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Full Length Research Paper

Safety procedure and agrochemicals use among arable crop farmers in Ido local government area of Oyo State, Nigeria

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Exposure of agrochemicals to arable crop farmers pose continuous health hazard on them, especially when considering agricultural working environment. The study, therefore, examined the agrochemical knowledge and safety procedure among arable crop farmers in Ido local government area of Oyo state. Multi-stage sampling was used to select 90 farmers in the study area. Data were obtained using structured interview schedule and described statistically with Chi-Square and PPMC for the hypotheses. The study revealed that 72.8% of the respondents were male, 69.1% of the respondents were married, and 35.8% fell within the age range of 40-49 years. Educational level shows that 16.0% had no formal education and 39.5% had tertiary. Also majority (58.0%) had Household size between the ranges of 1-5, Years of experience show that 53.1% had years of experience of between ranges of 1-10 years while 46.9% of the respondents cultivated below 4 hectares of land. The result also revealed that majority of the respondents mostly used fertilizers (88.9%), herbicides (85.2%) pesticides (75.3%) and fungicides (60.5%). Also, open market was identified by respondents as a major source of agrochemical in the study area. It was further revealed that the frequency of use of agrochemical was high and safety procedure was also high. Analysis of hypothesis showed that marital status, education was significantly influenced the respondents knowledge of safety procedures. Also, sources of agrochemicals significantly related to the respondents knowledge of safety procedures. It is therefore recommended that government and other stakeholders should allow only authorized sources agrochemical in order to reduced unauthorized sources to minimal level, so as to manage and monitor the use and safety procedures compliance.

Keywords: Agrochemicals, safety procedure, arable farmers

INTRODUCTION

The uses of agrochemicals contribute not only to healthy growth of crops and animals but also to improve farm work efficiency and stable supply of tasty agricultural produce. Although many kinds of chemicals are used in agriculture, they can be categorized into simple groups according to the functions they performed. This includes insecticides, herbicides, fungicides, molluscides, rodenticides and fertilizer just to mention few (Peter, 2012).

The application of agrochemicals for the control of wide variety of insectivorous, herbaceous pests and green leaves since chemical age, has contributed enormously to the success of agricultural advancement globally, but with some noticeable pollution effects on ecosystem and human health (Beseler *et al.,* 2008). Most farmers in developing world are not aware of the environmental impacts of using agro-chemicals on their farms, human being and wildlife (Kamel and Hoppin, 2004).

Agrochemicals are widely used in most sectors of the agricultural production to prevent or reduce losses by pests and thus can improve yield as well as quality of the produce, even in terms of cosmetic appeal, which is often important to consumers. Agrochemicals can also improve the nutritional value of food and sometimes its safety. There are also many other kinds of benefits that may be attributed to agrochemicals, but these benefits often go

unnoticed by general public. Agrochemicals can be considered as an economic, labor saving efficient tool of pest management with great popularity in most sector of the agricultural production. Agrochemical can also improve the nutritional value of food and sometimes its safety. Thus, from this point of view, agrochemical can be considered as an economic, labor-saving, and efficient tool of pest management with great popularity in most sectors of the agricultural production. In developing countries, farmers face great risks of exposure due to the use of toxic chemicals that are banned or restricted in other countries, incorrect application techniques, poorly maintained or totally inappropriate spraying equipment, inadequate storage practices, and often the reuse of old agrochemicals containers for food and water storage . Obviously, exposure to agrochemicals poses a continuous health hazard, especially in the agricultural working environment. By their very nature most agrochemicals show a high degree of toxicity because they are designed to kill certain organisms and thus create some risk of harm. Within this context, pesticide use has raised serious concerns not only of potential effects on human health, but also about impacts on wildlife and sensitive ecosystems. Often, agrochemicals applications prove counterproductive because they kill beneficial species such as natural enemies of pests and increase the chances of development of pest resistance to agrochemicals.

Furthermore, many end users have poor knowledge of the risks associated to the use of agrochemicals, including the essential role of the correct application and the necessary precautions. Even farmers who are well aware of the harmful effects of agrochemicals are sometimes unable to translate this awareness into their practices. Although agrochemicals have been developed to function with reasonable certainty and minimal risk to human health and the environment, the published results are not always in agreement with this fact. Even though the development of toxicity reference levels for agrochemicals incorporates uncertainty factors that serve to achieve this regulatory standard, in reality, we may never know whether a pesticide is safe under all circumstances, nor can we predict with certainty its performance in hypothetical situations. Scientific investigation is bound by the tools and the techniques that are available and therefore new developments continually redefine our capabilities.

Despite many studies on the fate and toxicity of agrochemicals, there are research gaps causing uncertainty in the predictions of their long-term health and environmental effects. On the basis of these contradictory results of the literature, discussions among scientists and the public focused on the real, predicted, and perceived risks that agrochemical pose to human health (worker exposure during pesticide use and consumer exposure to agrochemical residues found in fresh fruit, vegetables and drinking water) and the environment (water and air contamination, toxic effects on non-target organisms) are fully justified.

Agrochemicals are toxic to both pest and humans; however, they need not be hazardous to human and non target animal species if suitable precautions are taken. Most chemicals will cause adverse effects if intentionally or accidentally ingested or if they are in contact with the skin for a long time. An additional risk is the contamination of drinking water, food or soil. Special precautions must be taken during transport, storage and handling. And these precautions includes precautions during purchase, precautions during storage, precautions during handling, precautions when preparing solution to apply, precautions with equipment to use, precautions when applying chemicals, precautions on disposal after agrochemicals application.

Despite their popularity and extensive use, agrochemical present serious concerns about health risks arising from the exposure of farmers when mixing and applying agrochemicals or working in treated fields and from residues on food and in drinking water for the general population have been raised. These activities have caused a number of accidental poisonings, and even the routine use of agrochemical can pose major health risks to farmers both in the short and the long run and can degrade the environment. A higher proportion of chemicals poisoning and death occur in developing countries where there are inadequate occupational safety standards, protective clothing, illiteracy, and insufficient knowledge of agrochemicals hazards (Pitmental and Greiner, 2006).

The general objective of the study is to examine the safety procedure and agrochemicals use among arable crop farmers in Ido local government area of Oyo state.

METHODOLOGY

Ido is a Local Government Area in Oyo state, Nigeria. It has an area of 986 km² and a population of 103,261 at the 2006 census. Ido Local Government was among the five in Ibadan district before it was cancelled in 1956. In respect of the state administration policy of bringing government and development to the grassroots level, and in response to the yearning and aspirations of the people, Ido Local Government finally came into being in May, 1989. The Local Government has an area of 986km^2 and a total population of 103,261 based on 2006 National Population Census. On the account of extensive fertile soil, which is suitable for agriculture, the basic occupation of the people is farming. There are large hectares of grassland which are suitable for animal rearing, vast forest reserves and rivers. People in the area grow varieties of arable crops such as vegetable, maize, yam, and food crops. The area is also suitable for a wide range of edible fruits and arable crop farming is a major occupation.

Sampling techniques and sample size

Multi- stage random sampling technique was used to select town and arable crop farmers. Stage 1 involved random sampling of six wards out of ten in local government area, namely: Ward 1, 2, 3, 5, 6, 10. The second stage was the simple random selection of villages in each chosen ward. One village was selected in each wards based on the size of the arable crop farmers of about 25 in each village from the chosen village. Stage three involved simple random sampling of 15 respondents in each village. In all, 90 respondents were selected for the study in which 81 questionnaire were retrieved. Primary data were collected the information with the aid of well-structured questionnaires and personal interview. Descriptive statistics such as frequency distribution, percentage were used to analyze all the data collected on objectives and while chi-square and PPMC for hypotheses.

RESULTS AND DISCUSSION

Table 1 shows that the results of the socio-economic characteristics of the respondents in the study area. It shows that 72.8% of the respondents were male, while 27.2% were female which means male are mostly involved in arable farming. Majority 69.1% of the respondents were married, 17.3% were single, 9.9% were divorced and 3.7% were widow. This implies that males are more prone to adverse effect of agrochemical usage. This is due to that fact that most of the respondents engaged in arable crop farming which most times require agrochemicals. This is supported by the findings of Matanmi *et al*. (2015) who found that majority of the respondents' married male crop farmers. Also, Abegunrin *et al*. (2019) also found the similar result where married male respondents were predominantly engaged in arable crop farming. Also, 35.8% fall within the age range of 40-49 years age bracket, while age 30-39 years and 50-59 years were of the same points, 17.3% were between 20-29 years and least of them 4.9% were between 60 years and above. This is supported by Obidike, (2011) who reported that majority males are into arable crop farming than female. Educational level shows that 16.0% had no formal education, 3.7% had both adult education and Arabic education, 8.6% had primary education, 28.4% had secondary education and tertiary education which happens to be the highest had 39.5% which implies that the majority of the respondents were educated. Also majority 58.0% were Muslim, 40.7% were Christians, while 1.2% were traditional religion which means Muslims are predominant and mostly involved in arable crop farming. Household size shows that 58.0% were between the ranges of 1-5, 39.5% were between the range of 6-10, while 2.5% were above 10. Years of experience show that 53.1% were between the ranges of 1-10 years, 32.1% were between the ranges of 11-20 years, 7.4% were between 21-30 years 4.9% were between 31-40 years, while 2.5% fall within the range of 41 years and above. Area of land cultivated shows that 46.9% cultivated below 4 hectare of land, 24.7% cultivated between 4-6 hectare of land, 13.6% cultivated between 6-8 hectare of land, 9.9% cultivated between 8-10 hectare, while 4.9% cultivated above 10 hectare, which means respondents that cultivate below 4 hectare of land mostly planted arable crops in large scale area of land. This implies that most of had year of farming experience of 10 years and cultivated area of land not more than 4 hectares. This corroborates the work of Matanmi *et al.* (2015) who found that most of farmers had farming experience of 10 years and cultivated 4 hectares of land. This is also supported by the work of Abegunrin *et al*. (2019) who found that most of the farmers cultivated less than 4 hectares of land. Table 2 reveals that majority of the respondents 88.9% were using fertilizers, followed by herbicides with 85.2%, pesticides with 75.3%, and while 60.5% were using fungicides. This implies that majority of the respondents in the study area were using agrochemicals. Table 3 shows that 51.8% of the respondents used herbicides more than three times in a season, and 45.7% were using fertilizers more than thrice a season, 49.4% were using pesticides more than a season, while 39.6% are not using fungicides. This implies that herbicides, pesticides and fertilizers were mostly frequently used by the farmers. This is supported by the findings of Matanmi *et al.* (2015) who found that fertilizers were mostly used by farmers. In summary, the result shows that 55.5% of the respondents had high frequency of use of agrochemical while, 45.5% of the respondents had low use of agrochemical in the study area (Table 4).

Table 5 shows the source of Agrochemicals, it shows that 67.9% of the respondents sourced their agrochemicals stores, 54.3% got it from open market, 37.2% sourced it from fellow farmers, while 19.8% sourced it from extension agent. This implies that the majority of the farmers are literate, so they know the right place to get their agrochemicals which is agrochemicals stores. Table 6 shows the safety procedures arable crop farmers practiced in handling agrochemical. It shows that 64.2% followed manufacturer instruction frequently, 69.1% avoided eating and drinking when handling agrochemical occasionally, 63.0% make sure the agrochemical were properly stored, 59.3% of the respondents used protective materials, while 58.0% frequently avoided skin contact. The result indicated that the majority of the arable crop farmers in the study area have full knowledge of how dangerous the agrochemical can be when safety procedures are not fully implemented. In summary, the result in the (Table 7) shows that 63.0% of the respondents had high safety procedures, while 37.0% of the respondents had low safety procedures in the study area. This deviates from

Table 1. Socio-economic characteristics of the respondents.

Variable	Frequency	Percentage
Sex		
Male	59	72.8
Female	22	27.2
Age		
20-29 Years	14	17.3
30-39 Years	17	21.0
40-49 Years	29	35.8
50-59 Years	17	21.0
60 Years and above	4	4.9
Marital Status		
Single	14	17.3
Married	56	69.1
Divorce	8	9.9
Widow/Widower	3	3.7
Religion		
Christianity	33	40.7
Islam	47	58.0
Traditional	1	1.2
Level of Education		
No Formal Education	13	16.0
Adult Education	3	3.7
Arabic Education	3	3.7
Primary Education	7	8.6
Secondary Education	23	28.4
Tertiary Education	32	39.5
Household Size		
1-5	47	58.0
6-10	32	39.5
Above 10	2	2.5
Years of Experience		
Below 4	38	53.1
4-6	26	32.1
6-8	6	7.2
8-10	4	4.9
Above 10	2	2.5
Area of Land Cultivated		
Below 4 Hectare	38	46.9
4-6 Hectare	20	24.7
6-8 Hectare	11	13.6
8-10 Hectare	8	9.9
Above 10 Hectare	4	4.9

Table 2. Types of agrochemicals frequently used

Agrochemicals	Frequency	Percentage
Fertilizer	72	86.9
Fungicides	49	60.5
Herbicides	69	85.2
Pesticides	61	75.3

Table 3. Frequency of the use of Agrochemicals

Agrochemicals	Not used	Once in a season	Twice in a season	Thrice in a season	More than thrice
Fertilizers	9(11.1)	14(17.3)	10 (12.3)	11(13.6)	37(45.7)
Fungicides	32(39.6)	11(13.6)	14 (17.3)	10(12.3)	14(17.3)
Herbicides	12(14.8)	10(12.3)	11(13.6)	6(7.4)	42(51.8)
Pesticides	20(24.7)	11(13.6)	8 (9.9)	8 (9.9)	34(49.4)

Source: Field survey, 2018

the work of Abegunrin *et al.* (2019) who reported that most of the respondents had low safety practices of agrochemicals.

Hypotheses

The result in (Table 8) shows that there is no significant

Table 4. Categorization of respondents based on frequency of use of agrochemicals.

Variable	Frequency	Percentage
High	45	55.5
Low	36	45.5

Mean=11.6543

Table 5. Source of agrochemicals.

Sources of Agrochemicals	Frequency	Percentage
Extension agents	16	19.8
Open market	44	54.3
Fellow farmers	22	27.2
Agrochemicals stores	55	67.7

Source: Field survey, 2018.

Table 6. Safety procedures practiced by the respondents

Safety procedures	Frequently	Occasionally	Never
Adherence to manufacturer instruction	52 (64.2)	17 (21.0)	12 (14.8)
Proper storage of agrochemicals	51 (63.0)	21(25.9)	9 (11.1)
Use of protective materials	48(59.3)	19(23.5)	14(17.3)
Avoid eating and drinking when handling	56(69.1)	13(16.0)	12(14.8)
Avoid skin contact with agrochemicals	47(58.0)	21(25.9)	13(16.0)

Source, Field survey, 2018

Table 7. Categorization of respondents based on safety procedures

Variable	Frequency	Percentage
High	51	63.0
Low	30	37.0

Mean=7.3951

Table 8. Chi-square analysis of the relationship between socio-economic characteristics of the respondents and the knowledge toward agrochemicals.

Value	X^2 (Value)	P-value	Decision
Age	4.445	0.814	NS
Sex	2.989	0.224	NS
Marital status	14.249	0.027	S
Educational level	54.709	0.000	S
Household size	3.037	0.552	NS
Religion	0.627	0.960	NS
Years of experience	7.122	0.524	NS
Land cultivated	14.003	0.082	NS

Table 9. PPMC showing the relationship between source of agrochemical and agrochemical knowledge among the farmers.

Variables	r-value	p-value	Decision
Source of agrochemical and agrochemical knowledge	0.393	0.000	S

S = Significant at 0.05

relationship between socio economic characteristics of the respondents and the knowledge toward agrochemicals among the farmers except marital status (x^2= 14.249, p<0.05), and educational level (x^2= 54.709, p<0.05) which is significant. The implication is that educational level and marital status influenced the knowledge of agrochemicals in the study area. The hypothesis testing in the (Table 9) also indicate that there is significant relationship between source of agrochemical (r = 0.393, p< 0.05) and agrochemical knowledge among the respondents in the study area.

Conclusion

Based on the findings, it could be concluded that majority of the arable crop farmers in the study area were male and majority of them were married and had tertiary education which implied that most of them are literate. The percentage of the farmers based on agrochemical knowledge is high due to the fact that the majority of them were literate and they also sourced their agrochemicals mainly from agrochemical stores followed by fellow farmers. Also, the most commonly used agrochemicals in the study area were fertilizers and herbicides for improving farm yield and destroying weeds respectively. Majority of the respondents had high safety procedures of agrochemical use in the study area due to their level of literacy.

Recommendations

(i) Government agencies and non-government agencies should enlighten the farmers on the misuse of agrochemicals.
(ii) Training and support services on guide and safety procedures of agrochemicals should be rendered to arable crop farmers in the study area. This will prevent the farmer from unnecessary exposure to hazard associated with the unwholesome safety procedure.
(iii) Extension services or officer should be available to enlighten the farmers about the types of agrochemicals to use quantity and methods of application, time lapse and precautionary measures.
(iv) Literate farmers should organize seminar or create awareness on agrochemical knowledge and safety procedure for others that are yet to understand the concept among them
(v) Reducing the unauthorized sources of agrochemical, so as to manage and monitor the use and safety procedures compliance.

Authors' declaration

We declared that this study is an original research by our research team and we agree to publish it in the journal.

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