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EVALUATION OF HERBICIDE USE BY FARMERS IN SOUTH AND NORTH OF MUBI LOCAL GOVERNMENT AREAS, ADAMAWA STATE, NIGERIA

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ABSTRACT

A study to investigate herbicide use and adherence to established protocols for application of herbicides was carried out in Mub-North and Mubi-South Local Government Areas of Adamawa State. A systematic sampling technique was adopted for the study. A total of 200 structured questionnaires were administered to respondents (farmers) to obtain data on aspects related to herbicide use. Data generated was analysed using descriptive statistics. The results obtained revealed that the majority of the farmers use Dragon/Gramazol and 2-4-D categories of herbicides more frequently, while Pentashi and Paraquat were applied infrequently. Also, the results indicated that majority (59%) of the respondents do not adhere to user's guide provided by the manufacturers of herbicides, though, 162 (81%) agreed that they were aware of adverse effects of herbicides on the environment. Similarly, 172 (86%) of the respondents were aware of effects of herbicides on non-target organisms. Also, 130 (65%) of the respondents do not use proper dress and protective equipment during application of herbicides. The results further revealed that 174 (87%) % of the respondents have used empty containers of herbicides for other purposes. Lastly, the results revealed that 150 (75%) of the respondents have known individuals that have suffered one form of herbicide poisoning. Based on the findings from the study, it is recommended that relevant government agencies should intensify awareness campaign to farmers on the safe use of herbicides and other agrochemicals.

Keywords: Herbicide, environment, food production, weeds and application

INTRODUCTION

Food production started from time immemorial. With the geometric increase in population of human beings the need to increase food production to feed large number of people led to the advent of technologies like machines, herbicides among others (Avav & Oluwatayo, 2006). The issue of providing adequate food supply to meet requisite demand in Nigeria has been topical for a number of years (Jurewiez & Hanke, 2008). The use of agrochemicals contribute not only to healthy growth of crops but also to improve farm work efficiency and stable supply of agricultural produce (Kudak & Streibig, 2003). Although, many kinds of chemicals are used in agriculture, they can be categorized into groups according to the function they perform. This includes insecticides, herbicides, fungicides, molluscides and rodenticides (Ayoola, 1990). According to He *et al.* (2012a) herbicides are the most used chemical substances throughout the world. 75% of all herbicides in the world are used in developed countries, however, its use in developing countries is increasing (Moreland, 2000). Herbicides are designated by common names approved by the Weed Science Society of America (WSSA) or the

British Standards Institution. Weeds jeopardize agricultural production when they invade crops and can cause significant loss in the quality of the harvest (Kudsk & Streibig, 2003). Crop production has been threatened by weeds.

Chemical weed control has become an increasingly necessary operation in the production of crops. Benefits of herbicides rank high. However, negative effects of herbicides on the environment and human health generated mainly by lack of knowledge regarding safety parameters on the part of the user has made herbicides use in agriculture one of today's most controversial issues (Miller, 2002). Herbicides have been alleged to cause a variety of health effects ranging from skin rashes to death (Nehls and Segner, 2001). The pathway of attack can arise from improper application resulting in direct contact with field workers, inhalation of aerial sprays, food consumption and from contact with residual soil contamination. Ueta *et al* (1997) reported that the practice of using agrochemicals for long periods, often indiscriminately have raised concern among the public authorities and experts of public health and sustainability of natural resources. When herbicides are used in an uncontrolled manner, they can cause impacts on non-target organisms, especially on those that live in aquatic environments (Nwani *et al*., 2011).

Matson *et al*. (1998) reported that herbicide used against control of grasses can kill beneficial insects like butterflies, moths, spiders, bees, lady bugs and aphids. Some of these insects such as bees play important roles in the environment such as pollinating plants. In most countries, herbicides must be approved for sale and use by a government agency. For example, in the United States, the Environmental Protection Agency (EPA) does so. Studies must be conducted to indicate whether the herbicide is safe to use and effective against the intended herb. Also, a label is created which contains directions for use of the herbicides. Some agrochemicals are considered too hazardous for sale to the general public and are designated restricted use agrochemical. Only certified applicators may purchase or supervise the application of restricted use chemicals (Wilson, 1996). There is widespread reuse of empty herbicide containers especially in developing countries as such, it is necessary to ensure safe and effective use of herbicides by increasing awareness, training and the dissemination of relevant information, and by enacting legislation of control sales, distribution, use, production, formulation and disposal. Therefore, this study attempted to investigate the level of adherence to safety precaution in herbicide use/application, assess the perception of effects of the herbicides on the environment and human health especially farmers and identify the herbicides used commonly.

MATERIALS AND METHODS

The Study Area

Mubi North and South lies in the region between latitude 9^{o} 30' and 11^{o} north and longitude 13^{o} and 13^{o} 45' east. It has a land area of 4728 km^{2} with population of 280,009 (National Population Commission, 2006). It has a tropical climate marked with dry and wet seasons. March and April are the hottest months, while November and December are the coldest months. Substantial numbers of Mubi residents engage in commercial activities and farming. Mubi have been an important centre for both local and international business especially with the neighbouring Cameroon Republic.

Research Design

The study adopted a systematic sampling technique. It is a probability sampling method where the elements are chosen from a target population by selecting a random starting point. Thereafter, other members are selected after a fixed sampling interval.

Sampling and Sample Size

A total of 200 respondents from Mubi-North and Mubi-South Local Government Areas were selected by stratified random sampling technique as described by Sutherland (1997). Structured questionnaires were administered to the respondents. The population for the study include farmers aged years 18 and above.

Data Collection

Data were collected using the structured questionnaires. The questionnaire contained questions regarding socio-demographic characteristics of the respondents. Other questions were related to use of herbicides and precautions adhered to during application of the herbicides. In addition, aspects related to the level of knowledge of the respondents with regards to the effects of the herbicides were included.

Data Analysis

Data generated from the study were analysed using descriptive statistics tools which includes, frequency counts, percentages and tabular presentation.

RESULTS

Socio-Demographic Characteristics of Respondents (Participants)

A total of 200 copies of questionnaires were administered, and all the questionnaires were returned. Respondents' age range was 18-70 years as shown on Table 1. Out of the 200 respondents, 130 (65%) were males while 70 (35%) were females (Table 2). The academic qualifications of the respondents (Table 3) indicated that 40 (20%) did not have formal education or hold the First School Leaving Certificate or Senior School Certificate (Table 3). Based on residential area, 130 (65%) of the respondents reside in rural areas while 70 (35%) in urban areas as shown on Table 4.

Assessment of Level of Awareness of Respondents on Herbicides Use and Effects

The range of herbicides commonly/frequently used by the respondents (Table 5) shows that out of the 200 respondents 48 (24%) used 2-4-D, 16 (8%) Paraquat, 12 (6%) Pentashi, 30 (15%) Clearweed, 66 (33%) used Dragon (Gramazol), while 28 (14%) used Slasher more frequently. An assessment of the level of adherence by the farmers to user's guide for application of herbicide as shown on Table 6 indicates the following: 82 (41%) respondents adhered to the user's guide regularly, 86 (43%) adhered sometimes, while 32 (16%) rarely adhere to the user's guide. This implies that a significant proportion of the farmers do not always adhere to the user's guide. Assessment of farmers' level of awareness on the effects of herbicides on the environment (Table 7) indicates that 162 (81%) respondents were aware of adverse effects of indiscriminate application of herbicide on the environment, while 38 (19%) indicated lack of awareness of adverse effects of the herbicides on the environment.

Similarly, 172 (86%) of the respondents indicated that they have knowledge that application of herbicides have effects on

non-target organisms, while 28 (14%) claim to lack such knowledge of herbicides having effects on non-target organisms as presented on Table 8. As per contamination of water bodies as a result of application of herbicides, 154 (77%) agreed that herbicides could contaminate water bodies, while 46 (23%) did not agree that herbicides contaminate water bodies (Table 9).

Personal Safety Precautions

The eating habits of respondents when on the farm indicates that 28 (14%) have the habit of eating arbitrary while they apply herbicides. However, 172 (86%) do not eat food while they are on the field spraying herbicide as presented on Table 10. Similarly, Table 11 shows the extent to which the respondents adhere to the use of proper dressing (kit) during application of herbicides. 70 (35%) of the respondents regularly dress properly and use protective equipment such as face masks and hand gloves.

However, 130 (65%) of the respondents do not use protective equipment or dress properly during application of herbicides. The use of empty herbicide containers for other purposes among the respondents was assesses (Table 12). 174 (87%) agreed that they have used empty herbicide containers for other purposes, while 26 (13%) have never used such empty containers. Lastly, question to elicit response related to occurrence of cases of herbicide poisoning revealed that 150 (75%) of the respondents knew of individual(s) that have suffered herbicide poisoning. On the other hand, 50 (25%) respondents claimed not to know any individual that have had case(s) of herbicide poisoning.

Table 1: Distribution of respondents based on age

Age range	Frequency	Percentage (%)
18-25	70	35.0
26-35	82	41.0
36-45	30	15.0
46 and above	18	9.0
Total	200	100.0

Table 2: distribution of respondents based on gender

Gender	Frequency	Percentage (%)
Male	130	65.0
Female	70	35.0
Total	200	100.0

Table 3: Distribution of respondents based on academic qualification

Academic qualification	Frequency	Percentage (%)
No formal education/FSLC/SSC	40	20.0
NCE	34	17.0
Diploma	46	23.0
Bachelor's degree	70	35.0
Master's degree	8	4.0
Doctorate degree	2	1.0
Total	200	100.0

Table 4: distribution of respondents based on place of residence

Place of residence	Frequency	Percentage (%)
Rural area	130	65.0
Urban area	70	35.0
Total	200	100.0

Table 5: Range of herbicides commonly used by the respondents

Herbicide type	Number of respondents	Percentage (%)
2-4-D	48	24.0
Paraquat	16	8.0
Pentashi	12	6.0
Clearweed	30	15.0
Dragon (Gramazol)	66	33.0
Slasher	28	14.0
Total	200	100.0

Table 6: Adherence by respondents to manufacturer's user's guide during application of herbicides

Response	Number of respondents	Percentage (%)
Regularly	82	41.0
Sometimes	86	43.0
Rarely	32	16.0
Total	200	100.0

Table 7: Awareness of the detrimental (adverse) effects of indiscriminate application of herbicide on the environment

Awareness	Number of respondents	Percentage (%)
Yes	162	81.0
No	38	19.0
Total	200	100.0

Table 8: Awareness of effects of herbicide on non-target organisms

Awareness	Number of respondents	Percentage (%)
Have awareness	172	86.0
Lack awareness	28	14.0
Total	200	100.0

Table 9: Contamination of water bodies by herbicides

Response	Number of respondents	Percentage (%)
Herbicides contaminate water bodies	154	77.0
Herbicides do not contaminate water bodies	46	23.0
Total	200	100.0

Table 10: Respondents' eating habits during herbicide application

Eating habits	Number of respondents	Percentage (%)
Do eat while applying herbicide	28	14.0
Do not eat while applying herbicide	172	86.0
Total	200	100.0

Table 11: Use of specified dressing kit during application of herbicide

Dressing	Number of respondents	Percentage (%)
Use of proper dress	150	75.0
Do not use proper dress	50	25.0
Total	200	100.0

Table 12: Use of empty herbicide containers for other purposes

Have you used empty herbicide container before?	Number of respondents	Percentage (%)
Yes	174	87.0
No	26	13.0
Total	200	100.0

Table 13: Incidence of herbicide poisoning

Knowledge about individual(s) that have experienced herbicide poisoning	Number of respondents	Percentage (%)
Yes	150	75.0
No	50	25.0
Total	200	100.0

DISCUSSION

The range of herbicide types frequently used by the farmers (respondents) indicates that 62 Dragon (Gramazol) was the most widely used. Other commonly used herbicides were 2-4-D and Clearweed. The high level of use of these herbicides may be attributed to their effectiveness in weed control or affordability. The herbicides that were used less commonly were Paraquat and Pentashi. This may be attributed to their high cost. The level of adherence by farmers to manufacturer's guide for application of herbicides revealed that 86 (43%) respondents adhere to the rules sometimes, while 32 (16%) rarely adhere to the guides. This implies that majority of the farmers 118 (59%) do not usually adhere to the guides provided by the manufacturers of herbicides.

Such actions may predispose such farmers to some health risks and also harm animals.

In addition, it may cause damage to the environment. The low level of adherence by farmers to herbicide manufacturers' guides may be attributed to ignorance and lack of adequate education. The results on the level of awareness among the farmers on the adverse effects of indiscriminate application of herbicides on the environment revealed that majority of respondents were aware of the potential adverse effects of the herbicides. Similarly, majority (86%) of the respondents have admitted that they were aware of effects of herbicides on non-target organisms. The high level of awareness on the effects of herbicides might have been as a result of observations on the field. Similarly, majority of the respondents comprising 77% have indicated that they were aware of the possibility of herbicides contaminating water bodies. This is in agreement with Jacomini *et al*. (2011) and Duke *et al*. (2005) who reported that water can be contaminated by herbicides.

The eating habits of the farmers revealed that 172 (86%) do not eat during herbicide application. This is certainly an indication to avoid herbicide poisoning through foods. However, findings on the extent to which the farmers adhere to the use of specified dressing and protective equipment such as hand gloves and face masks revealed that 70 (35%) always use proper dress and protective equipment, though the majority 130 (65%) do not usually dress properly neither do they use protective equipment. This implies that majority of the farmers tend to expose themselves to health hazards through contamination of their bodies or inhalation of the fumes of herbicides during application. The attitude of the farmers may be as a result of ignorance which is in consonance with Miller (2002) who reported that negative effects of herbicides on the environment and human health are generated mainly by lack of knowledge regarding safety parameters on the part of the users of herbicides. The reuse of herbicide containers for other purposes by farmers revealed that 174 (87%) of the farmers have at a point in time made use of empty herbicide containers while 26 (13%) have never used such empty containers. This implies a wide usage of herbicide containers, which are potentially harmful to the users. Finally, the extent of the farmers knowledge about incidences of herbicide poisoning revealed that 150 (75%) of the respondents knew someone that have experienced herbicide poisoning, while 50 (25%) have no such idea. The findings clearly indicated that cases of herbicide poisoning are relatively common.

CONCLUSION

The findings from the study have revealed that a wide variety or categories of herbicides are used by farmers in the study area. Generally, most of the farmers do not adhere strictly to the user's guide and safety measures during application of herbicides. In addition, non-challant attitude is generally displayed with regards to the use of protective equipment/clothing. However, most of the farmers seem to be aware of the adverse effects of herbicides on human health and the environment, though the reuse of herbicide containers for domestic purposes was common among most of the farmers. This has the potentials of exposing the farmers to health hazards.

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