Journal of Agricultural Chemistry and Environment, 2023, 12, 65-83
https://www.scirp.org/journal/jacen
ISSN Online: 2325-744X
ISSN Print: 2325-7458

Potential Risks to the Environment as a Result of Pesticide Handling in the Nanumba-North Municipality, Ghana

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How to cite this paper: Yakubu, F., Pelig-Ba, K.B., Abagale, S.A. and Oseni, L.A. (2023) Potential Risks to the Environment as a Result of Pesticide Handling in the Nanumba-North Municipality, Ghana. *Journal of Agricultural Chemistry and Environment*, **12**, 65-83.
https://doi.org/10.4236/jacen.2023.122006

Received: February 11, 2023
Accepted: April 7, 2023
Published: April 10, 2023

Abstract

The present study deduced the potential risks to the environment as a result of pesticide handling in the Nanumba-North Municipality of the Northern Region of Ghana. Cluster sampling was used to select 30 communities from Nanumba-North Municipality. Simple random sampling and purposive sampling were used respectively to select 7 households from each community and one farmer from each household, giving a sample size of 210 farmers. The instrument used for the study was a questionnaire of respondents. The quantitative data obtained were analyzed using frequencies and percentages. The study concluded that 11 types of pesticides are commonly used by the farmers on their fields, with atrazine (22%) being the most commonly used pesticide which is an herbicide, and deltamethrin (1%) was the least used pesticide which is an insecticide. The study, therefore, recommends that appropriate authorities in the area should inculcate means to enlighten farmers on the best way of pesticide utilization that can beef up the ambition of sustainable agricultural production and desirable environmental conditions.

Keywords

Pesticide, Risk, Nanumba-North Municipality, Environment

1. Introduction

Pesticides are versatile substances adopted by road contractors, gardeners, and farmers, to simply, safely, and effectively, control pests and diseases. Since the introduction of pesticides after World War II to serve as warfare particularly, organophosphate insecticides were developed as nerve gases. Pesticides have become the most frequently used chemical in agriculture. However, there are growing pieces of evidence of some potentially toxic chemicals that are recurring in our bodies.

Also, nowadays, with the adoption of agricultural machinery to mechanize the work of agriculture, farmers rely heavily on the use of agrochemicals, including pesticides for increased yield of crops. Undoubtedly, in Ghana, pesticide use by farmers for the control of pests and pathogens as well as the preservation of harvested crops has increased in recent years [1].

However, the use of pesticides can be a necessary evil for farmers, consumers and traders or workers who come into contact with these potentially toxic chemicals during food supply if not used properly [2]. Similarly, according to [3], inappropriate or improper application of pesticides possesses potential health risks to humans, animals, and the environment, even though the adoption of these potentially toxic chemicals can extra-ordinary improve productivity by farmers. Also, according to [4], indiscriminate use of these potentially toxic chemicals in the recent past has led to environmental contaminations amid magnification in food, air, soil, and water bodies. Furthermore, most of these potentially toxic chemicals are usually applied indiscriminately and inappropriately [5], creating potential adverse effects on humans and the environment.

In general terms, the main outstanding contribution linked to the increased use of adulterated, mislabelled, and cheap pesticides in Ghana, is potentially associated with farmers' irrational insight on pesticide types, their use and attendant risks, ineffective enforcement of pesticide regulations by the government and robust incentives amongst pesticide users and traders. Furthermore, evidence of misuse of pesticides and other agrochemicals by farmers in other farming areas in Ghana has been documented by [5] [6] and it is enough backing to give cause for similar concerns in the Nanumba-North Municipality.

Studies have shown that pesticides can cause death, systemic (e.g., liver, skin, bone, and thyroid), neurological, developmental, endocrine, and immunological toxicity in humans and animals. Pesticides are extensively distributed in the environment due to their persistence and resistance to degradation. Its bio-accumulates in human tissues and this eventually pose serious health risks to humans and animals [7]. For instance, studies on leukemia and non-Hodgkin lymphoma have been linked to pesticide exposure and therefore substantial use of pesticides should be decreased [8].

Other detrimental effects related to pesticide exposure include birth defects, pernicious effects, and neurological and neuro-developmental disorders [9] [10]. There is also growing concerned about the improper disposal of pesticide waste as it can create serious threats to humans and the environment [11].

Admittedly, in the Nanumba-North Municipality of the Northern Region of Ghana, pesticides are without a doubt, used by farmers to catapult the yield of food and crop production. However, overuse and improper use of chemical pesticides can have deleterious effects on human health and the environment in the municipality. In addition, most farmers have no formal education and do not follow precautions for pesticide application and usage, increasing potential adverse risks to the environment and humans. This study aimed to deduce the potential risks to the environment as a result of pesticide handling in the area. Clearly, this aim was achieved by employing the following:

1) First of all, various pesticides available on the market were identified,

2) Secondly, the types of pesticides mostly used by farmers were also identified,

3) Thirdly, the storage of used and unused pesticides by farmers was assessed in addition to the mode of disposal of empty pesticide containers in the study area, etc.

2. Methods

The survey was conducted in the Nanumba-North Municipality, which is one of the farming areas in the Northern Region of Ghana. Nanumba-North Municipality lies between latitudes 8.5˚N and 9.25˚N and longitudes 0.57˚E and 0.5˚E (**Figure 1**). According to the 2010 Population and Housing Census, the total population of Nanumba North Municipality is 141,584. Males constitute 49.4 percent and females represent 50.6 percent in the Municipality. The Municipality has a total land area of 2260.8 sq. Km. The predominant occupation is farming with about 97.7% of the Municipal economically active population (15 years and older) involved in farming staple food crops and cash crops. Less than fifty percent (50%) of the population in the district has access to safe drinking water namely treated water, boreholes, and hand-dug wells [12].

Sampling

Purposive sampling was used to identify shops stocking agrochemicals in the Nanumba-North vicinity. The research was conducted from September 2019 to October 2020. Twenty shop attendants and distributors were interviewed using a

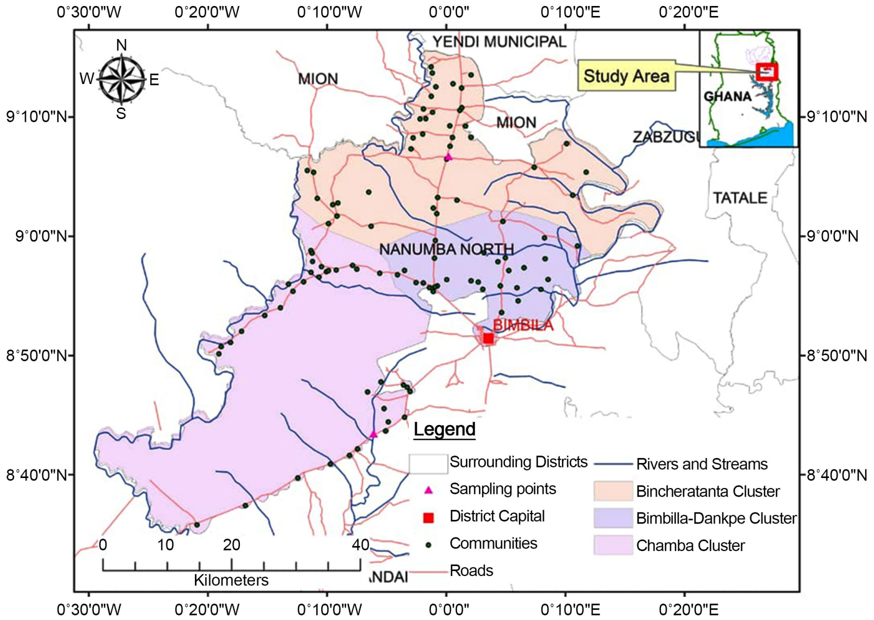


Figure 1. Nanumba north municipality in the northern region of Ghana.

designed semi-structured questionnaire. The purpose and confidentiality of the study were explained to each subject before each interview. Cluster sampling was used to select thirty (30) communities from three catchment areas namely the Bimbilla-Dankpe, Bincheratanga, and the Chamba in the Nanumba-North Municipality. However, simple random sampling was used to select seven (7) households from each community and one farmer from each household, giving a sample size of two hundred and ten (210) farmers. All farmers selected for the study agreed to participate. The selection of two hundred and ten (210) farmers was based on their engagement in farming activities and usage of pesticides. Similar responses were repeated during the data collection, indicating saturation. This sampling was considered to be adequate to cover the full range of pesticide handling and application practices by farmers in the Nanumba-North Municipality. A semi-structured questionnaire was designed and administered to the selected farmers. The questionnaire was designed in English but the interviews were conducted in the local language, Dagbanli/Nanunli, and Likpakpa. Personal observation was employed to observe chemicals available in the shops, pesticides used by farmers, and the mode of disposal of pesticide waste containers. Photographs of pesticides that were available at the time of identification were taken with a camera for easy identification. The collected data were processed using the Statistical Package for the Social Sciences (SPSS) version 16. Descriptive statistics such as percentages and frequencies were used for categorical variables and the results are presented in Figures and Tables.

3. Results

3.1. Farmers' Survey

A total of 210 farmers were interviewed during the field survey in three (3) clusters namely; Bimbilla-Dangbe, Bincheratanga, and Chamba clusters in the Nanumba-North Municipality of Northern Region of Ghana.

3.1.1. Background of Farmers

The background characteristics of the 210 farmers who responded to the survey are presented in **Table 1**. **Table 1** clearly demonstrated that ninety-nine percent (99%) of the respondents were males respectively, while one percent (1%) of the respondents were female (**Figure 2(c)**). However, with regard to age distribution, approximately 3% were below 20 and almost 97% were between 20 and above 60 years of age (**Figure 2(b)**).

Also, of the 210 farmers interviewed, only 48% were able to read and write and were likely to understand instructions on pesticide container labels, whereas 52% had received no formal education (**Figure 2(a)**).

The survey identified 20 agrochemical shops and distributors in the Nanumba-North Municipality. Meanwhile, in the study 80% of the attendants and distributors of these chemicals were male and 20% were female (**Figure 3(a)**), as depicted in **Table 2**. A total of 85% had formal education, and 15% had no formal education (**Figure 3(b)**), surprisingly no respondents had a tertiary education

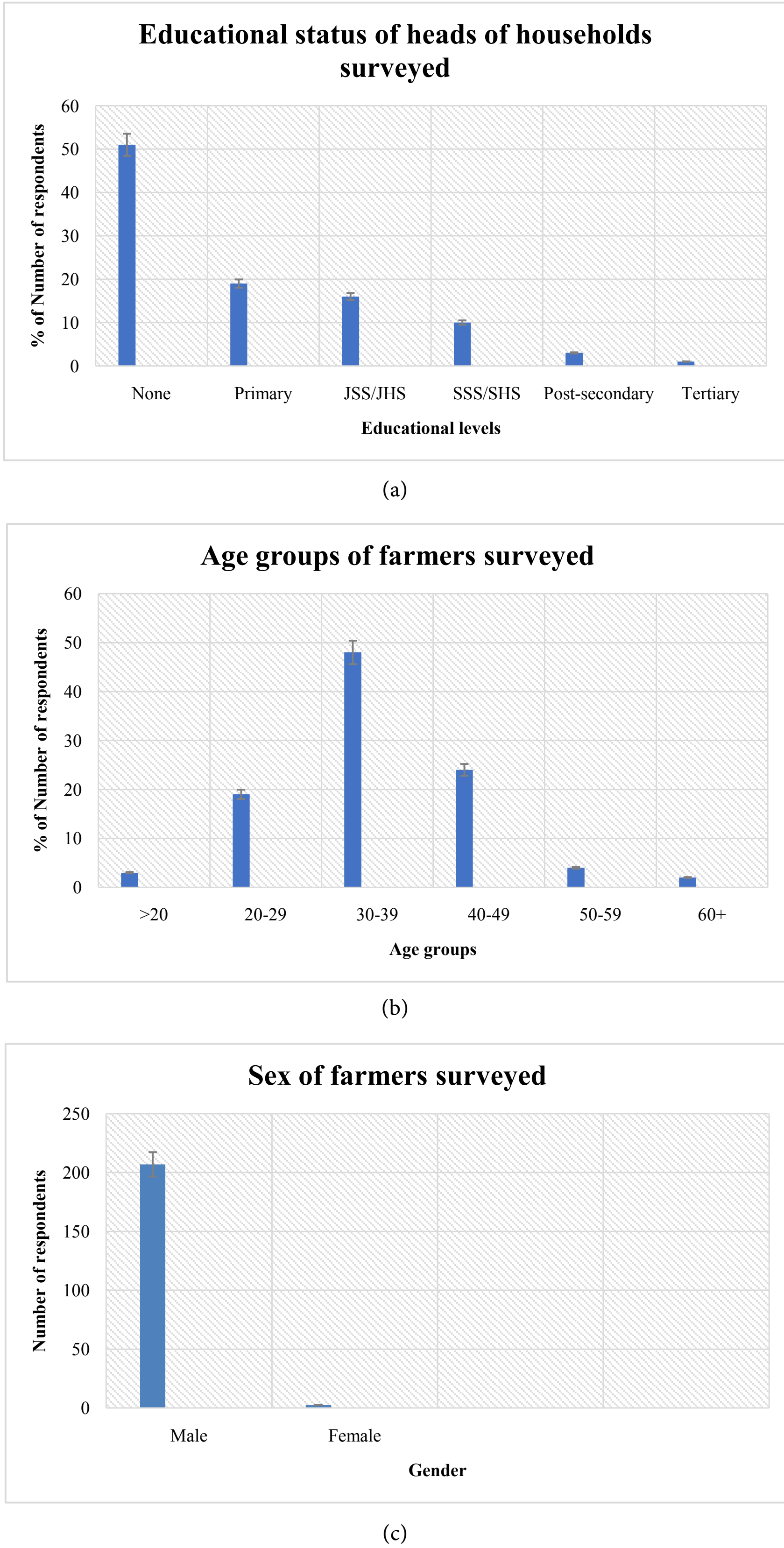


Figure 2. (a) Educational status of heads of households surveyed; (b) Age groups of farmers surveyed; (c) Sex of farmers surveyed.

Table 1. Farmer's personal information.

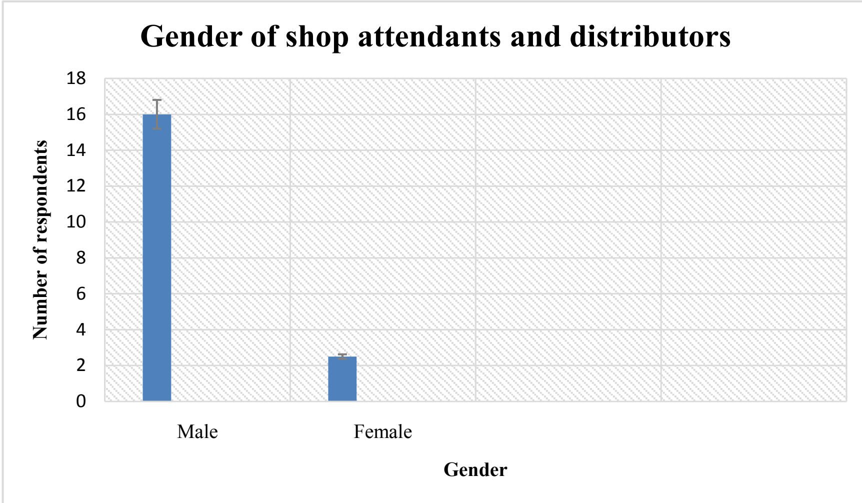
Characteristics	Variables	Clusters			Total Number (N)	(%)
		Bimbilla-Dankpe	Bincheratanga	Chamba		
Sex	Male	68	70	69	207	99
	Female	2	0	1	3	1
Age group	>20	1	4	2	7	3
	20 - 29	10	13	16	39	19
	30 - 39	35	32	34	101	48
	40 - 49	15	17	18	50	24
	50 - 59	6	3	0	9	4
	60+	3	1	0	4	2
Educational status	None	30	35	42	107	51
	Primary	10	18	12	40	19
	JSS/JHS	11	10	13	34	16
	SSS/SHS	14	5	2	21	10
	Post-secondary	3	2	1	6	3
	Tertiary	2	0	0	2	1
Total number		70	70	70	210	100

Source: Field work, 2020.

Table 2. Availability and sources of pesticides in Nanumba-North Municipality.

Demographic characteristics of shop and distributors					
Gender of shop attendants and distributors	Number of respondents			Percentage (%)	Angle (˚)
	Bimbilla-Dankpe	Bincheratanga	Chamba		
Male	8	4	4	80	288
Female	4	0	0	20	72
Level of education					
Formal education	11	3	3	85	306
No formal education	1	1	1	15	54

which was pretty much perturbing because rationally, farmers normally purchased pesticides in small quantities within easy reach of their homes. The primary sources of pesticides were local commodity shops, followed by private farmers' shops, with agricultural suppliers playing a minor role (**Figure 3(a)**). Psychologically, the underlying factor for this was that pesticides in the local shops were quite cheaper, readily available (as the pesticides were sold in the farming communities), and with no limitations to their usage by farmers. All the farmers interviewed considered the price and efficacy of the pesticides first before buying them. Also, many farmers considered the availability and neighbours' recommendations into account. Farmers' consideration of prices and the efficacy of pesticides as reported in this finding clearly alluded to [13] report among farmers in developing countries as a regular practice.



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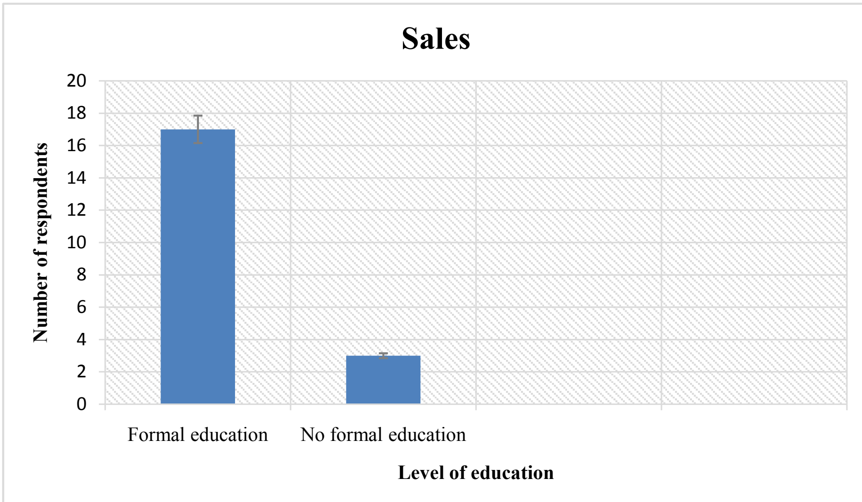


(b)

Figure 3. (a) Age group of shop attendants and distributors; (b) Sales on shop.

3.1.2. Types of Pesticides Commonly Used by Farmers in Nanumba-North Municipality

The survey identified eleven (11) different types of pesticides were in use in the study area. However, in numerical terms, the study revealed that the most widely used pesticide by farmers in the study area is atrazine (22%) as depicted in (Table 3). Furthermore, from Table 3, it is pretty much clear that, twenty-two percent (22%) of the respondents used atrazine, while seventeen percent (17%) used DDT for controlling weeds and insects (Figure 4). However, this is not astonishing since it underlies the fact that, weeds and insects are the most portentous risk to crop production in the Municipality (Figure 4).

For instance, in Table 3, it is revealed that (1%), of respondents used deltamethrin while (2%) used aldicarb, secondly (3%) of the respondents used aldrin and chlordane with similar proportion, thirdly (5%) of the respondents used BHC, moreover (6%) used cypermethrin, furthermore (10%) used heptachlor, whereas (15%) used chlorpyrifos, and finally (16%) used glyphosate respectively, for controlling weed and insect pests (**Figure 4**). Clearly, cypermethrin and deltamethrin were the only synthetic pyrethroid pesticides in use in the study area, whereas atrazine, chlordane, DDT, heptachlor, BHC, and aldrin were the only organochlorine pesticides used in the study area. Similarly, glyphosate and chlorpyrifos were the only organophosphate pesticides in use, meanwhile, aldicarb was the only carbamate pesticide in use in the Nanumba-North vicinity, as depicted in (**Table 3**). However, from a toxicological point of view in relation to [14] classification, most of the pesticides were moderately hazardous chemicals (category II) for instance (6/11) pesticides were moderately hazardous chemicals.

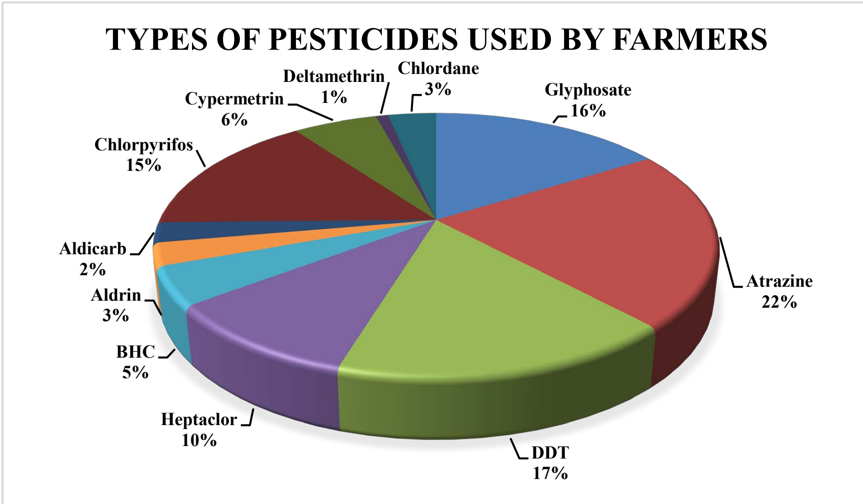


Figure 4. Types of pesticides used by farmers.

Table 3. Insecticides and herbicides identified in Nanumba-North Municipal.

Pesticide	Trade name	Chemical class	Use	WHO Classification	Number of respondents
Glyphosate	Sunphosate, Barriza, Ganosate, Sarosate	Organophosphate	Herbicide	III	34
Atrazine	Atrazine and Utrazin	Organochlorine	Herbicide	III	46
DDT	Anafox, Dinocide,Dicophane	Organochlorine	Insecticide	II	35
Heptachlor	Biarbinex,Heptagran, Heptox, Drinox	Organochlorine	Insecticide	IB	21
BHC	HCH, Grammexane	Organochlorine	Insecticide	II	10
Aldrin	Aldrec, Aldrex, Aldrex 30, Compound 118	Organochlorine	Insecticide	IB	6
Aldicarb	Termik, OMS 771	Carbamate	Insecticide	IA	5
Chlorpyrifos	Termicost and Duraban	Organophosphate	Insecticide	II	32
Cypermethrin	Lambda Cyperdem, polytrine, sunhalortharin and summitex	Synthetic pyrethroid	Insecticide	II	12
Deltamethrin	Deltapaz 2.5 EC	Synthetic pyrethroid	Insecticide	II	2
Chlordane	Octachlor and Velsicol 1068	Organochlorine	Insecticide	II	7

Note: IA = Extremely hazardous (Class IA) IB = Highly hazardous (Class IB) II = Moderately hazardous (Class II) and III = Slightly hazardous (Class III).

3.1.3. Farmers' Access to Information on the Use of Pesticides

Access to information on the usage of these pesticides by farmers was obtained from five sources. Ten percent (10%) of the respondents had information about various pesticides through training programs organized by agricultural extension officers. Also, 19% of the respondents had information from agrochemical sellers in the Municipality while 5% and 14% of them received theirs from reading labels on pesticides and radio advertisements (Figure 5). Most (52%) of the respondents on the usage of these pesticides by farmers was through personal experience (Table 4).

3.1.4. Pesticide Storage

The present study also questioned farmers about their pesticide storage practices (Table 5), and the majority (86%) of respondents stored pesticides in their bedrooms. Other farmers (10%) reported that they stored pesticides in the kitchen, as well as the in the compound, whiles (4%) of farmers responded they stored their pesticides in farms (Figure 6).

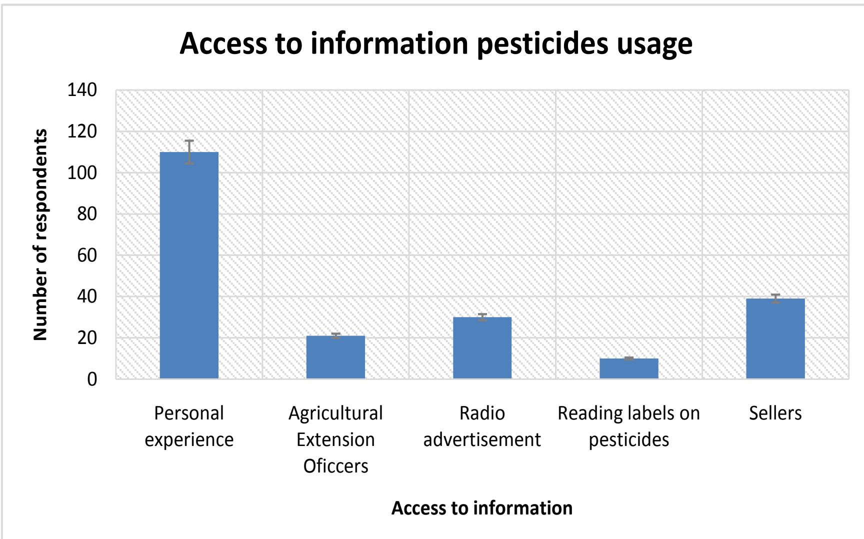


Figure 5. Access to information on pesticides usage from field surveyed.

Table 4. Farmers' access to information on the use of pesticides in Nanumba-North Municipality.

Access to information on pesticides usage	Number of respondents	Percentage (%)
Personal experience	110	52
Agriculture extension officers	21	10
Radio advertisement	30	14
Reading labels on pesticides	10	5
Sellers	39	19

Source: Field work, 2020.

Table 5. Mode of storage of pesticides in Nanumba-North Municipality.

Pesticide's storage	Number of respondents	Percentage
Farms	9	4
Bedrooms	180	86
Others	21	10

Source: Field work, 2020.

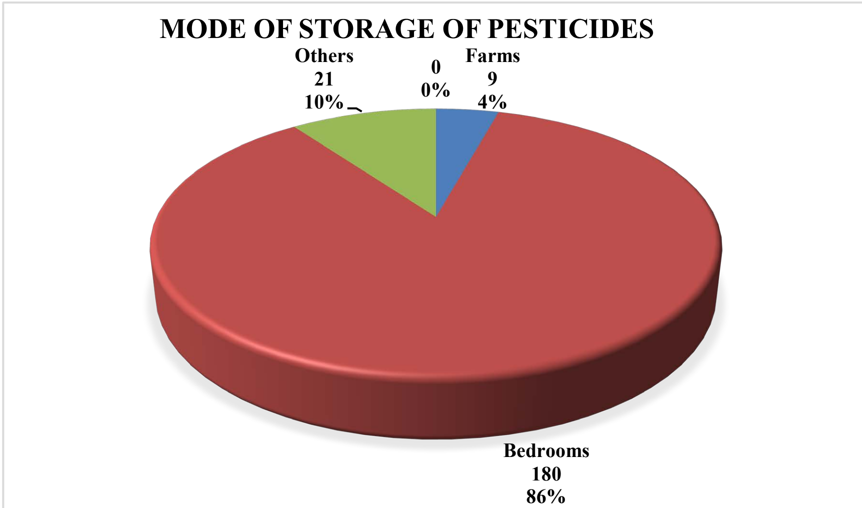


Figure 6. Mode of storage of pesticides from field surveyed.

3.1.5. Disposal of Empty Pesticides Containers

The study observed that 61% of respondents (Figure 7) in the Nanumba-North Municipality discarded pesticides containers indiscriminately (Figure 7); 24% through burning, 2% by burying them in soil, and 13% of farmers stored seeds in empty containers (Figure 7). None of the farmers reported using the empty pesticide containers for other means such as storing water. Substantial amounts of pesticides could be left in pesticide containers that are not appropriately disposed of (Table 6).

3.1.6. Protective Clothing Used by Farmers and Timing of Application

The present survey found that 64% of farmers used no protective clothing, while 36% used a protective clothing (rubber boots, overalls and mask), (Figure 8(a)). The study showed that 95% of farmers applied pesticides after rain when the soil is moist, which is the encouraged technique, and 5% applied pesticides to dry soil, which is not encouraged (Figure 8(b)). The study observed that 64% of farmers were at risk of pesticide exposure through skin contact, inhalation, and ingestion during preparation and application to crops due to failure to use protective clothing (Table 7).

3.1.7. Health Impairment: Farmers' Reports of Symptoms of Pesticide Poisoning

A majority responded that they or someone in their family had suffered from

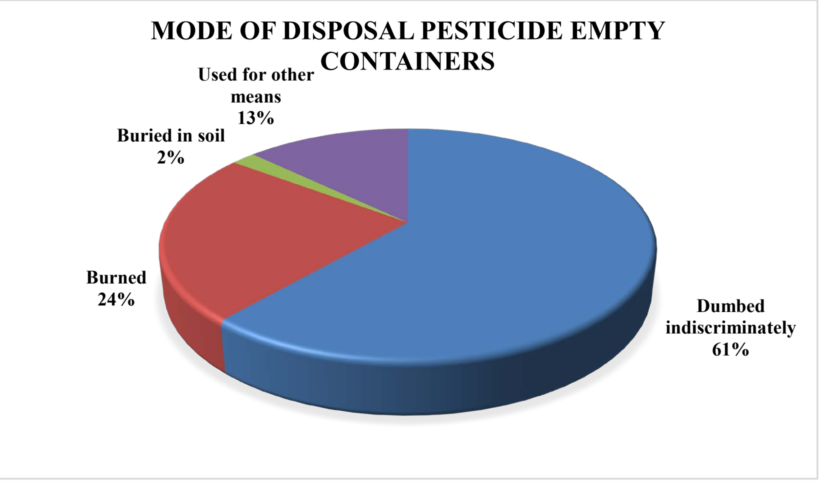
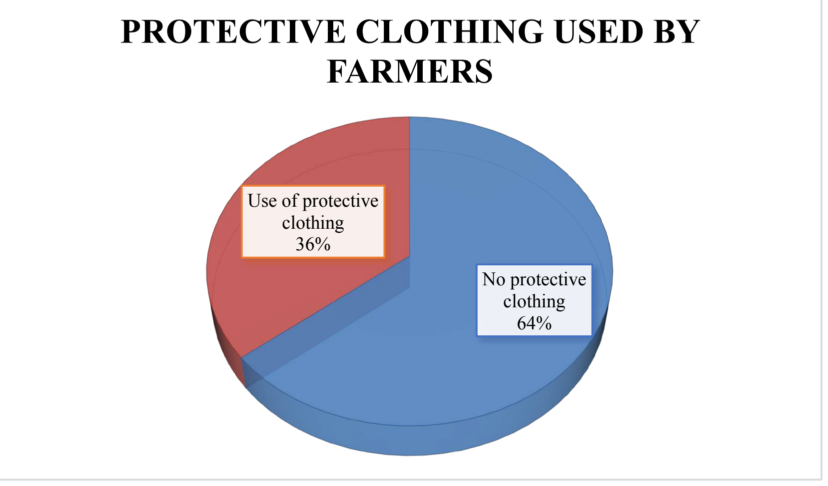


Figure 7. Mode of disposal of empty pesticides containers from field surveyed.



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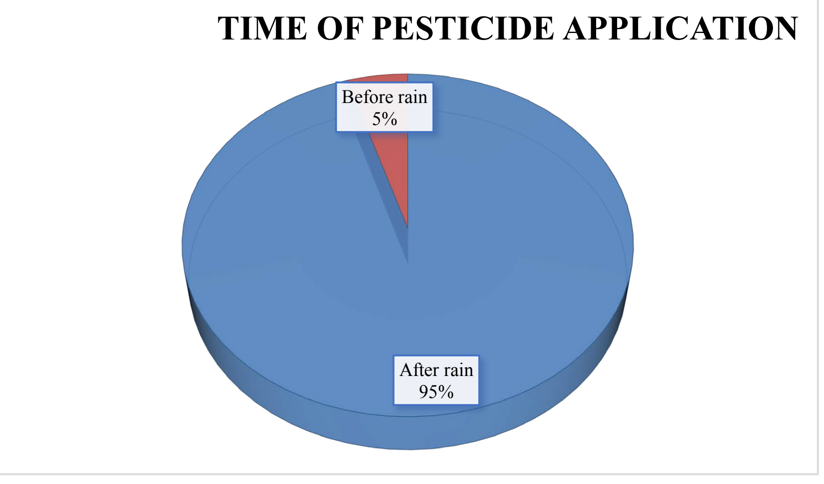

(b)

Figure 8. (a) Protective clothing used by farmers from field surveyed; (b) Time of pesticides application.

Table 6. Mode of disposal of empty pesticides containers in Nanumba-North Municipal.

Disposal of empty pesticides containers	Number of respondents	Percentage (%)
Dumbed indiscriminately	129	61
Burned	50	24
Buried in the soil	4	2
Used for other means	27	13

Table 7. Protective clothing used by farmers and timing of application in the study area.

Use of protective clothing	Number of respondents	Percentage
No protective clothing	135	64
Use protective clothing	75	36
	Time of pesticides application	
After rain	200	95
Dry soil (before rain)	10	5

pesticide-related health symptoms during or after the application of pesticides (**Table 8**). This is usually the situation in most developing countries where farmers sometimes report ill health and cases of hospitalization following pesticide application [13] [15] [16] [17]. The interviewed farmers reported multiple health effects such as nausea, headache, vomiting, eye irritation, and skin problems, with farmers reporting a minimum of one and a maximum of two symptoms of illness (**Figure 9**). Most of the farmers experienced these symptoms during preparation/formulation and during application/spraying of the pesticides, yet the majority openly admitted that they did not take any protective measures when handling pesticides. The farmers considered these symptoms as common phenomena and attributed them to fatigue and tiredness after working in the field; however, upon asking them whether they believed that pesticides could be dangerous to their health and the environment, all the respondents believed this to be true. This indicated that the farmers were well aware of the possible health effects of pesticides, but their actions implied that they did not adjust their practices accordingly. This is also a common practice among farmers in Benin, Ethiopia, Ghana, and Senegal [13]. Continuous exposure to pesticides can lead to an array of health effects, depending on the pesticide's toxicity and the dose absorbed by the body [18] [19] [20]. Thus, the farmers could have been suffering from chronic diseases associated with pesticide exposure of which they were unaware, such as cancer, brain disorders or depression, hormone, and reproductive system disruption.

3.1.8. Pesticides and Biodiversity in the Study Area

According to [21], in spite of the remarkable contribution of pesticides to farmers, they are also considered to be detrimental to animals, water bodies, and fish.

Eighty-five percent of the farmers interviewed (85%) sprayed pesticides near water bodies. Also, they always used water from them to mix pesticides in the field and wash spraying knapsacks after spraying. This habit may increase the predisposition of the farmers to pesticide exposure in the sense that a preponderance of the farmers sometimes depended on these water bodies for their consumption and other recreational activities as well as agricultural purposes, and eventually, its potential affect the quality of the water bodies and this actually creates unpleasant consequences on aquatic organisms such as frogs and fishes.

Empirically only 20 percent of the respondents reported changes in the aquatic life in the study area following pesticide application as shown in **Table 9**. However, glyphosate is used by 16 percent of the farmers in the study area and this potentially toxic chemical can expunge populations of aquatic organisms such as fish and frogs [22].

Table 8. Farmers' reports of symptoms of pesticide poisoning in the study area.

Health impairment: farmers' reports of symptoms of pesticide poisoning		
symptoms of pesticide poisoning	**Number of respondents: (Multiple responses)**	**Percentage (%)**
Eye irritation	50	12
Skin irritation	190	45
Vomiting	60	14
Nausea	80	19
Headache	40	10

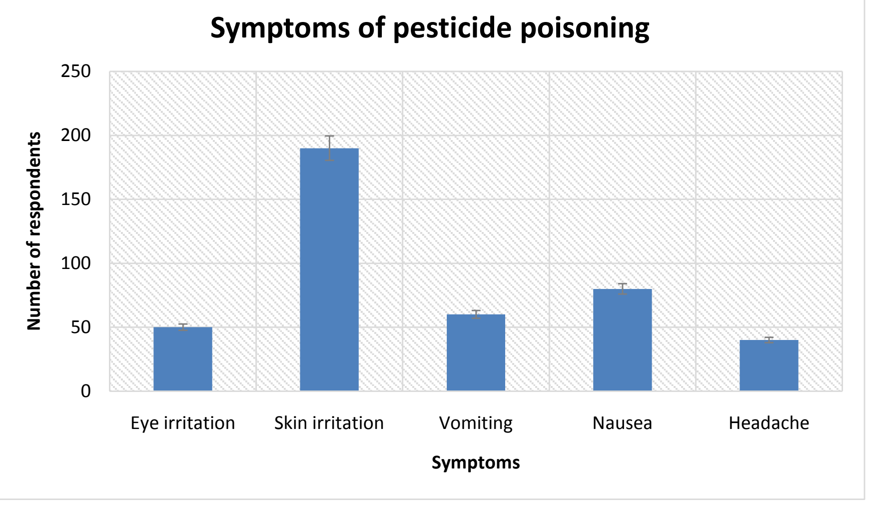

Figure 9. Symptoms of pesticide poisoning of the study area.

Table 9. Pesticides and biodiversity in the study area.

Pesticides and biodiversity in the study area		
Biodiversity	**Increasing**	**Decreasing**
Weeds	4	60
Insects and pests	3	50
Mammals and birds	10	40
Aquatic life	3	40

Similarly, with 46 percent of the respondents depending on their long-term personal experience rather than paying attention to the concentration rate on pesticide labels, continuous use of this pesticide in the study area in an unsafe manner is likely to pose a greater threat to these organisms. The study further revealed that beneficial insects, birds, and other animals may be decreasing in the study area (**Figure 10**). Upon asking the farmers whether they had noticed any immediate changes in the number of insects and animals in the area over the last two years following pesticide application, 24 and 19 percent of the farmers reported that they had noticed a decrease in the number of insects and pests as well as other mammals and birds, respectively. These declines may be attributable to accidental contact by the animals with pesticides misused by the farmers [23]. Also, the farmers reported infrequent visits to their cashew, okro, and cowpea farms by honeybees and a scarcity of honeycombs, which used to be abundant in the area. This could have been a result of the use of a neurotoxic insecticide on their farms which has been documented to be highly toxic to birds and bees [24].

4. Discussion

The results clearly indicated the lack of knowledge among farmers in pesticide use and handling. This was attributed to the lack of training and monitoring by agriculture officers and the poor attitude of farmers. Absolutely, the study categorically insinuated farmers' poor attitude and behavior toward these potentially toxic chemicals as well as, lack of awareness and management of pesticides coupled with weakness in the agriculture extension services as contributing to poor handling and use of pesticides in the municipality.

The relatively high number of farmers without formal training and knowledge in pesticide use is an important source of concern as pesticides are hazardous chemicals that require to be handled with caution (**Table 1**).

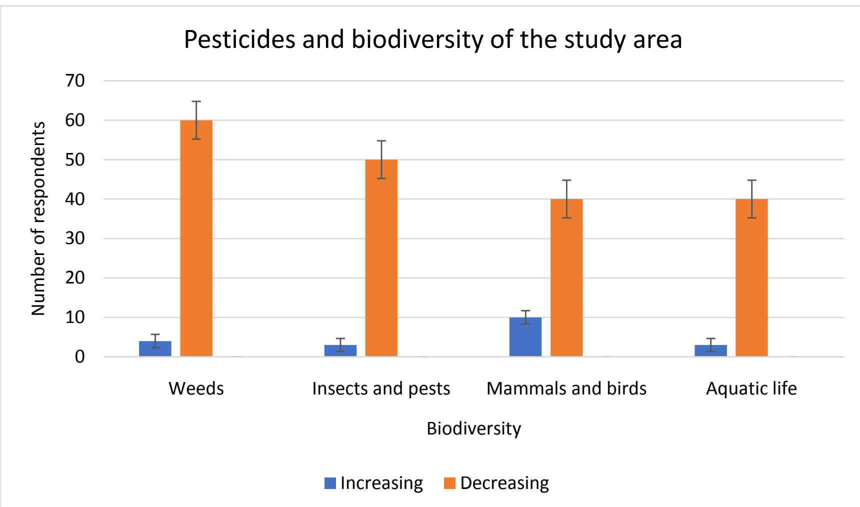

Figure 10. Pesticides and biodiversity of the study area.

Empirically, the most commonly used pesticides in the study area were insecticides and herbicides (**Table 3** and **Figure 4**). However, the key consideration here is that insect and weed control is the key threat to farmers in Ghana. The majority of the herbicides used were atrazine and glyphosate. This was similar to the findings of studies done in Northern Malawi and Eastern Zambia and Nigeria where respondents reported using pesticides that are hazardous (class 1) according to [14] classification. Through this practice, farmers are also continually being exposed to pesticides and this can lead to an array of health effects depending on the pesticide's toxicity and the dose taken in by the body [19].

The study revealed that the majority of the farmers had no formal education. Due to this high illiteracy rate, most farmers are not able to follow the recommended procedures for pesticide usage, leading to inappropriate usage and resulting in environmental and health risks. Most farmers rely on recommendations from colleagues, their own intuition, and recommendations from extension officers and chemical dealers on the modes of application of pesticides. This reopens the idea that there is a knowledge gap between agriculture extension agents and farmers in the study area. Farmers also depend on pesticide sellers, the majority of whom have a high school education and may not be educated on the appropriate usage of pesticides. This may result in inappropriate handling and usage of pesticides, which can cause serious health and environmental problems.

Broad-spectrum herbicides with the active ingredient glyphosate were most commonly used by farmers, along with selective herbicides with atrazine. The insecticide DDT (dichlorodiphenyltrichloroethane), which was banned for agricultural use worldwide under the Stockholm Convention, was reportedly used by some farmers but was not found on the market. This implies that farmers obtain their pesticides through other channels apart from registered agrochemical dealers in the region.

Farmers reported that they store these pesticides in their bedrooms and farms to prevent them from being accidentally consumed by children or animals and for theft prevention. Chemicals can volatilize and travel through the air, and storing pesticides in the home makes residents vulnerable to poisoning through inhalation and contaminated food. These pesticides have serious effects on human health, as chlorpyrifos is known to be highly toxic to mammals and inhibits the action of certain enzymes [25].

Regrettably, the majority of farmers use empty pesticide containers for storing water and seeds, and this can be catastrophic to the ingenious health of farmers in the area since they lack a fundamental understanding of the obnoxious nature of these potentially toxic chemicals. According to [26] [27], storing foods in pesticide containers, even after washing, retains traces of pesticides, and therefore can pose serious health risks to farmers and workers who come into contact with these containers. Unfortunately, the majority of farmers (61%) disposed of empty pesticide containers indiscriminately in the field after use (**Table 6** and **Figure 7**), thereby causing significant environmental contamination [21]. However, the finding of the study was that the majority of the respondent farmers left empty pesticide containers in their farms indiscriminately. This routine is a worrying factor to human health and the environment as improper disposal of empty pesticide containers can be washed into soil, ground, and surface water, causing catastrophic effects for the pesticide users, consumers, and the environment.

Most farmers in the present study were at risk of skin irritation, inhalation, and ingestion of pesticides during the formulation of pesticides to mitigate the target pest (weeds and insects) in their farms, as many did not use protective clothing during application. And this clearly attested to [28] [29], when they reported small proportions of the use of protective clothes by farmers in some parts of Ghana and beyond. Furthermore, most farmers do not use Personal Protective Equipment (PPE) such as protective gear when applying these potentially toxic chemicals, typical examples are masks and safety gloves that are not rightly considered during application. Nevertheless, it is evident that the absence of Personal Protective Equipment can practically stimulate pesticide exposure to the human body and this may have detrimental effects on the bloodstream via ingestion, inhalation, and dermal exposure, which have catastrophic consequences on their eyes, respiratory system, and skin [30]. Meanwhile, [31], categorically stated that the use of category I and II pesticides requires farmers to use suitable protective equipment to prevent exposure of pesticides to farmers.

Findings from this study established that farmers are vulnerable to the risk of pesticide exposure as a result of handling pesticides as they do not use protective clothing during pesticide application. And this clearly alludes to [32], when they conducted research on the risk assessment of pesticide usage among workers who come into contact with pesticides revealed that the adoption of safety protection measures is greatly influenced by the socioeconomic status of workers who come into contact with these potentially toxic chemicals and can be enlightened through proper tutelage. Therefore, it can be concluded that insecticides and herbicides were widely used by farmers in the study area to control weeds and insects, with atrazine being the most commonly used pesticide followed by (dichlorodiphenyltrichloroethane) DDT. However, most farmers did not use protective clothing during pesticide application to control weeds and insects. Empirically, the study revealed that farmers practiced indiscriminate disposal of empty pesticide containers which has lingering effects on the environment and human health. Moreover, most of the farmers stored pesticides in their bedrooms, and this could rapidly increase the burden of vulnerability during linkages since these chemicals are volatile in nature. Additionally, it is conscious that farmers were not adequately informed about the human health and environmental risks that may arise from improper pesticide usage and this could be a serious misery. Therefore, it is recommended that appropriate authorities such as the Agriculture Extension Agency, Environmental Protection Agency, and other environmental stakeholders organize collaborative educational programs for farmers or workers who come into contact with pesticides on the proper use, effective handling, and risks linked with inappropriate usage of pesticides in the municipality.

5. Conclusion and Recommendation

5.1. Conclusion

It can be concluded that insecticides and herbicides were widely used by farmers in the study area to control weeds and insects, with atrazine being the most commonly used pesticide followed by (dichlorodiphenyltrichloroethane) DDT. However, most farmers did not use protective clothing during pesticide application to control weeds and insects. Empirically, the study revealed that farmers practiced indiscriminate disposal of empty pesticide containers, which has lingering effects on the environment and human health. Also, most of the farmers stored pesticides in their bedrooms, and this could rapidly increase the burden of vulnerability during linkages since these chemicals are volatile in nature. Additionally, it is conscious that, farmers were not adequately informed on human health and environmental risks that may arise from improper pesticide usage and this could be a serious misery.

5.2. Recommendation

Therefore, it is recommended that appropriate authorities such as the agriculture extension agency, environmental protection agency, and other environmental stakeholders organize collaborative educational programs for farmers or workers who come into contact with pesticides on the proper use, effective handling, and risks linked with inappropriate usage of pesticides in the municipality.

Data Availability Statement

The data that support the findings of this study were Statistical Package for the Social Sciences (SPSS) version 16, descriptive statistics such as percentages and frequencies. However, according to the Ghana Statistical service less than fifty percent (50%) of the population in the district has access to safe drinking water, https://ghanadistricts.com 2011 data.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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