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SURVEY OF UTILIZATION OF HERBICIDES ON THE SOKOTO-RIMA FLOOD PLAINS IN DUNDAYE, NIGERIA

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ABSTRACT

With the increased use of herbicides, there is a need for proper management practices and protective measures in the use of herbicides by the farmers in the flood plains of Dundaye district. A study was carried out on the flood plains of Dundaye along Rivers Sokoto and Rima. Ninety (90) respondents were selected randomly for the study with the aim to obtain information on the demographic characteristics, types of herbicides used, common weeds and crops cultivated, basic rules of herbicide application and impact of herbicides on environment and health. Data collected were analysed using descriptive statistics. The results showed that farmers were able to identify variety of grasses and broadleaved weeds common in the area. Common herbicides used by the farmers were *Atrazine, Primextra* and *Dual*. Majority (68.88%) of the farmers sourced their herbicide from the market. Though farmers had experience in farming and herbicide application, yet there is the need for proper guidance on the application and management of pesticides. The major problem raised by the farmers was the cost involved in the purchase of herbicides. From this study, it was concluded that farmers utilised herbicide but more education and enlightenment on management of herbicides and the use of preventive measures is required in the area.

Keywords: Weeds; Herbicides management; Flood plains.

INTRODUCTION

Pesticides have played a major role in crop protection and the control of vector born diseases. Today their use is recognized throughout the world as an effective, relatively simple and quick method of pest control. Without chemical control man's crop would be ravaged by diseases, insect, and weeds and severe loss of food production would undoubtedly occur (Reagan, 1995; Dorn, 1991). Weeds are "natural hazards" to the activities of man and growth where they are not wanted (Hance and Holly, 1989). Weeds are problematic in the tropics because incessant heat and high-light intensity assist their regeneration and aggressive growth (Holms, 1969). Some tropical farmers recognize the

necessity to remove weeds early in their crops but other do not consider them serious until have nearly covered their crops. However, some farmers engage in constant weed removal by manual means and so keep grown crops weed-free until harvest. This practice is however, tedious, time consuming and costly in view of the huge man-hours involved thus limiting large scale operations (Hammerton, 1974; Melifonwu, 1998; Joshua, 2002).

Considering the ever increasing labour wages in Nigeria and scarcity of labour in crop production finding an alternative and effective method of weed control is imperative. This not only increases yield but also releases labour for the production of other crops. Herbicide is labour saving, less capital intensive and ideal for many farmers who are unable to adopt sophisticated capital intensive technology because of technical and economic reasons (Lagoke and Shebayan, 1988).

However, offsetting the benefits are many problems identified with herbicide use; unsafe use, persistence in the environment, toxicity to bees, fish and wildlife, contaminated water sources, persistent pesticides accumulation in the food chain, impact on earthworms, and other beneficial organisms in developing countries (Anon, 1997; Anon, 2002; Carsons, 2004). Herbicides are routinely used in an unsafe condition and farmers lack training and resources to increase safety to their own health and environment (Udo, 1998). These penalties are sometimes borne by herbicides users themselves, but in many cases it is the other sector of society that may be adversely affected (Williamson, 2003).

Fortunately, most herbicides are relatively safe, but there are a few exceptions, · Paraquat has an unusally high oral toxicity and even a small amount of diluted mixture can be fatal. Paraquat is inactivated by clay or activated charcoal which should be administered orally (mixed with water) if oral ingestion occurs. · Dinitrophenols have high oral toxicity and can also be absorbed dermally (through the skin). Suspected birth defects caused by 2, 4-D type herbicides have been linked with faulty manufacture which produces dioxins (rarely present under current production methods). For these reasons, it is not recommended that these herbicides be used without first receiving instructions in handling from a knowledgeable professional. Except for those mentioned above, nearly all herbicides are Class 4 in their relative toxicity (least dangerous) (Peace Corps, 1981). Furthermore, Geisel (2003) recommends that herbigation should not be carried out without having the proper antipollution systems in place to prevent pesticides from entering the water source.This paper reports on the management of pesticides application by farmers on the flood plains of Dundaye of Wamakko Local Government area, Sokoto State.

MATERIALS AND METHODS

Dundaye village is located at the bank of rivers Rima and Sokoto on latitude 13°01' N and longitude 5°15 E. Intensive farming activities take place in the flood plain year round (rainy and dry season). Ninety (90) farmers who cultivate on the floodplain were randomly selected using systematic sampling technique. Structured questionnaire was administered to the sampled respondents. Data collected were on socio-economic characteristics of the respondents, types of herbicide used, common weeds, crop type cultivated, basic rules of herbicide applications, impact of herbicide on environment and health, and problems encountered in herbicide usage. Data collected were analysed using descriptive statistics.

RESULTS OF DISCUSSION

Socio-demographic Characteristics of the Respondents

The results of socio-demographic characteristics of the farmer in the study area, showed that all the respondents were male (100%) majority of which fall in the age group of 31-40 years (33.3%) and 47.8% of the respondents had a family size of 6-10 in number (Table 1). The highest educational level attained by the farmers was Islamic education (75.55%) through which respondent can read and understand labels written in Arabic scripts. This clearly indicates low literacy level which makes it difficult for farmers to understand the mechanism, and proper operation of herbicides. This is in line with findings of Akobundu (1997) that lack of formal education was a problem to adoption of herbicides by farmers, because of the technicality and scientific nature of the herbicides formulations. Majority (65.5%) of the farmers were in the age group of 31-50 years while 13.3% of the farmers were below 30 years of age. It is likely that the young farmers would appreciate the use of the herbicides more than the older ones who see mechanical operation more adoptive to carry out and less expensive (Table 1).

Table 1: Socio-economic characteristics of the respondents.

Characteristics	Frequency	Percentage
Gender		
Male	90	100.00
Female	0	0.00
Age		
10-20	3	3.30
21-30	9	10.00
31-40	30	33.30
41-50	29	32.20
51 and above	19	21.10
Educational Status		
Primary	9	10.00
Secondary	12	13.33
Islamic education	68	75.55
Family size		
0	0	0.00
1-5	8	18.90
6-10	17	47.80
11 -15	48	24.40
16 and above	22	8.90

Field survey, 2004/2005

Crops Grown

Crop production practices by the farmers on the flood plain are very intensive. The land remains occupied both in the rainy and dry seasons. Farmers cultivate variety of crops ranging from field crops like maize, millet Guinea corn to vegetables like tomato, onion,

garlic, pepper, carrot, leafy vegetables and so on. The crops grown in the floodplain by the respondents are presented in Table 2. This intensive farming activity, no doubt requires use of agrochemicals to obtain reasonable yields, as labour required for weeding is costly or unavailable due to migration of the younger ones to cities for white collar jobs.

Table 2: Cultivated crops in dry and rainy seasons in the survey area

Wet season crops	Dry season crop
Rice	Tomatoes
Okro	Onions
Leaves	Pepper
Cowpea	Wheat
Maize	Sweet potato
Pepper	Carrot
Pumpkin	Garden eggs
Tomatoes	Amaranthus leaves
Millet	Garlic
Guinea corn	Maize
-	Okro
-	Rice

Field survey, 2004/2005

Type of Weeds

Due to the intensive cultivation of the river banks, variety of grasses and broadleaved weeds were identified by the respondents. The scientific names of the weeds are presented in Table 3. These weeds were probably introduced through irrigation water, birds, cattle excreta and through crop seeds as some weeds are associated to certain crops.

Table3: List of common weeds found in the survey area.

Weeds	Weeds
Amaranthus viridis	*Portulaca oleracea*
Oryza longistaminata	*Amaranthus spinosus*
Solanum nigrum	*Tribulus terrestris*
Melochia corchorifolia	*Cleome viscose*
Cyperus rotundus	*Ageratum conyzoides*
Cynodon dactylon	*Acalypha ciliate*
Elusine indica	*Digitaria horizontalis*
Euphorbia hirta	*Dactyloctenium aegyptium*
Chenopodium schradarianum	

Field survey, 2004/2005

Common Herbicides Used in the Floodplain Plains

From the study, it was observed that the respondents had the understanding of the herbicide usage in reducing the menace of weeds. Use of herbicides to control weeds increased yield of crops and saved time and labour spent on manual weeding. The common herbicides used by the farmers in the floodplain are presented in Table 4. Respondents were able to mention trade marks or market names of the herbicides used, however, they did not know their generic or compound name and mechanism of activity. Their main concern was on the observed efficacy of the herbicide when applied to keep the farm weed-free. The most common ones surveyed were *Atrazine, Primextra, dual, Galax, Codal, Round-up, Ronstar* etc. It was observed that farmers in the study area used any herbicide available and what their pocket could afford.

Table 4: Herbicides used by the farmers in the survey area.

Common Name	Trade name
Atrazine	Aatrex, Gesaprim
Paraquat	Gramoxone
Primextra 500FW (Atrazine +metolachlor)	Primextra
Chlorbromuron	Maloran
Metolachlor	Dual
Bentazon	Basagram
Galex 500 EC (Metabroburon+Metolachlor+Gramoxone)	Galex
Codal (Prometryn+metolachlor)	Codal
Oxadiazon	Ronstar 25 EC
Glyphosate	Round-up

Field survey, 2004/2005

Table 5: Sources of herbicides and their affordability.

Item	Frequency	Percentage
Source		
ADP	9	10.00
Open market	62	68.88
Agro-store	19	21.11
Government	0	0.00
Farmer association	0	0.00
Cost of Herbicides		
Cheap	0	0.00
Expensive	90	100.00

Field survey, 2004/2005

Table 6: Herbicide management skills of the respondents

Skill	Frequency	Percentage
Use of herbicide		
Yes	84	93.33
No	6	6.66
Length of experience of use		
1-5	2	2.22
6-10	52	57.77
10 and above	36	40.00
Type of use		
Selective	17	18.88
Non-selective	46	51.11
Combine i & ii	27	30.00
Time of use on crops		
Pre-planting	20	22.22
Pre-emergence	21	23.33
Post-emergence	49	54.44
Quantification/rates		
Eye judgment	6	6.66
Top cover	33	36.66
Cups	22	24.44
Gallons	8	8.88
Milk tin	21	23.33
Source knowledge about herbicide use		
Agric extension agent	3	3.33
Friends farmers	46	51.11
University staff	26	28.88
Retailers	15	16.66
Equipment use for application		
Bunch of leaves in bucket	12	13.33
Knapsack sprayer (Cp 15)	78	86.66
Boom sprayer	0	0
Motorized sprayer	0	0

Field survey, 2004/ 2005.

Source of Chemicals

Farmers mostly sourced their herbicide from Sokoto central market (68.88%) as shown in (Table 5). This is because of the proximity of the market to the farmers. Those who visited agro-chemical stores to buy the herbicides constituted (21.11%) while 10% obtained their herbicides from the Agricultural Development Project (ADP) as at the time

of the study. Farmers association and government no longer supply farmers with the commodity.

Herbicide Management

Table 6 indicate the basic skills of herbicide management in terms of application, timing, selection, quantification, year of experience, source of knowledge about herbicides and equipments used for application of herbicides. The survey showed that 93.33% of the farmers interviewed used herbicide. With length of experience varying with the age of the farmer in the fadama, experience had some relation with the involvement of the farmer in the fadama plains, and type of crops cultivated. It was found that farmers put more herbicide into use in the dry season.

Majority of farmers used non-selective herbicide (51.11%). This may be connected with the variety of weeds in area, 18% used selective while 30% combined both types. Time of herbicide application was mostly (54.44%) at post-emergence and the rate was generally determined by using the top cover (36.66%)(cap) of the herbicide tin. About twenty four percent of the respondents (24.44%) used cups and 23.33% used milk tins for herbicide quantification (Table 6). Herbicides are job-specific, selective in their performance in terms of effectiveness on weed and occur within a given range of concentration under particular conditions. If applied in excess, it causes severe damage to crop plant. On the other hand, insufficient application can result in poor weed control. Consequently farmers are instructed to adhere to measurement equivalents available to them at the instance of herbicide use. The most widely used measure is by the top cover of herbicide containers that are graduated to known equivalents. The least use method was the eye judgment by the farmers. This method is often used by experienced farmers that use herbicides very frequently. When farmers were asked about the source of knowledge about herbicides, 51.11% of the respondents gained knowledge about the herbicide from their colleagues (experienced farmers). The source of knowledge through agricultural extension agents was limited to about 3.33%. About 28.88% of the farmers affirmed to have learned a lot from the University staff of Faculty of Agriculture, Usmanu Danfodiyo University, Sokoto that conducted research in the floodplain where the Faculty of Agriculture, Fadama Teaching and Research Farm is located.The popular equipment used in herbicide application was Knapsac CP 15 sprayer (86.66%) which is often was owned by individuals or hired. However, 13.33% of the farmers resort to the use of bucket and bunch leaves to apply and spray herbicides (Table 6).

Protective Measures

The protective measures employed by the respondents are presented in Table 7. Owing to the toxicity of the herbicide and hazards associated with their usage, great care in handling of herbicide compounds is essential. Farmers observed wearing of protective materials when applying herbicides. It was found that 34.4% of the farmers wore gloves, 33.33% wore boots and 24.44 wore goggles. Only 7.77% confessed talking while applying herbicides and 2.22% eat food while applying herbicides. However, 92.22% of the respondents do not talk and 97.77% of the respondents do not eat while spraying herbicides. Proper disposing of empty containers is strongly recommended in order to

avoid environmental pollution, contamination of food or feed of animals, or direct contact with children or animals.

About 47.77% of the respondents disposed the tin as litter, 20% burned the tin while 15.55% used it for domestic purpose. Majority of the respondents washed their sprayers after spraying and take bath after application. It was found that all the respondent adopt a safe method of storing herbicides (in a store) with a view to avoid accidents by ingestion, inhalation or direct contact with the skin.

Table 7: Protective measures used by respondents during herbicide application

Measures	Frequency	Percentage
Protective materials		
Wearing of gloves,	31	34.44
Wearing goggle	22	24.44
Gloves and respirator	7	7.77
Appearel	3	3.33
Boots	30	33.33
Talking		
Yes	7	7.77
No	83	92.22
Eating		
Yes	2	2.22
No	88	97.77
Disposable of container		
Bury	6	6.66
Domestic use	14	15.55
Sell	9	10
Disposed as litter	43	47.77
Burning	18	20.00
Washing sprayer after use		
Yes	85	68
No	2	3
Bathing after application		
Yes	90	10
No	0	0
Method of keeping herbicide		
Bedroom	17	18.88
Store	71	78.88
In farm	2	2.22
In way in the house	0	0.00

Field survey, 2004/2005

Constraint Associated with Herbicide Use

All respondents were aware of the environmental pollution caused by the use of herbicides. Because of possibility of persistence that leads to serious contamination of the ecosystem. They acknowledged that herbicides are detrimental to the growth and development of aquatic life (fish) and salinity build up.

The Table 8 revealed that majority (80%) complained about the high cost of the herbicides. This may be due to the fact that all the herbicides are imported, unless if the industries are established in the country. In addition, the farmers did not vividly see the impact of herbicides compared to other pesticide such as insecticides, or fungicides etc. This finding is in line with that of Logoke and Shebayan, 1988; Ogunniyi *et al*, 2001 and Kolo, 2004) that some farmers make effort to use and managed herbicides particularly in densely or actively farmed areas.

Table 8: Constraints in the use of herbicide.

Constraints	Frequency*	Percentage
High cost of herbicides	72	80.00*
Resistant weeds	35	38.88
Fake herbicides	53	58.88
Bad odours	22	24.44

Field survey, 2004/ 2005. *Multiple response, percentage over 100%

CONCLUSION

The findings of the study revealed that some farmers use herbicides to control weeds. However, they lacked proper knowledge of herbicide management. Furthermore, farmers identified high cost as an impediment to the use of herbicides.

Farmers should be provided adequate training on the use of pesticides. Without proper training and care, farmers may subject themselves and the environment to serious risks through the misapplication or mishandling of these toxic chemicals.

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