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The Risk and Mitigation Practices of Poor Application of Agro-Chemicals in Some Selected Charanchi Rural Communities

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ABSTRACT
There have been researches on disaster management mostly focusing on natural disasters such as earthquake, flooding, bushfire etc. However little is known on the farmer's livelihood activities towards agricultural practices especially application of fertilizer and agro-chemicals. The traditional application of agricultural chemicals commonly observed in rural areas often found very hazardous. The most vulnerable farming practices among rural farmers in Nigeria are fertilizer application, spray of insecticides and herbicides. These practices are often associated with variant risks especially health risks to farmers. This research is therefore aimed at to explore these risks. Questionnaire was administered to 120 local farmers from six communities within the study area. The results obtained through t-test statistical analysis show high risk of vulnerability to diseases as a result of poor application of agro-chemicals. The hypothesis of no risk was rejected. The study recommend mitigation such as absolute protective measures when applying agro-chemicals such as wearing of hand globes, using rain boots, facemask and avoiding facing wind direction among others.
Keywords: Risk, Agro-chemicals, Vulnerability, Mitigation,

1.0 INTRODUCTION

The traditional application of agricultural chemicals commonly observed in rural areas often found very hazardous. The most vulnerable farming practices among rural farmers in Nigeria are fertilizer application, spray of insecticides and herbicides. These practices are often associated with variant risks especially health risks to farmers. They also cause fertilizer wastage and spend more than necessary on fertilizer as a result of improper application. These have accounted for the vulnerability of individuals, households and social groups.

To varying degrees, it might be assumed that rural farmers in Nigeria have developed social and biological resistance to such hazards or their respective culture has also developed ways of tolerating such hazards. However the assumption is wrong, rural farmers have been suffering from variety of diseases and acute shortage of farm produces as a result of missing appropriate fertilizer, herbicides and insecticides application techniques.

Pesticide application is a widely adopted technology by rural farmers in Nigeria to combat pest attack which is a predominant phenomenon in crop production. Although, pesticide use in crop production by the farmers is for the purpose of improving productivity through reduced or no pest attack, it has the capacity of altering the fragile ecosystem, the environment and the health of farmer in general (Bentley, Boa, & Stonehouse, 2004). From the foregoing, it is necessary to examine the health and economic effects of pesticide use in crop production in Nigeria especially by rural farmers. Specifically, this study described

the traditional fertilizer, Herbicides and Pesticide misapplications (*FHP*misapp) by rural farmers identified the common pesticides and insecticides used, described the pesticide handling practices and highlighted the observed effect of pesticide use on the rural farmer's health and economic wellbeing.

Despite economic importance application of agrochemicals has in the improvement of agricultural output, their misapplication practices can still be harmful to human and surrounding ecosystems. The environmental exposure to these agrochemicals (Herbicide, pesticide or fertilizers) has become a concern for human health. (Van Bruggen, et al., 2018)A large part of reducing this vulnerability index is through enlightenment, by bringing the farmers into a level of awareness regarding different sources of FHPMisapps so they can avoid potential risks.

Some of the farmer's livelihood activities towards agricultural practices are hazardous in terms of health. Pesticides may be applied by farmers without adequate protection such as hand gloves, face masks, or boots. Fertilizer application is also without due protection. Many farmers both wet and dry seasons farmers have associated health risks including malaria, bilharzias and diarrhoea. These farmers have different access to production resources such as land, labour, tools, knowledge, skills, and livestock and to social networks and employment opportunities with which to provide a livelihood. This livelihood therefore, needs to be secured and adequate to reduce the vulnerability of the health components. This research is hence timely and would help to mitigate the risk of losing the productivity of rural farmers who provides substantial amount of variant food. They also help the national economy through provision of direct and indirect employment to community members.

Studies on disaster management have been skewed towards natural disasters such as Flooding (Yodsuban & Nuntaboot, 2021), Earthquake (Y. J. Chen, et al., 2023), Tsunamis (Osti, Tanaka, & Tokioka, 2009), Volcanic eruption (Gestrich, Fee, Tsai, Haney, & Van Eaton, 2020), Mudslides (Debieche, et al., 2012), Wildfire (Oliveira, et al., 2023) and Drought (Poonia, et al., 2021) etc.

However, disasters as a result of human activities are at alarming rate. Agricultural activities are associated with numerous disaster threats. Farmers are at risk and vulnerable to hazards due to their frequent contacts with pesticides, fertilizers and herbicides. These have attracted the attention of researchers who have been investigating the whole incident. For instance, (Ambrose, 2022) study shows that the hazard quotients of about 60% of the organochlorine pollutants (OCPs) in cabbage are greater than one therefore pose serious health risk to consumers. They offer fumigation with organophosphate chemicals which has little health risk. In a similar research, acid-processed montmorillonite clays (APMs) were found to be able to decrease human and animal pesticide exposures especially during disasters and emergencies (Wang & Phillips, 2019). Furthermore, (Y. Chen, Fu, & Liu, 2022) in their study suggested that government should encourage farmers to conduct moderate-scale management and promote their fertilizer application behaviour with organic fertilizer by improving awareness, strengthening education and training, and providing financial support.

Agricultural activities mostly are determine by farmers livelihood assets, (Wei, Su, Li, & Ma, 2019) assert that choice of livelihood strategies are more affected significantly by the status of livelihood assets. This shows the large scale farmers tend to acquire effective and environmentally friendly agricultural equipments that ensures safety and puts their workers on less vulnerable to any hazards than have not farmers. However, (Ikwuakam, Iyela, Areo, Usman, & Rabiu, 2022) believes that role of infrastructural facilities in increasing the farmers productive potentials and livelihood activities of rural farmers has never been in doubt. Against this background therefore, that is why in their research they suggested a provision of infrastructural framework based on people's felt needs and implementing same accordingly to be germane to improved livelihood activities in the rural farmers.

2.0 Problem Statement

Majority of rural farmers are subsistence farmers, though they do contribute immensely in massive production of grains, their produce are more of sustaining their livelihood needs than commercial. In an attempt to improve their production to at least improve their livelihood status, these rural farmers engaged in using farm inputs which include fertilizers, pesticides and herbicides.

These farm inputs are not properly applied farmers apply fertilizer without using hand globes and face mask. Farmers in this case are vulnerable to varied diseases as a result of inhaling these chemicals. They

also eat food on the spot without adequate washing hands with soap this has been causing discomfort, diarrhoea and even lost of live.

Farmers in rural areas do not follow due process during fertilizer application. Each crop has its own quantity of fertilizer required. It also has timing i.e when first second and third application has been done. These has drastically affects production as some times fertilizer is applied when the plant does not need it or applied in excess and eventually the plant died.

Similarly farmers in rural areas sprays pesticides and herbicides without using hand globes, face masks and rain boots. These farmers are vulnerably to inhalation of these toxics leading to many health hazards. It is believed that weed management is one of the most important agronomic operations for agricultural production, and chemical weed control has been practiced even at local level. Herbicides applied to control unwanted plants could cause a number of negative health and environmental effects if handled improperly. Inadequate caution and exposure to these products without protection could cause poisonings (Korres, 2019). The toxicity of the many available commercial herbicides varies considerably. Adherence to occupational hygiene practices could contribute significantly to avoidance or reduction of unintended poisoning from herbicides.

3.0 Materials and Methods

3.1 Sampling

Six communities were selected at random and 20 rural farmers were selected in each community and administered the questionnaire given a total of 120 respondents. These communities are Charanchi ward, Radda ward, Kuraye ward, Ganuwa ward, Banye ward and Koda ward. These farmers were grouped in to three based on their farmland size. Group A less than one hector, Group B 2-4 hectors and Group C above 4 hectors.

3.2 Data collection

Questionnaire will be administered to 20 respondents in each community giving a total of 120 respondents.

3.3 Hypothesis

3.3.1 The null hypothesis H_O stated that there is no risk of poor application of agricultural chemicals by rural farmers

3.3.2 The alternative hypothesis H_a assumed that there is risk of poor application of agricultural chemicals by rural farmers

3.4 Statistical Test

Student's T-test using SPSS software was used to test the hypothesis;

$$t = \frac{x - \mu}{\frac{s}{\sqrt{n}}}$$

Where x = is the observed samples' mean value

μ = Population mean value

S = the standard deviation of the sample

N = is the sample size

4.0 RESULTS AND DISCUSSIONS

4.1 Results

a- Inventory of Agro Chemicals Used by Farmers in the Study Area

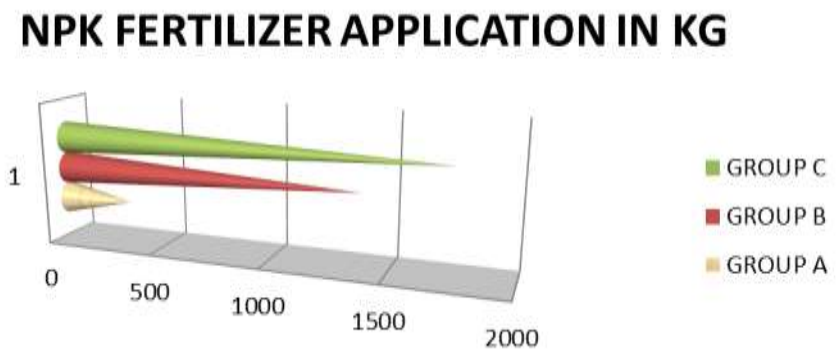
We classified the common agricultural chemicals used in the study area in to three. These are Fertilizers, Insecticides and Herbicides as shown in Table 4.1 below;

Table 4.1

FERTILIZERS	INSECTICIDES	HERBICIDES
1- NPK 2- UREA	1- Pyrethrins 2- Pyrethroids	1- Glyphosate 2- Atrazine and Paraquat

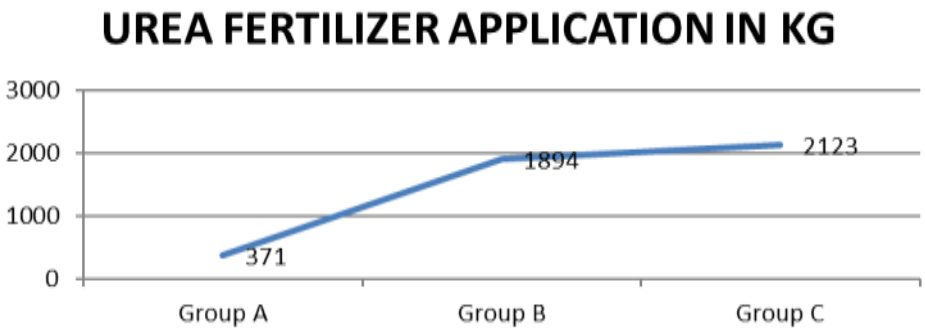
The study shows that farmers who cultivate one hector and below of land (≥ 1) in the entire selected communities within the study area used 16,100kg of NPK fertilizer per annum. Those who cultivate two to three hector of land (2-4) use 69,050kg of NPK fertilizer and those who cultivate four hector and above of land (4 and above) use 88,000kg of NPK fertilizer in each farming season.

Figure 4.1



Similarly, group A farmers who's farmland is one hector and below use 18,550kg of UREA fertilizer while group B (2-4) hector of land use 94,700kg and group C above 4 hector of land use 106,150kg of UREA fertilizer.

Figure 4.2



The community that has high application of NPK fertilizer is Charanchi ward which use 31,500kg and use 45,700kg of UREA fertilizer. Banye ward community use the least quantity of both NPK and UREA fertilizer. They use 26,850kg and 32,500kg respectively. Table 1 below shows the average quantity of fertilizer use in each sampled community;

Table 4.2

Average Quantity of Annual Fertilizer Application

Community		NPK	UREA
1- Banye ward			
	Group A	52 Bags	58 Bags
	Group B	210 Bags	276 Bags
	Group C	275 Bags	316 Bags
2- Charanchi ward			
	Group A	61 Bags	71 Bags
	Group B	248 Bags	387 Bags
	Group C	321 Bags	456 Bags
3- Ganuwa ward			
	Group A	51 Bags	60 Bags
	Group B	211 Bags	281 Bags
	Group C	281 Bags	332 Bags
4- Koda ward			
	Group A	49 Bags	58 Bags
	Group B	230 Bags	288 Bags
	Group C	290 Bags	331 Bags
5- Kuraye ward			
	Group A	54 Bags	59 Bags
	Group B	236 Bags	280 Bags
	Group C	294 Bags	321 Bags
6- Radda ward			
	Group A	55 Bags	65 Bags
	Group B	246 Bags	382 Bags
	Group C	299 Bags	367 Bags

This study further revealed that farmers use 1,295liters of insecticides for every farming season and 432liters of herbicides for every farming season. The range of Insecticides use in the study area is 48liters while that of herbicides is 26liters.

Table 4.3

Average Quantity of Annual Agro-chemicals Application

Community	Insecticides	Herbicides
Banye	197liters	56liters
Charanchi	245liters	82liters
Ganuwa	211liters	67liters
Koda	213liters	62liters
Kuraye	198liters	72liters
Radda	231liters	93liters

Statistical Analysis

The statistical analysis results shows that agro-chemicals poorly applied in the study area are more clustered for having low standard deviation while fertilizers shows degree of spread for having high standard deviation. Meanwhile the standard error of the mean that tells the distribution can be 95% confident our observed sample mean plus or minus two from the population mean, meaning that the probability that the population mean fall in the calculated interval at $P<0.05$

Table 4.4

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
Fertilizer	6	1308.50	139.982	57.148
Agrochemicals	6	287.83	30.446	12.430

Agro-chemicals comprising insecticides and herbicides exhibits high value of t-scores. This indicates that a large difference exist compared to fertilizer. The very low range of t-scores between the two samples indicates that the difference between them is statistically significant.

Table 4.5

One-Sample Test

	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	99% Confidence Interval of the Difference	
					Lower	Upper
Fertilizer	22.897	5	.000	1308.500	1078.07	1538.93
Agrochemicals	23.157	5	.000	287.833	237.72	337.95

DISCUSSIONS

The null hypothesis of no risk of poor application of agro-chemicals by rural farmers in the study area is therefore rejected. The rejection becomes as the calculated t- value is greater than the critical t- value. Table 4.5 shows that t-scores for fertilizer and agro-chemicals are 22.9 and 23.2 respectively while the tabulated t-score is 3.17.

It is therefore evident that farmers in the study area are vulnerable to varied health challenges as a result of physical contact and inhalation of toxic agrochemicals and fertilizer. Insecticides for instance can cause poisoning after being swallowed, inhaled or absorbed through the skin. This can lead to eye tearing, coughing, heart problems, breathing difficulties and death. In one hand herbicides can cause short terms health effects such as skin rashes and permanent failure of eye and blindness. The long term effects may include kidney damage, cell damage, DNA abnormalities and mutations and also death.

The study further revealed that these rural farmers often eat food with their hands not washed after application of fertilizers. In the end they tend to swallowed substantial quantity of fertilizer. This put them vulnerable to dizziness, fainting, low blood pressure, seizures, and shortness of breath with stomach pains. This may eventually cause death.

CONCLUSION

This study was limited to exploring the risk of poorly application of fertilizers and other agro-chemicals by rural farmers in some selected communities of Charanchi local government Katsina state. Student t-test was used to determine statistical significance of the sampled distribution. It was also used to reject the null hypothesis of no risk of using agro-chemicals by rural farmers in the study area.

There is therefore need for further research to explore economic lost resulting from poor application of fertilizers and agro-chemicals. The process of application ensures greater wastage which when quantified it would a great lost to the farmers and will affect their net income after farming season. More researches such also be conducted to ascertain the effects to the plants themselves. When not properly applied agro-chemicals can cause stunted growth of plants hence low yields.

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