

Investigation into the Effect of Pesticide application on Soil and Environment with Crop Protection Machine in Southern Adamawa state

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ABSTRACT

An extensive field study and investigation shows the negative impact of pesticide on soil and environmental pollution. This summary information in southern Adamawa state, Nigeria with current knowledge of pest application with crop protection machine at recommended levels, rarely had detrimental effect on human and microbial activities in the soil. They had effect on population of bird species that feed on insects and invertebrate killed by pesticide. It kills the blooming species of insects that pollinates plants. Over 10-20% population of natural honey bee use for food were reduced in the study zone. Available information raises in this study regarding the long term exposure to pesticide had lead to 164 contracted diseases, 103 poisoned, 101 hospitalized and 28 untimely dead of farmers. More information from this study that fresh source of drinking water and underground water in rural areas had been contaminated by surface run off, percolation, spillage and leaching through water ways or drainage. Investigation carried out in the field study that 59% of operators, farm workers and stock holders are not using personal protective equipment. The device and clothing that protect the human body from contact with pesticide and pesticide residue is not common in the study zone.

Key words: Crop protection machine, Effect, Environment, Pesticide, Soil

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I. INTRODUCTION

Modern technologies utilizing optimum management of pesticide to improve agricultural practices had made pesticide a reality. Pesticide has markedly modified traditional pest control to increase yield and quality of agricultural products for domestic use and export.

For the purpose of this project in southern Adamawa state as a case study had been interpreted as a geographical region occupied Demsa, Ganye, Guyuk, Jada, Mayo belwa, Numan and Toungo in which the field study had examined the detrimental effect of pesticide on soil and environmental pollution.

Pesticide are chemical used in preventing pest from damaging crop, grain and seed. The hazardous nature of pesticide and their inherent toxicity on farm workers include;

- I. Neurological effect such as weakness of arms, legs, hands, memory loss and loss of concentration.
- II. Reproductive health effects such as alteration in sexual behavior fertility and pregnancy.
- III. Organic disorder which include disruption of activity in the body of kidney, liver, blood or digestive tract.

World health organization estimated that at least 3 million cases of acute poisoning and 20,000 deaths occur annually due to exposure to pesticide (Orhili Paul 2010).

Food contamination and environs with pesticide is a serious hazard that poses great threat to public health worldwide. It is also a leading cause of trade problem internationally.

Orhili Paul (2010) reported that there is a rapid annual increase in sales, use and dependence on pesticide in developing countries.

Pesticide has widely variable toxicity. The acute toxicity due to exposure had lead to long term problems and a range of health effects from skin rashes to death. The path way of attack can be transported via surface run off and leading to contaminate distant water source. Pesticide discompose rapid in soil via soil micro bid, hence inhabiting the activities of micro organism in the soil.

The field study in this project will focus on biological environment to evaluate accurate effect of pesticide on non photosynthesis, invertebrates, birds and fish.

Most of the chemical use in pesticide is persisted soil contaminant which adversely affects soil conservation and impact may endure for decades.

Hence the effect of pesticide on environment include:-

- i. A research performed at Oak national laboratory (2000) showed a fatal condition of pesticide run off in the Gulf of Mexico each year.
- ii. World watch reported farmers in China, experience toxic chemical contaminating ground water on every inhabited continent, and emerging the world most valuable supply of fresh water.
- iii .A study published in the journal of Agriculture and food chemistry (2000) showed DDT chlordane and other organic chlorine pesticide keep showing up in lettuce, carrot, potato, and vegetables treatment in a garden heavily with chlorine 38 years earlier
- iv .A recent information on soil at East brook and West brook middle school, Alana Quartuccio editor reported, July 8, 2013, contains level of pesticide above the environmental standard. It shows the presence of fine pesticides compound above residential direct contact soil criteria. The sample showed elevated levels of the “pesticide, aldrin, deil drin and chlordane” all which had been banned in the late 1980’s. The school had been closed for months during remediation and the report said no further clean up was needed when the school reopened.

In addition, the indiscriminate uses of crop protection machines have contributed adversely on environmental pollution by careless and unprofessional farm workers.

1.1 Scope and Limitation

The scope is an extensive study to investigate effect of pesticide application on soil and environmental pollution with crop protection machine in Southern Adamawa State-Nigeria.

It is limited to nine Local Governments as sample areas to carry out the research work.

1.2 Objective of the Field study

The summary of the work include;

- i. Effect of pesticide on soil micro organism, organic matter, aquaculture and birds
- ii. Environmental pollution of pesticide on human health, ecological areas and water source.
- iii. Unprofessional operations of farm workers with crop protection machines.
- iv. Guide lines for failure safe use of pesticide.

II. METHOD AND MATERIALS

The research methodology focus on the effect of application of pesticide on soil and environment with crop protection machines in southern Adamawa state.

The main source of information and data in the study zone were questionnaires.

Questionnaire were administered randomly in six local government areas and dully filled by farmers. In a situation where some farmers and stockholders cannot read or write, oral interview was conducted to collect first hand information.

The questionnaires’ are close and open –ended. In the close ended, the farmers/ and stockholders have been given alternative choice of answers; while the open-ended questionnaires’ allow farmers to express their views freely. Latest sources of information from past technical reports, internet, oral questions and relevant published journals.

2.1 Population and sample size

The population in study zone is farmers and stockholders. The area under study was stratified into six local governments’ areas, Demsa, Ganye, Jada ,Mayo belwa, Numan and Toungo, randomly selected to represents the nine local governments for effective coverage of southern Adamawa state. As shown in the table1

Table 1: Number of farmers and sample size

S/N	Local government areas	No of questionnaires distributed	No of questionnaires retrieved
1.	Demsa	15	13
2.	Ganye	50	50
3.	Jada	35	29
4.	Mayo belwa	15	13
5.	Numan	15	14
6.	Tongo	18	12
7.	total	150	131

Source: Field Survey (2013)

Thus, one hundred and fifty questionnaires were administered and retrieved numbers were131 questionnaires [87%]. Dully filled and retrieved for database analysis.

2.2 Method of data analysis

Tabulation and sample percentages were employed for the analysis. Inference and conclusion was drawn base on the percentages for quantitative data report.

2.3 Problems encountered

During distribution and interview of farmers across the study zone, the following problems were encountered, wrong response to questionnaires, misconception of the field survey, and refusal to submit questionnaires.

III. RESULT AND DISCUSSION

Result obtained from field survey study and analysis indicates that there are several negative effects of pesticide on soil, environment and farm workers.

The quantitative effects of pesticide estimated were presented in tables and interpolated with current knowledge.

Table2: Procurement of pesticide as management tool for pest control

source	No of response	Percentage (100%)
Open market	110	84
Registered company	4	2.5
Stockholders	9	7.5
government	8	6.0
Total	131	100

Source: Field Survey (2013)

The field work carried out indicates that majority of farmers in study zone purchase their pesticide directly from open market. In which there is probability of adulteration of pesticide. It may devalued the standard of the company and affect its efficiency and efficacy.

Table3: pesticide length of exposure.

Length of exposure (years)	NO of respondents	Percentages[100%]
Above 5	63	49
6-10	46	37
Above 10	19	14
Total	128	100%

Source: Field Survey(2013)

In this study, most of the farm workers and stockholders were exposure to pesticide from 1 to 5 years. Pesticide was popularly known and used in the study from 2000 to update.

Prolong exposure had lead to contracted diseases, poison and untimely dead of farm workers in the study zone as shown in table4.

Table4: Pesticide hazards to farm workers.

Investigated effects	No of farm workers.
Contacted disease	164
Poison	103
Hospitalized	101
Death	28

Source: Field Survey (2013)

Table 4 shows quantitative and statically data of ill health and contacted diseases as a result of exposure to chemical fumes from crops protection machines.

Drift beyond intended spray site is more likely dangerous and harmful to farm workers and environment.

However, pesticide enters the human body through, the skin, mouth and breathing.

Skin contact is the most common causes investigated in study zone. This can occur through splashes, spillage contaminated cloth and continuous exposure to spray. Sweat during field operation increases skin absorption. Hands and arms often exposed when handling products.

Table5: Pesticide effect on soil.

Groups	Effect category %		Total
	negative effect	No Effect	
Decrease biomass activity	78	22	100
Soil degradation and sorption	47	53	100
Nitrogen fixing bacteria	75	25	100
Organic matter broken in soil	47	53	100

Source: Field Survey (2013)

Table 5 indicates 73% negative effect on biomass activity. The use of pesticide and pesticide residue decreases the general biodiversity in the soil.

Soil degradation and sorption had 47% effect in the study zone. The two factors have influence in persistence of pesticide in the soil. over 58% negative effect on organic matter broken in soil.

Breaking down of organic substance and degradation involves interaction among micro organism in the soil. Observed chemicals have been shown to be less accessible to micro organism. If this symbiotic interaction reduces, nitrogen fixing bacteria will reduce. This will result in low yield of crop production. In which, continuous application of pesticide will have 75% negative effect on nitrogen fixing bacteria.

Table6: Pesticide effect on environment

Groups	Effect category %		Total[100%]
	Negative effect	No effect	
1. Species of insects that pollinate crops.	94	6	100
2. Decrease fish and aquatic life production	80	20	100
3. Gradual decrease of bird species and honey bee use for food.	78	22	100
4. Contaminate source of drinking water and areas.	83	17	100

Source: Field Survey (2013)

In this study, 5-10% of honey bees' use for food had been decreased in the study zone; the producer and supplier of honey in large scale in the state.

In 1970 s, quantitative analysis was carried on pesticide run off in order to predict amount of water contamination through major routes, which indicate, percolation, and leach, spilled or through neglect by farm workers was identified.

Other possibility of underground water contamination can occurs through rain or precipitation into water ways or drainage.

The negative impact of pesticide is often greater than what is intended by those who use them. Some pesticide contributes to global warming and depletion of the ozone layer.

Table7: Pesticide effect on crop protection machinery operators.

Status of operators	No of respondent	Percentage %
1. Professional	16	13
2. Trained personnel	65	52
3. Untrained personnel	44	35
Total	129	100%

Source: Field Survey(2013)

Table7 shows the effect of pesticide on operators, in which 35% of farm workers involved in spraying pesticide are untrained personnel. The length of exposure and close contact of farm worker and operator is harmful and hazards to their health.

Field study reported by environmental protection agency [EPA] that 10,000-20,000 related incident occurs each year, out of 27 farm workers most common pesticide identified by U. S .An environment protection agency [EPA], 15 of them are considered with additional links to various disorder and respiratory problem. During farm operation, farm workers come directly to inhale fumes, vapors and spray mix.

Further report of field survey unveiled the consequence of washing sprayers and equipment inside river is 31% and 60% near streams. It's susceptible to surface run or percolate to harm and cause hazards to fish and aquatic life in the study zone. Over 61% of farm workers are facing problems of handling sprayers and equipment in the study zone. More information from qualitative analysis of field study carried out that 59% of farm workers and stockholders are not using personal protective equipment [PPE] as shown in figure 1and2. It is the clothing and devices that are worn to protect the human body from contact with pesticide or pesticide residue, which indicates overalls or protective suits, foot wear, gloves, aprons, respirator, eye wear and head gears.

IV. CONCLUSION

Pesticide as management tools for quality and quantity agricultural production practices had become a reality.

World health organization estimated that at 3million cases of acute poisoning and 20,000 untimely death occur annually due to exposure to pesticide [Paul orhi,2000]. Field study carried out in the study zone investigated that 164 cases of contacted diseases, 103 acute poisoning and 28 untimely death from 2000-2012 in the study zone.

Quantitative analysis of report, that pesticide had acute effect on soil, environmental pollution and farm workers. It is revealed that there is gradual decline of birds and honey been use for food in the study zone. There is high degree of

contamination of fresh source of drinking water and underground water, when rain or precipitation washed pesticide into rivers ponds and tube wells in rural areas.

In addition, the drift can affect people nearby, collects on their skin and food materials especially fruit and vegetables. Sprayer operator comes directly to inhale fume dust, gas and vapor of spray mixture. Thus, the effect of pesticide and pesticide residue on soil and environmental pollution on un protected farm workers will gradual cause severe hazard in future.

The following recommendation and suggestions will reduce the detrimental effect and safeguard farm workers and stockholders in the study zone.

The handling and use of pesticide requires due consideration to avoid hazards to man, animals crops and environments. Indiscriminate sales and use of pesticide are common in the study zone .Pesticides are imported, transported ,stored ,sold or used by untrained personnel. The consequences of in appropriate pesticide handling are the acute hazard of food contamination, pollution of water sources and even untimely death.

Safety precaution includes;

- [1] Recommended products by registered company
- [2] Understand dose, rate, dilution, timing and frequency of application
- [3] Ensure timely supply of appropriate and genuine products equipment and spare parts are ordered and stocked.
- [4] Avoid selling pesticide in the open or close to food stuff and animal
- [5] Avoid manufacturers packages repacked for sale in bottle, bags or tins
- [6] User should avoid pesticide product that are damaged, leaking, hand sealed, tempered and lack of original label or expired
- [7] Secure pesticide store under lock, away from children, animal's food stuff and water supplies.
- [8] Always read label and seek instruction before starting to use pesticide.
- [9] Do not apply pesticide without adequate training.
- [10] Wash personal protective equipment every day after use.
- [11] Wash your body thoroughly after work every day.

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Figure1: Farm worker in the study zone handling pesticide with local protective clothing.



Figure2: Farm worker in the study zone handling pesticide without protective devices and clothing



Figure3: sellers of agro chemicals in the study zone are exposed to pesticide hazard without protective devices and clothing.



Figure4: sales managers in the study zone are accommodated in the same store without ventilation and protective devices. Are they immune from poison?

Figure5: Status of crop protection machinery operators in the study zone

