

Examination of the economic and environmental factors affecting pesticides handling and usage and its effects on man and the environment in Danko/Wasagu Local Government Area, Kebbi State, Nigeria

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Abstract

The study examined the Economic and Environmental Factors Influencing Pesticides Handling and Usage in Danko/Wasagu Local Government area of Kebbi State, Nigeria. Structured Questionnaires were used to obtain information from the respondents. Descriptive statistics comprising frequency distribution tables and percentages, Mean and Ranking were used for Data Analysis. The result of the study showed that majority of the respondents (90%) were male while female formed the minority in pesticide usage with only (10%). The study also showed that all the respondents (100%) were married and engaged in agricultural activities. The study further revealed that all the respondents never had any formal training on the use of pesticide from either governmental or non-governmental organizations. The research study also found out that all (100%) of the respondents were not aware of pesticide effects on man and environment. On the economic and environmental factors affecting pesticide handling and usage, it was found out that, the effect of pesticide on man and the environment is in the form of Nausea, Dizziness, Diarrhea, Respiratory Difficulty, Skin Irritation, Rashes, and Fever, Peeling of the Skin, Vomiting, and Headache. These were discovered to be the serious effects of pesticides on man. However, it was found out that the effects of pesticides on the environment were in the form of pollution, annihilation of the micro fauna and flora and reduction in land viability on the occasion of repeated usage over time, pollution of water bodies, pollution of the atmosphere, depletion of plat population etc. It is concluded that respondents were posed with serious challenges on pesticide usage and handling. It is therefore recommended that appropriate authorities should enforce the use of protective clothing, appropriate equipment and correct handling practices when using pesticides. Existing pesticide regulations and monitoring policies should be enforced. Government should also intensify efforts at registering and controlling distribution of pesticides and banning hazardous ones. It should also enforce the making of less toxic pesticides available to farmers.

Keywords: Economic; Environmental; Factors; Pesticides Handling and Usage; Man and Environment

1. Introduction

Pesticides are chemicals usually synthetic sometime biologically used to kill or contain the activities of (4). Crop damage from pest infestation often result in serious consequences, warranting the need to use pesticide. However, despite their benefits, pesticide are potentially hazardous to man and the environment when inappropriately handled (5). Factors

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such as balanced use, optimum dosing, correct application method and timing helps in ensuring improved agricultural productivity (6). Use of agrochemicals has led to increased food production. However, exposure to other organisms during their application including human, is poorly controlled (8). Their use has significantly increased the concentration of toxic materials in food and the environment, with negative effects on plant and animal health. (10) The world health organization (WHO) has estimated that more than three million farmers in developing countries are poisoned by agrochemicals each year (7).

In Nigeria, agricultural sector is the major supplier of food, raw materials and 70% of Nigeria's population largely depend on this sector for survival (12). Due to the country's drive to increase agricultural production and the upsurge of different species of pest that damage and ravage agricultural products` in field and storage, farmers have resorted to the use of agrochemicals as an important control strategy (11). An estimated 125,500, 130,000 metric tons of pesticides are used annually (14). According to (13), 7% of rice and yam farmers apply pesticides, and 41% of farmers apply pesticides to at least one food crop in Nigeria. The application of pesticides is often imprecise, with unintended worker exposures. (12) On problems associated with pesticide usage and application in cocoa production in southern Nigeria found the use of pesticides for insect pest control has generated public health problems and environmental pollution in Nigeria.

Exposure to insecticides is one of the most important occupational risks among farmers in developing countries. In some situation exposure to insecticides can occur from accidental spills of chemical leakages of faulty spraying equipment (9). The exposure of farmers increases in the case of not paying attention to the instructions on how to use the insecticides and particularly when they ignore basic safety equipment (16).

Despite the fact that several pesticides are banned and restricted or unregistered in many countries despite them been listed as hazardous by (15); (11), Stated that many of them are still widely promoted and applied especially in developing countries where weak controls and dangerous work condition make their impact even more devastating. In view of the adverse environmental effects from the usage of insecticide, lack of awareness of health consequences by some farmers, it therefore becomes imperative to identify farmers and pest management practices in their farming activities by investigating farmer's awareness and perception about the effect of pesticides used in the environment.

2. Methodology

2.1. Description of the Study Area

Danko/Wasagu local government is one of the twenty one (21) Local Government Areas of Kebbi State. It covers a geographical area of four thousand, two hundred and eight (4,208km²) square kilometers, with an estimated population of about two hundred and sixty five thousand, two hundred and seventy one (265,271) people (7). It is bordered in the south by Sakaba Local Government Area, in the west by Zuru Local Government Area, in the North-East by Bukkuyum Local Government Area of Zamfara State.

Danko/Wasagu Local Government lies between latitude 11°25`N and longitude 5°40` E of the equator. The area is flat or low topographically with a fertile soil, covered by sandy soil, sometimes coarse in texture with several Fadama and alluvial plain soil, suitable for Agricultural activities. The area is made up of eight (8) administrative districts namely; Danko, Wasagu, Ribah, Waje, Kanya, Bena, Kyabu and Wari Districts. The weather is marked by a single raining season and long dry season. The average rainfall is 720mm, the raining season period is between May to October, raining season is about five months. The average temperature is 37° C - 38° C. November to February are particularly cold due to dry harmattan and from March to April are generally hot (5). Types of crops grown include cereals (Maize, millets, sorghum and rice) horticultural crops like hot pepper and amaranthus, livestock kept are cattle, sheep and goat at peasant level.

Objectives of the Study

The General objective of the study is to examine the economic and environmental factors influencing pesticides handling and usage in Danko/Wasagu Local Government Area of Kebbi State. The specific objectives are:-

- Describe the socio- economic characteristics of the respondent in study area.
- Identify the associated health hazards of pesticide handling and usage on man and the environment.

2.2. Sampling Procedure and Sample Size

Agriculture Development Project (ADP) in Danko/Wasagu Local Government Area has 3 Extension Blocks headed by a Block Extension Supervisor (BES). Each Block has 8 villages under it headed by a village Extension Worker (VEW). Hence, purposive sampling techniques was employed to select six (6) villages namely: Wasagu, Bena, Kyabu, Maga, Ribah and Waje. Two villages from each block. twenty (20) questionnaire were administered, in the selected six (6) villages, which gave a total of one hundred and twenty (120) questionnaire distributed to the respondents in the study area. Frequency of the use of pesticide was considered as the basis for selection of the study areas, as provided by the village Extension Workers.

2.3. Data Collection Procedure

The basic instruments used for data collection for this research study was structured questionnaire. A structure questionnaires containing both open and close ended questions, was used to collect primary data from the respondents. Oral interview was used to collect primary data from those who cannot read and write that is those who do not have education in the study area, while secondary data were sourced from test books, journals conference papers, magazine and websites.

2.4. Method of Data Analysis

The data collected from the administered questionnaires were collated, tabulated and analyzed using both descriptive. Descriptive statistic involving frequency distribution tables, percentages, mean and Ranking were used to analyze the data.

3. Results

Table 1 Socioeconomic Characteristic of the Farmers

| Variables | Frequency | % |
|-----------------------|-----------|-----|
| Gender | | |
| Male | 108 | 90 |
| Female | 12 | 10 |
| Total | 120 | 100 |
| Age | | |
| 7-20 | 0 | 0 |
| 20-34 | 24 | 20 |
| 35-50 | 96 | 80 |
| Total | 120 | 100 |
| Education | | |
| Illiterate | 2 | 2 |
| Primary | 36 | 30 |
| Secondary | 17 | 14 |
| Tertiary | 19 | 16 |
| Non Formal Education | 46 | 38 |
| Total | 120 | 100 |
| Marital Status | | |
| Married | 120 | 100 |
| Single | 0 | 0 |

| | | |
|-------------------------------|-----|-----|
| Total | 120 | 100 |
| Secondary Occupation | | |
| Civil servants | 43 | 36 |
| Trading | 29 | 24 |
| Only farming | 48 | 40 |
| Total | 120 | 100 |
| Experience | | |
| 1-9 years | 22 | 18 |
| 10-19years | 26 | 22 |
| 20years and above | 72 | 60 |
| Total | 120 | 100 |
| Crops Grown | | |
| Guinea corn | 62 | 52 |
| Maize | 19 | 16 |
| Rice | 19 | 16 |
| Pepper | 10 | 8 |
| Beans | 10 | 8 |
| Total | 120 | 100 |
| Training on Pesticides | | |
| Yes | 0 | 0 |
| No | 120 | 100 |
| Total | 120 | 100 |
| Farm Size (ha) | | |
| 0-1 (ha) | 10 | 8 |
| 1-2(ha) | 48 | 40 |
| 2-3(ha) | 34 | 28 |
| Above 4(ha) | 29 | 24 |
| Total | 120 | 100 |

Source: Field Survey, 2021

Table 2 Distribution of the Respondents According to Effects of Pesticide on Man and the Environment (n=120)

| Factors | Frequency | % |
|---|-----------|-----|
| a. Negative Effects of Pesticide | | |
| Yes | 120 | 100 |
| No | 0 | 0 |
| Total | 120 | 100 |
| b. Been Poison by pesticides | | |
| Yes | 53 | 44 |

| | | |
|--|-----|-----|
| No | 67 | 56 |
| Total | 120 | 100 |
| c. Usage of empty containers | | |
| Abolition | 36 | 30 |
| Store food material | 48 | 40 |
| Dispose | 36 | 30 |
| Total | 120 | 100 |
| d. Disposal of empty containers | | |
| At the bin | 0 | 0 |
| In rivers | 43 | 36 |
| In refuse dump | 77 | 64 |
| Designated place | 0 | 0 |
| Total | 120 | 100 |
| e. Washing of Used Equipment | | |
| River/Ponds | 122 | 82 |
| At home | 12 | 10 |
| Bore holes | 10 | 8 |
| Total | 120 | 100 |

Source: Field Survey, 2021

Table 3 Distribution of the Respondents based on the Problems reported after handling or usage of pesticides (n = 120)

| Symptoms | Frequency | % |
|---------------------|-----------|------|
| Headache | 60 | 78 |
| Dizziness | 31 | 40 |
| Skin irritation | 100 | 83.3 |
| Vomiting | 08 | 10 |
| Nausea | 10 | 13 |
| Itchy eyes | 48 | 62 |
| Coughing | 15 | 19 |
| Stomach ache | 06 | 8 |
| Poor vision | 09 | 12 |
| Shortness of breath | 07 | 9 |
| Excessive sweating | 14 | 18 |
| Fatigue | 42 | 55 |
| No health effect | 17 | 22 |

Source: Field survey, 2021 * Multiple responses recorded

Table 4 Distribution of the Respondents According to Effects of Pesticides on Man and Environment

| S/N | Response | Frequency | Mean | Ranking |
|---|-----------------------------------|-----------|--------|---------|
| Effects of Pesticides on Man | | | | |
| 1 | Headache | 16 | (14.0) | 10 |
| 2 | Nausea | 34 | (28.0) | 1 |
| 3 | Vomiting | 24 | (20.0) | 9 |
| 4 | Rashes | 55 | (46.0) | 6 |
| 5 | Skin Irritation | 60 | (50.0) | 5 |
| 6 | Respiratory Difficulty | 67 | (56.0) | 4 |
| 7 | Dizziness | 101 | (84.0) | 2 |
| 8 | Fever | 53 | (44.0) | 7 |
| 9 | Diarrhea | 82 | (68.0) | 3 |
| 10 | Peeling of skin | 34 | (88.0) | 8 |
| Effects of Pesticides on the Environment | | | | |
| 1 | Pollution of the environment | 106 | (88.0) | 2 |
| 2 | Pollution of the atmosphere | 113 | (94.0) | 1 |
| 3 | Pollution of water bodies | 82 | (68.0) | 6 |
| 4 | Reduction of wild life population | 98 | (82.0) | 3 |
| 5 | Kills micro/macro organisms | 96 | (80.0) | 4 |
| 6 | Harms aquatic animals | 94 | (78.0) | 5 |
| 7 | Interfere with plant growth | 74 | (62.0) | 7 |
| 8 | Deplete soil fertility | 62 | (52.0) | 8 |

Source: Field Survey, 2021; *Multiple Responses were recorded

4. Discussion

Table 1 shows the gender of the respondents. The results indicated that men were the majority in the study with 90% and female form the minority with only 10%. In the study conducted by (1) to determine the environment and health effect of pesticide use in Nigeria 93.3% of the farmers were male. Majority of the farmers' who were found to be intensively using pesticides were within age brackets of 35-40 representing 80% and 20% between the ages of 20-34. It means that teenagers were not actively involved in farming activities and young adults were more involved in farming. Age is a socioeconomic factor in farmer's awareness as young adult tend to know more about pesticides than the very young farmers. Older farmers are more aware of pesticide usage due to experience in farming over the years (3).

Farmer's level of awareness in using pesticides is related to their educational status as educated farmers can read labels on pesticide containers and also access information from stem sources hence reducing the level of information that should be disseminated by the change agents. In the study, it was determined that 2% of the farmers were illiterate, 46% had finished primary school, 17% had secondary education, and 16% had tertiary education and 19% non -formal education. Most of the farmers could not read and write as found out by this study. Marital status of the farmers was 100% as all the farmers interviewed were married. Secondary occupation of the respondents besides farming were civil service constituting 35%, traders forming 24% and 40% were exclusively involved in farming. Therefore, since greater percentage of farmers were aware of pesticides and used it over the years, it can be said that they were aware of the hazards associated with pesticides. Experience of farmers on farming is an important factor in acquiring skill in farming and effective use of inputs. The famers who participated in the study had been farming for many years of which 18% of them farmed for 1-9years, 22% 10-19years and 60% above 20years.From the experiences gathered by farmers over the years, it will be easier for them to properly handle pesticides on the farms.

It was found out by the researcher that farmers in this study area mostly cultivate Guinea corn constituting 52%, 16% cultivated maize, 4% cultivated rice and another 4% grew beans and all of which mostly used pesticides on their farms. The use of pesticides by the farmers has increased agricultural productivity and hence increased income and improved standard of living.

All the respondents in the study area who were interviewed testified that they have not received any kind of training on pesticide usage from either governmental or non-governmental organizations. Farmers therefore need regular training on pesticide usage so as to encourage safety practices on pesticide handling and minimize wrong usage. Majority of the had farm size of 1-2 hectares constituting 40% farmers, 28% of the respondents cultivated between 2-3 hectares of farm lands, 24% farmers possessed above 4 hectares of land and only 8% of the respondents had 0-1 hectares. Larger hectareage possession by the respondents means large output in return. The findings of (2) supported that the larger the size of the farm the more the need for pesticides usage and the lesser the size of the farm the lesser the need for pesticide usage.

Table 2. Shows the effects of pesticides on man and the environment. The findings indicated that pesticides had negative effects on man and the environment because it can affect man by causing nausea, vomiting, dizziness, peeling of the skin etc. it can pollute the environment thereby causing discomfort to fauna. The findings of this research agreed with that (1) who opined that pesticides are harmful to fish, water bodies, man and the environment.

Majority of the respondents forming 56% had never been poisoned by pesticides which could be due to the fact that they follow the safety procedures prescribed on pesticide containers while 44% of the farmers confessed that they were in one occasion or the other been poisoned by the chemical. This could be attributed to either not using protective clothing or been ignorant of the safety procedures written on the pesticide containers. 30% of the respondents use empty containers to perform ablution, 40% use empty containers to store food materials and 30% respondents properly dispose the containers after usage. Use of containers to perform ablution or store food items is not advisable because residual chemicals can have consequential effects on the health of man. 82% respondents normally wash used equipment at ponds or rivers, 10% respondents wash it at home and 8% wash used equipment at boreholes. It can be seen from results of the study that majority of the respondents normally wash equipment at ponds and rivers which is not proper as these residues of chemicals can affect aquatic life and other animals and humans that drink water from ponds and rivers.

Table 3 shows that, A total of 60 farmers (78%) self-reported at least one symptom of acute pesticides poisoning during the last one year of pesticides handling and usage, while 17 (22%) of the respondent did not ascribe any significant health effect to pesticides exposure. The most reported symptoms by respondents were headaches (78%), skin irritation (71%), itchy eyes (62), fatigue (55%), dizziness (40%), and coughing (19%). Other symptoms reported by respondents were vomiting, nausea, stomach ache, poor vision, and excessive sweating. These symptoms were similarly reported in studies conducted in Tanzania (8) and (4), that suggested exposure to acute toxic doses of pesticides. The use of personal protective equipment (PPE) as claimed by the vegetable farmers in the study area did not commensurate with the health hazards they reported. For effective protection, PPE should be chosen based on the information given on the pesticide label. Unsafe practices increase the risk of pesticide exposure, thereby increasing the risk of clinical and subclinical adverse health effect (12)

Table 4 reveals the effects of pesticides on man and the environment to which 28.0% respondents were affected by headache after pesticide usage, 20.0% nausea, 46% vomiting, 50% rashes on the body, 56% skin irritation, 84% Respiratory and Difficulty in breathing, 44% Dizziness, 68% Fever, 88% Diarrhea and 52% peeling of skin. It can be noted that greater percentages of 84% and 88% respectively were usually affected with both respiratory and difficulty in breathing and diarrhea which show that by inhaling the chemicals during spray it can cause respiratory problems which can equally lead to diarrhea. This findings corroborated with that conducted by (9), who reported that 91% of the farmers reported that either themselves or their families experienced health symptoms associated with pesticides during or after pesticide application. Similarly, in the study conducted by (2), It was reported that 64.3% of the farmers had eye and face irritation, 32.4% dizziness, 28.1% chest pain, 27% skin irritation, 26.5% headache, 9.7% fever, 2.7% of them loss their Libido and 1.6% had problem of forgetfulness. It can therefore be seen that pesticides can pose serious health challenge to the farmers.

On the effect of pesticides on the environment it was found out that 88.0% respondents agreed that pesticides could lead to pollution of the environment 94.0% supported that pesticides can cause pollution of the atmosphere, 68.0% are of the opinion that pesticides could pollute water bodies, 82.0% lamented that pesticide usage can cause reduction of wildlife population, 80.0% agreed that pesticides can kill micro and macro organism, 78.0% viewed pesticides to be harmful to aquatic animals, 62.0% observed that pesticides usage could interfere with plant growth and 52.0%

considers pesticide usage as depleting soil fertility. In a research conducted on health and environmental impact of pesticides used and practice a case study of farmers in Ekiti State, the study revealed that pesticides are harmful to fish, water bodies and animals. 63% washed pesticide tanks and containers in water bodies, this affect aquatic organisms like snail and frog, it also affect drinking water. The study also revealed that beneficial insects like birds and other animals are decreasing in the area stated (29.3%). This decline may be due to accidental contact by the farmers. A study conducted by (4) also found out that frequent usage of pesticide can affect bee's population on cowpea farms which used to be abundant to pollinate the plants. This could be due to neurotoxic inherent in insecticides.

5. Conclusion

The study examined the economic and environmental factors affecting pesticides handling and usage and its effects on man and the environment in Danko/Wasagu Local Government Area, Kebbi State, Nigeria These factors such as pollution of the environment, pollution of the atmosphere, pollution of water bodied, reduction of wild life population, dizziness, vomiting, depletion of soil fertility etc significantly influenced pesticides handling and application and had detrimental effects on man and the environment.

Compliance with ethical standards

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Disclosure of conflict of interest

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Statement of informed consent

The research study involved intensive survey using focused group discussion, questionnaire administration and interview to obtain data contain in this article.

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