely pro-environmentalism. The distribution of levels of agrochemical use shows that farmers in the study area are taking serious advantage of the benefits that agrochemical use has to offer while the

farming environment in the study area has been meted with the negative consequences of agrochemical use. Herbicides and fertilizers are the most popular agrochemicals used among farmers in the study area. Being male is significantly more predisposing to greater use of agrochemicals but age and education are insignificant factors in agrochemicals use among famers in the study area. The stronger the perceived severity of environmental hazards, the higher the use of agrochemicals among farmers in the study area. This is counter-environmentalism, suggesting that perceived severity of environmental hazards is not protective against greater use of agrochemicals.

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