

Agricultural Chemicals And Environmental Health: A Study Of The Impacts Of Pesticide And Fertilizer Use On Environmental Degradation In Akamkpa Local Government Area

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Abstract

This study is on Agricultural Chemicals and Environmental Health: A Study of the Impacts of Pesticide and Fertilizer Use on Environmental Degradation in Akamkpa Local Government Area. Two research questions and hypotheses were formulated to guide the study. The population of the study is the entire Akamkpa LGA of Cross River State, Nigeria. The study area has an estimated population of 151,125 thousand people. The purposive and accidental sampling technique were used to select (347) respondents between the ages of 18 years and above within the selected communities in Akamkpa local government area of Cross River State under the study. Agricultural Practices and Environmental Degradation Questionnaire (APEDR). was used for data collection. The research instrument was face and content validated by experts in Text and Measurement and Environmental Education Department both in University of Calabar. The Cronbach alpha reliability analysis was used to a certain the reliability of the research instrument which ranged from .81-89. The data were analysed with simple linear regression. The results revealed that there is a significant relationship between application of Agricultural Chemicals on environmental degradation in Akamkpa Local Government Area of Cross River State. Based on the findings, it was recommended, among others, that. The government and agricultural extension services should promote and support the use of organic fertilizers and sustainable soil management practices among farmers in Akamkpa Local Government Area. Additionally, farmers in the area should be trained on the proper use and application of fertilizers to minimize environmental degradation and optimize crop yields.

Keywords: Agricultural Chemicals, Environmental Health, Pesticide, Fertilizer, Environmental Degradation

INTRODUCTION

Environmental degradation in present generation is posing a serious challenge that require a quick response and control if the global resources should remain sustainable. In the struggle for survival and development, man creates a lot of negative impacts on the forest environment, these impacts ranges from over-exploitation of forest resources, destruction of ecosystem, pollution, among others. According to [9] that due to man excessive exploitation of the forest that there should be strict laws regulating indigenous farmer's activities around reserved forest area and also that farmer should be trained on selective harvesting skill, that is in line with sustainable best practices. Often, the exploitation of forest resources in Cross River State has been done in a non-sustainable way, which is causing an increasing concern, as the non-sustainable exploitation of forest resources ultimately threatens human existence. One difficult task faced by forest users is to guarantee the lasting utilization of natural resources at the lowest possible environmental cost, while still assuring the

economic and social development [7]. The environment provides the basic necessities of life like food, raw materials for making clothing and shelter, providing habitat for the variety of wildlife species, control and moderate climate, prevent soil erosion and flooding. Despite the benefits of the environmental ecosystem to man, the clearing and unsustainable utilization of environmental resources have contributed to the continued degradation of environmental resources [13].

Negative modifications have taken place on the environment due to farming practices, increasing human population, lack of awareness, destructive environmental practices, poverty, greed and the need for development which is adversely affecting the earth's environmental carrying capacity. According to [10] that sustainable occupation significantly relate to forest resource utilization in view of this, that adequate programs should be carried out to sensitize rural people on the need to avoid environmentally unhealthy occupation for the good of the

environmental and human beings. In attempt to redirect this trend several strategies have been adopted in the past to achieve positive results in conservation of environmental resources at different levels. However, only minimal success appears to have been recorded. The world's gravest environmental worry is the rapid extinction of plant and animal species.

According to [12] that the protection of evil forest significantly contributes to forest utilization, that communities with pocket of the forest (evil forest) should be encouraged to continue to protect their resources and should ensure that no kind of human activities is allowed there. This fear surpasses pollution, global warming and thinning of the ozone layer. At the 1992 United Nations Conference on Environment Development "Earth summit" in Rio de Janeiro, Brazil, there was an important indication of growing international concern about biodiversity loss and its transformation from the scientific point of view to popular, political and ultimately diplomatic issues. The convention had its objectives as conservation of biological diversity, the sustainable use of flora and fauna, and the fair and equitable distribution of benefits among community members and all stakeholders arising from the utilization of these generic resources [1]. Over the years, several research reports from articles have revealed that undeviating reasons for loss of environmental resources through farming practices. However, there are contradictory reports as it concerns forest resource conservation and no person can tell how true this is. [2] describe traditional farming practices as sustainable agricultural techniques or intensive agricultural techniques adopted by different people or farmers in agriculture depending on their geographical location and the type of soil of the people. These different traditional farming practices include: Bush burning, use of fertilizers, use of pesticides, terracing, animal husbandry, and intercropping, shifting cultivation, bush fallowing, crop rotation, soil tillage among others.

According to [11] that community participation and use of print media significantly influences wildlife conservation therefore there is need for community to intensify their participation in wildlife conservation by imposing traditional fine on defaulters and also proper enlightenment campaign against over exploitation of wildlife through the use of print media such as posters, flyers, handbills etc. The indiscriminate use of agricultural chemicals, particularly pesticides and fertilizers, has been linked to severe environmental degradation and health hazards in Akamkpa Local Government Area of Cross River State. This study investigates the impacts of pesticide and fertilizer use on environmental degradation, with a view to promoting sustainable

agricultural practices and mitigating the associated environmental and health risks.

A pesticide is a toxic chemical substance or a mixture of substances or biological agents that are intentionally released into the environment in order to avert, deter, control and/or kill and destroy populations of insects, weeds, rodents, fungi or other harmful pests. Pesticides work by attracting, seducing and then destroying or mitigating the pests. Pesticide formulations contain active ingredients along with inert substances, contaminants and occasionally impurities. Once released into the environment, pesticides break down into substances known as metabolites that are more toxic to active ingredients in some situations [15]. Pesticides are used to kill the pests and insects which attack on crops and harm them. Different kinds of pesticides have been used for crop protection for centuries. Pesticides benefit the crops; however, they also impose a serious negative impact on the environment. Excessive use of pesticides may lead to the destruction of biodiversity. Many birds, aquatic organisms and animals are under the threat of harmful pesticides for their survival. Pesticides are a concern for sustainability of environment and global stability [14].

Many cases of intoxication of farmers, rural workers, and their families did occur during pesticide applications and were documented in reports on poisoning and the effects of synthetic chemicals on human health. It was reported that unintentional poisonings kill an estimated 3, 55,000 people globally each year, and such poisonings are strongly associated with excessive exposure and inappropriate use of toxic chemicals [8]. Dispersion of pesticide residues in the environment and mass killings of nonhuman biotas, such as bees, birds, amphibians, fish, and small mammals, were also reported. Early reports and structured incident reporting systems certainly helped to develop regulations for pesticide applications, including dosage of chemicals and best periods of application. Over the years, a considerable research effort was developed also to understand the behavior of these chemicals in the environment, including their cycling and fate as well as their toxicity to biota [5]. The majority of pesticides are not specifically targeting the pest only and during their application. They also affect non-target plants and animals. Repeated application leads to loss of biodiversity. Many pesticides are not easily degradable, they persist in soil, leach to groundwater and surface water and contaminate the wide environment. Depending on their chemical properties they can enter the organism, bioaccumulate in food chains and consequently influence also human health.

The term fertilizers refer to chemically synthesized plant nutrient compounds which are usually applied

to the soil to supplement its natural fertility. Fertilizer could also be defined as any organic or inorganic materials of natural or synthetic origin which are added to a soil or foliage to supply certain elements essential for plant growth [3]. They are the most effective means of increasing crop production and of improving the quality of food and fodder. Fertilizers may contain one or more of the essential nutrients. Those that contain only one of the major elements are described as single, simple or straight fertilizers. Those that contain two or more of the major elements are classified as mixed or compound fertilizers. Nitrogen, phosphorus and Potassium are the main plant nutrients and these three provide the basis for the major groups of fertilizers.

Chemical fertilizers are important in modern Agriculture, for example, the new high yielding varieties which supply so much of the country's food, only perform well when they are given good field management and a balance application of fertilizers. However, in situations where fertilizers are relatively cheap, over application becomes a problem rather than being a solution. Farmers want to ensure good crop yield by using more than the recommended rates, and apply so much such that it has a residual effect on both the soil and the crop. Apart from that, a large amount of excess fertilizer application may be wasted through leaching which may pollute rivers and underground water systems [17]. Fertilizers that are not taken up by plants during the growing season, plus that which is returned to the soil un-harvested portions accumulate in the soil assuming losses due to erosion and leaching are small. This is what is referred to as fertilizer residues and it is the effects of such residues on soil and crop performance.

The term fertilizers refer to chemically synthesized plant nutrient compounds which are usually applied to the soil to supplement its natural fertility. Fertilizer could also be defined as any organic or inorganic materials of natural or synthetic origin which are added to a soil or foliage to supply certain elements essential for plant growth [4]. They are the most effective means of increasing crop production and of improving the quality of food and fodder. Fertilizers may contain one or more of the essential nutrients. Those that contain only one of the major elements are described as single, simple or straight fertilizers. Those that contain two or more of the major elements are classified as mixed or compound fertilizers. Nitrogen, phosphorus and Potassium are the main plant nutrients and these three provide the basis for the major groups of fertilizers. Most fertilizers that are commonly used in agriculture contain the three basic plant nutrients: nitrogen, phosphorus, and potassium. Some fertilizers also contain certain "micronutrients," such as zinc and other metals, which are necessary for plant growth [6].

The study highlights a gap in awareness, knowledge, and sustainable practices among local farmers. Addressing these gaps through targeted training programs, workshops, and extension services would build the capacity of local communities to adopt safer, more sustainable agricultural practices. This supports the broader objective of capacity building within environmental and health sectors. Sustainable development must include rural agricultural communities like Akamkpa. By involving local stakeholders in environmental health education and providing them with the tools to make informed decisions, the study promotes an inclusive approach to sustainability—ensuring that no community is left behind. Based on the aforementioned challenges in the research area, the researcher was poised to study Agricultural Chemicals and Environmental Health: A Study of the Impacts of Pesticide and Fertilizer Use on Environmental Degradation in Akamkpa Local Government Area.

STATEMENT OF THE PROBLEM

The use of agricultural chemicals, particularly pesticides and fertilizers, has become a widespread practice in Akamkpa Local Government Area of Cross River State. However, this practice has raised concerns about the potential impacts on environmental health. The indiscriminate use of these chemicals has been linked to soil pollution, water contamination, and air pollution. This has resulted in environmental degradation, which poses a significant threat to human health and the ecosystem. Despite the benefits of agricultural chemicals in boosting crop yields, their negative impacts on environmental health cannot be ignored. The environmental health risks associated with pesticide and fertilizer use are a major concern in Akamkpa Local Government Area. The area's agricultural sector is largely dominated by small-scale farmers who may not have access to information on safe handling and use of agricultural chemicals. This lack of knowledge and awareness exacerbates the problem of environmental degradation. Furthermore, the regulatory framework for controlling the use of agricultural chemicals in the area is weak, leading to unchecked use of these chemicals. The environmental impacts of pesticide and fertilizer use are not limited to the area itself but also have broader implications for the state's ecosystem. The study aims to investigate the impacts of pesticide and fertilizer use on environmental degradation in Akamkpa Local Government Area. Specifically, the study seeks to examine the relationship between pesticide and fertilizer use and environmental health risks.

It also aims to identify the factors contributing to the indiscriminate use of agricultural chemicals in the area. The study's findings are expected to provide valuable insights into the environmental health implications of pesticide and fertilizer use. This will inform the

development of strategies for promoting sustainable agricultural practices and mitigating environmental health risks. Ultimately, the study's outcomes will contribute to the protection of environmental health and the ecosystem in Akamkpa Local Government Area. The study's result will also have implications for policy and practice in the agricultural sector, particularly in relation to the use of agricultural chemicals.

OBJECTIVES OF THE STUDY

Specifically, the study seeks to find out whether:

1. find out the extent to which pesticide application relate to environmental degradation in Akamkpa Local Government Area of Cross River State
2. find out the extent to which fertilizer application relate to environmental degradation in Akamkpa Local Government Area of Cross River State.

RESEARCH QUESTIONS

The following research questions were posed to guide the study:

1. How does pesticide application relate to environmental degradation in Akamkpa Local Government Area of Cross River State?
2. To what extent does fertilizer application relate to environmental degradation in Akamkpa Local Government Area of Cross River State?

HYPOTHESES

The following hypotheses were formulated to guide the study:

1. There is no significant relationship between pesticide application and environmental degradation in Akamkpa Local Government Area of Cross River State
2. There is no significant relationship between fertilizer application and environmental degradation in Akamkpa Local Government Area of Cross River State.

SIGNIFICANCE OF THE STUDY

The result obtained in the study will be useful to the following individuals and group.

1. The findings of the study will be relevant to student of Environmental Education, the University Community, and other related disciplines as useful materials for acquiring relevant knowledge on the subject matter of this study.
2. Government agencies and international organization, like the ministry of Environment in this study as baseline data required for designing strategies and laws for effective utilization and management of natural resources, regulations towards effective use and application of Agricultural chemicals by farmers as regards to sustainable agricultural practices.

3. Non-governmental organization working on sustainable Agricultural best practices and other related activities will also find the result of this study very useful as it gives them an insight into the nature of the situation under investigation.

4. Members of the host communities in the study area will also benefit immensely for the findings of the study as a medium of evaluating their attitude towards the sustainable agricultural best practices for sustainable development.

5. Researchers intending to carry out similar study on a broader scope or in other locations will benefit from the findings of this study as a reference material.

6. Lecturers in the aforementioned discipline will also see the findings of this study as a resource material for acquiring and imparting relevant knowledge to their learners.

LIMITATION OF THE STUDY

The following limitations were encountered in the cause of this research work:

1. The materials required for carrying out this study were not easy to come by, this posed a limitation of the study.
2. The study area is rural in nature and characterized by a difficult terrain, movement across the various communities posed a great challenge to the researcher.
3. The financial demands required to carry out the comprehensive study is high; this limited the scope of the study to some selected communities in the study area.

METHODOLOGY

Survey research design was used for the study. The research design studies situations as they exist at the time of a research. This research design is therefore considered appropriate for this study because it allows the researchers to make use of a representative sample of the population from where generalization of the study result will be made. *area has an estimated population of 151,125 thousand people. The purposive and accidental sampling technique were used to select (347) respondents between the ages of 18 years and above within the selected communities in Akamkpa local government area of Cross River State under the study.*

First the researcher intentionally picks six three communities from the local government area because of the characteristics they possess which is much forest resources/farming population, accessibility, convenience and financial implication. Secondly, the researcher accidentally gave the instrument to the respondents that was met at the time of administration that were willing to take part in the research after due introduction of the aim of the research and adhering strictly to the ethical

considerations of research confidentiality. Agricultural Practices and Environmental Degradation Questionnaire (APEDR). was used for data collection. The research instrument was face and content validated by experts in Text and Measurement and Environmental Education Department both in University of Calabar. The Cronbach alpha reliability analysis was used to ascertain the reliability of the research instrument which ranged from .81-89. The sample of the study comprise three hundred and forty-seven (347) respondents between the ages of 18 years and above within the selected communities in Akamkpa local

government area of Cross River State under the study. The data collected during the study were analyzed with simple linear regression using package IBM SPSS Version 27. The data were analyzed at .05 level of significance 1 and 345 degrees of freedom'

PRESENTATION OF RESULTS

Ho1: There is no significant relationship between pesticide application and environmental degradation in Akamkpa Local Government Area of Cross River State. The result of the analysis is shown in Table 1.

Table 1: Simple regression analysis on the relationship between pesticide application and environmental degradation in Akamkpa Local Government Area of Cross River State

Model R	R Square	Adjusted R Square	Std. Error of the Estimate		
.150	.023	.021	2.70805		
ANOVA ^b					
Model	Sum of Squares	Df	Mean Square	F-ratio	Sig.
Regression	83.380	1	83.380	11.370	.001 ^a
Residual	3615.436	345	7.334		
Total	3698.816	346			

* Significant at .05 level

The simple regression analysis in Table 1 showed There is a significant relationship between pesticide application and environmental degradation in Akamkpa Local Government Area of Cross River State which produced an adjusted R² of .021. This implies that only 2.1 percent of the variance of the dependent variable (environmental degradation) could be accounted for by the independent variable (pesticide application). The F-value value of 11.370 of the Analysis of Variance (ANOVA) obtained from the regression table with a p-value .001 with 1 and 345 degrees of freedom at .05 level of significance showed that the null hypothesis was rejected. This

result therefore signifies that agroforestry significantly predicted conservation of forest resources by 2.1 percent. The result therefore implies that there was a significant relationship between pesticide application and environmental degradation in Akamkpa Local Government Area of Cross.

Ho2: There is no significant relationship between fertilizer application and environmental degradation in Akamkpa Local Government Area of Cross River State.

The result of the analysis is shown in Table 2.

Table 2: Simple regression analysis on the relationship between fertilizer application and environmental degradation in Akamkpa Local Government Area of Cross River State

Model R	R Square	Adjusted R Square	Std. Error of the Estimate		
.177	.031	.029	2.69585		
ANOVA ^b					
Model	Sum of Squares	Df	Mean Square	F-ratio	Sig.
Regression	115.896	1	115.896	15.947	.000 ^a
Residual	3582.920	345	7.268		
Total	3698.816	346			

The simple regression analysis in Table 2 showed that there is a relationship between fertilizer application and environmental degradation in Akamkpa Local Government Area of Cross River State which produced an adjusted R² of .029. This implies that only 2.9 percent of the variance of the dependent variable (environmental degradation) can be accounted for by the independent variable (fertilizer application). The F-value value of

15.947 of the Analysis of Variance (ANOVA) obtained from the regression table with a p-value .000 with 1 and 345 degrees of freedom at .05 level of significance showed that the null hypothesis was rejected. The result therefore implies that there was a significant relationship between fertilizer application and environmental degradation in Akamkpa Local Government Area of Cross River State.

DISCUSSION OF THE FINDINGS

Results from testing of hypothesis one revealed that there is a significant relationship between pesticide application and environmental degradation in Akamkpa Local Government Area of Cross River State. This result supports [5] that stated that the majority of pesticides are not specifically targeting the pest only and during their application. They also affect non-target plants and animals. Repeated application leads to loss of biodiversity. Many pesticides are not easily degradable, they persist in soil, leach to groundwater and surface water and contaminate the wide environment. Depending on their chemical properties they can enter the organism, bioaccumulate in food chains and consequently influence also human health.

This result also agrees with [14] that stated that Excessive use of pesticides may lead to the destruction of biodiversity. Many birds, aquatic organisms and animals are under the threat of harmful pesticides for their survival. According to the authors Pesticides are a concern for sustainability of environment and global stability

Results from hypothesis two revealed that there is a significant relationship between fertilizer application and environmental degradation in Akamkpa Local Government Area of Cross River State. This result is in tandem with [17] who stated that though chemical fertilizers are important in modern Agriculture, for example, the new high yielding varieties which supply so much of the country's food, only perform well when they are given good field management and a balance application of fertilizers. According to the authors,, however, in situations where fertilizers are relatively cheap, over application becomes a problem rather than being a solution. Farmers want to ensure good crop yield by using more than the recommended rates, and apply so much such that it has a residual effect on both the soil and the crop. Apart from that, a large amount of excess fertilizer application may be wasted through leaching which may pollute rivers and underground water systems.

CONCLUSION

This study has established a significant link between the application of pesticides and fertilizers and environmental degradation in Akamkpa Local Government Area of Cross River State. The findings indicate that the indiscriminate use of these agricultural chemicals has devastating consequences for the environment, highlighting the need for sustainable agricultural practices. Therefore, it is imperative that stakeholders, including farmers, policymakers, and regulatory agencies, take immediate action to promote environmentally friendly agricultural practices and mitigate the

environmental degradation caused by pesticide and fertilizer use.

RECOMMENDATIONS

Based on the findings of the study, the following recommendations were given by the researchers that:

1. The government and relevant stakeholders should establish and enforce strict regulations on the use of pesticides in Akamkpa Local Government Area, to minimize environmental degradation. Furthermore, farmers in the area should be educated and incentivized to adopt integrated pest management practices that reduce reliance on chemical pesticides
2. The government and agricultural extension services should promote and support the use of organic fertilizers and sustainable soil management practices among farmers in Akamkpa Local Government Area. Additionally, farmers in the area should be trained on the proper use and application of fertilizers to minimize environmental degradation and optimize crop yields.

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