ASSESSING THE SAFETY USE OF HERBICIDES BY HORTICULTURAL FARMERS IN RIVERS STATE, NIGERIA

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Abstract

Herbicides though beneficial to farmers in weed control they could also be harmful to the users and the environment. It was therefore necessary to determine the level of herbicide use and access the safety methods applied by horticultural farmers in Rivers State, Nigeria. Assessment of the safety use of herbicides by horticultural farmers in Rivers State of Nigeria was carried out in the 2006 farming season. Structured questionnaires were administered to farmers in the three Agricultural Zones of the State. The survey revealed that most of the horticultural farmers in the state were within the age of 14 – 50 years (48%), were married (70%), were females (60%), secondary school leavers (40%), most did not use herbicides (63%) and having used herbicides for the past 1-5 years (45%). The results further showed that most of the farmers obtained their herbicides from the open market (55%), agreed that herbicides are time saving (52%), applied with CP-15 (53%), which were borrowed (48%) and use the milk measurement (40%). Majority of the farmers use protective wears (58%), talking during application (51%) discard left over spray mixture into the rivers/seas (39%), wash and sell the containers (36%), wash their sprayers (70%), bath after application (73%), experienced low crop injury (23%), encountered accidents (77%), through the skin (72%) and limited knowledge of herbicide use as the greatest constraints to safety use of herbicides by farmers. Herbicide use among horticultural farmers in the state is low, enlightenment programme on health and safety use of herbicide is needed.

Keywords: Rivers State, agricultural zones, horticultural crops, herbicides, spray equipment, protective measures.

Introduction

The Southern part of Nigeria is characterized by high rainfall and temperature which favour weed growth and weeds are serious threats to food production leading to food insecurity. Weeds have influenced human and social actions more than other crop pests. Though weeds can be controlled by inter-cropping, Akobundu (1987) indicated that this is not always the case in small holder cropping systems because crops in these system are grown at wide spacing that weed suppression is almost ruled out. Weeds are traditionally controlled using manual labour through how weeding and slashing with cutlass. According to Babalola (2002), one of the greatest hurdles constraining agricultural production is the scarcity and cost of labour for farm operations which is estimated to cost about 60% of farm account. This is due mainly to competing demands amongst industries, construction work and agriculture. Babalola (2002) also posited that the situation is further worsened by rural-urban migration of the young people who normally assisted their parents on the farm seeking as it were "greener pastures" not realizing that the pasture on the farm are usually greener than those in the town. Since labour involvement in agriculture is declining this constraint can best be solved by agricultural mechanization and use of herbicides.

Herbicides are important and essential components of weed management in the world of agriculture. Kolo (2004) asserted that the 23rd Food and Agricultural Organization of the United Nations Conference recognized that increased food production is a high priority in many parts of the world and this need cannot be met without the use of indispensable agricultural inputs such as herbicides. Tjornhom *et al* (1998) and Wilson and Tisdel (2001) revealed that one of the factors that had contributed to sizeable productivity gains in agriculture worldwide has been the use of pesticides (herbicides inclusive). For balanced diet intake which is a pre-requisite for healthy living in achieving the millennium development goals the inclusion of horticultural crops in our food must be encouraged.

Although herbicides lead to increased food production; there is every reason to use them properly to safeguard the people and the environment. Farmers' knowledge regarding safety application techniques, timing and dosage of herbicides use is often inadequate (Wopereis *et al.*, 2009). Exposure to pesticides and herbicides are very common especially for applicators that use these chemicals on a regular basis (Rell and Galvin, 2011). Rell and Galvin (2011) further noted that the three main entry routes for these compounds into the body are dermal (exposure through the skin or eyes), respiratory (inhalation into the lungs) and oral (ingestion by mouth). Certain precautions should be taken before, during and after herbicide application (Akobundu, 1987). Some of the precautions advanced by this author are

that it is important that before application, the user wears the recommended protective clothing, note the direction of the wind, minimize herbicide ingestion by avoiding eating, drinking, smoking and talking during application, and after application proper disposal of containters, and unused herbicide mixtures, washing of equipment, clothes and proper bathing. It is on this basis that the need to assess the safety use of herbicides in the horticultural crops in Rivers State needs to be brought to the fore. The objectives of this study were to determine the degree of awareness of herbicide use in horticultural crop production and the safety measures adopted by the farmers before, during and after herbicide application in the state.

Materials And Method

There are Twenty-Three (23) Local Government Areas (LGA) in Rivers State divided into three Agricultural zones which are crop (I), Fishing (II) and the Crop/Livestock (III) zones (Table I).

Table 1: Agricultural zones of Rivers State according to the LGAs

Zones I – Crop Zone Headquarters: Bori	Zone III – Fishing Zone Headquarters: Andoni	Zone III – Crop/Livestock Zone Headquarters: Omuma.
Port Harcourt	Abua/Odual	Ahoada East
Obio/Akpor	Akuku-Toru	Ahoada West
Khana	Andoni	Emohua
Gokana	Asari-Toru	Etche
Oyigbo	Degema	Ikwerre
Tai	Wakirike	Ogba-Egbema-Ndoni
Eleme	Opobo/Nkoro	Omuma
Ogu-Bolo	Bonny	

Source: Rivers State Agricultural Development Programme Annual Report (2000).

The survey work was conducted from the three zones as shown in Table 1 in the 2006 farming season by administering structured questionnaires with the aid of extension officers from the State Agricultural Development Project (ADP) and the State Ministry of Agriculture. Four Hundred (400) questionnaires were distributed to ten (10) towns / villages which were randomly selected, (40 questionnaires per town / village) from four LGAs randomly selected from each of the three Agricultural zones in Rivers State. This gave a total of one thousand and six hundred (1,600) questionnaires that there were administered. One thousand five hundred and fifty eight (1,558) questionnaires were retrieved and used for

analysis. The data were analyzed according to the frequency of responses and these expressed as percentages of the total for each response.

Results And Discussion

Majorities (48%) of the horticultural farmers are within the ages of 41-50 years and are married (70%) apparently using proceeds from horticultural crop production to assist the family (Table 2). Seventy percent of the horticultural farmers were females just as Iyagba and Gedi (2007) noted that majority of the horticultural farmers in Bayelsa State, a neighbouring State were women.

Table 2: Socio-demographic characteristics of horticultural framers in Rivers State Agricultural Zones (expressed in %)

	Agricultural Zones				
Parameters	I	II	III	Mean (%)	Responses N = 1558
Age of farmers (years)					
< 20	2	1	3	2	31
21 – 30	3	5	4	4	62
31 – 40	21	20	20	20	312
41 – 50	52	44	48	48	748
51 – 60	18	26	19	21	327
> 60	4	4	6	5	78
Marital status					
Married	71	70	69	70	1091
Single	29	30	31	30	467
Status of farmers					
Full Time	75	72	57	68	1059
Part Time	25	28	43	32	499
Gender of farmers					
Female	58	60	62	60	935
Male	42	40	38	40	623
Level of education					
Illiterate	11	10	12	11	171
Primary	15	23	30	23	358
Secondary	46	35	39	40	623
Post' secondary school	29	31	19	26	406

Egbarevba and Iweze (2004) in a survey reported that females were found to contribute generally more than males in all farming activities while Egbarevba (2005) reported that this was so because women are more knowledgeable about sustainable agricultural systems and also played a key role in preserving and exploiting biodiversity.

Considering the educational level of the farmers, a combination of illiterates and primary school leavers was 34% while that of secondary and post secondary School leavers was 64% (Table 2). It is therefore, expected that the farmers here are in a better position to adopt any new innovations and read safety precautions on herbicide use. Table 3 shows that 70% of these farmers used pesticides and 56% of them apply herbicides mainly in the cultivation of fluted pumpkin (Table 4).

Table 3: Horticultural farmers' response on the type and length of pesticide use in Rivers State.

Parameters	Agricultural Zones			Mean (%)
	I	II	III	
Pesticide types				
Insecticide	80	40	70	63
Herbicide	40	20	28	29
Nematicide	36	20	30	29
Fungicide	42	12	28	28
Use of pesticides				
Yes	68	70	72	70
No	32	30	28	30
Length of use (years)				
1 – 5	48	40	47	45
6 – 10	27	25	29	27
11–15	18	18	12	16
> 15	7	17	12	12

The commonest type of sprayer used was the CP-15 (53%) and CP-3 (45%) which is the common type of sprayer used in the tropics (Table 5). Table 5 also showed that only 21 and 18% of the farmers possess their personal spray

Table 4: Horticultural farmers' response (%) on the use of herbicides in Rivers State.

Parameters	Agricultural Zones			Mean (%)	Responses N = 1558
	I	II	III		
Years of Farming					
< 10	6	7	2	5	78
11 – 20	12	14	19	15	234
21 – 30	32	34	39	35	545
31 – 40	41	36	36	38	592
> 40	9	9	4	7	109
Use of Herbicides					
Yes	34	39	38	37	576
No	66	61	62	63	982
Frequency of use					
Regular	5	12	16	11	171
Seasonal	65	53	59	59	919
Occasional	30	35	25	30	468
Crop types on which herbicides are used					
Fluted pumpkin	30	33	27	30	467
Okra	28	26	30	28	436
Pepper	16	19	19	18	280
Water melon	4	1	3	3	46
Cucumber	6	4	5	5	80
Others (tree crops)	16	17	16	16	249
Purpose of use					
Agricultural	54	53	61	56	872
Non-Agricultural	46	47	39	44	686
Herbicide type used					
Selective	70	70	64	68	1050
Non-selective	30	30	36	32	498

equipment, and personally apply the herbicides respectively. The commonest method of herbicide measurement by farmers is by the use of empty milk tin (40%). The wide spread use of milk tin measurement (160 ml) to dispense quantity of herbicides into sprayer tank according to Kolo (2004) could be due to the recommendation by the National Advisory Committee on Weed Control (NACWC), a committee of the Federal Department of Agriculture, Abuja, Nigeria.

Table 5: Horticultural farmers' response on use of spray equipment and application of herbicides in Rivers State.

Parameters	Agricultural Zones			Mean (%)	Responses N = 1558
	I	II	III		
Types of sprayer					
CP–15	58	56	45	53	827
CP–3	38	44	53	45	701
Weed Duster	2	0	0	1	10
Motorized	2	0	0	1	10
Source of Sprayer					
Own	27	70	26	21	327
Borrowed	36	56	52	48	748
Hired	37	34	22	31	483
Herbicide Application					
Self	26	10	18	18	280
Other family members	12	5	10	9	140
Extension workers	41	49	30	40	624
Hired labour	21	36	42	33	514
Measurement					
Milk Tin (160 ml)	31	44	46	40	623
Visual estimate	39	23	28	33	514
Volume	30	24	26	27	421
Stage of Application					
Pre-planting	36	47	31	38	592
Pre-emergence	24	25	32	27	421
Post-emergence	40	28	37	35	545

Only 58% of the farmers across the zones use protective wears which does not portray safety consciousness and is therefore harmful to users (Table 6). This poses a serious health hazard and Akobundu (1987) reported that a farmer runs a greater risk of pesticides exposure to the body when using knapsack sprayers than their counterparts in developing countries using motorized sprayers. Akobundu (1987) also observed that the high risk of human exposure to pesticides arises from the fact that the lance of the knapsack sprayer is held barely a metre away in front of the operator, and despite all precautions, a sudden change in wind direction increases the chances of droplet deposition on the body of the operator.

Wolfe (1973) indicated that over 97% of the pesticide to which the body is subjected to during possible exposure situations is deposited on the skin. According to Akobundu (1987), 46% of all spray deposits that settle on the operator are deposited on the ankle. Personal protective equipment (PPE) is the first line defense against potential exposures to pesticides and herbicides and the types of PPE required vary according to the toxicity and physical form of the chemical (Anon., 2007). Herbicide contamination during application can be reduced by wearing protective clothing such as rubber gloves, overalls, aprons, hats, goggles and boots.

Table 6 further revealed that 51% of the farmers talked during application and this can also lead to herbicide ingestion, disease outbreak will therefore be imminent. Rell and Galvin (2011) stated that one of the main entry routes of herbicides into the body is through ingestion from the mouth.

Table 6: Horticultural farmers' response on use of protective measures in Rivers State.

Parameters	Agricultural Zones			Mean (%)	Responses
	I	II	III		N = 1558
Protective wears					
Yes	62	56	56	58	904
No	38	44	44	42	654
Discussion during application					
Yes	55	41	57	51	795
No	45	59	43	49	763

Disposal of unused/left over spray mixture					
	0	0	0	0	0
On farm boundaries	20	30	20	23	358
Pits	0	60	50	39	1200
Rivers/Seas	0	0	0	0	0
Retained in the sprayer	0	0	0	0	0
Others					
Methods of disposal of herbicides containers					
	9	5	8	7	109
Buried	28	17	27	24	374
Burnt	33	39	36	36	561
Wash and sell	32	39	29	33	514
Domestic use					
Wash of sprayer					
Yes	60	74	76	70	1091
No	40	26	24	30	467
Bath after herbicide use					
Yes	66	77	76	73	1137
No	34	23	24	27	421

Proper disposal of unusable herbicides as well as other pesticides like fungicides and insecticides is a problem especially in the tropics and proper disposal procedures are essential in the safe use of herbicides (Anon, 1980; Freed, 1983). The results from Table 6 shows that unused/left over spray mixtures are disposed into pits (23%) and rivers/seas (39%). This will cause hazard on the environment and public health. Eutrophication will occur and cause damage to fishes, the food chain will be affected and herbicide mixture can also enter the environment through drift, runoff water and pollute the water ways (Falconer, 1998: Whitehead, 2000).

The commonest method of deposal of herbicide containers are wash and sell (36%) and domestic use (33%), while only 7% of the herbicide users dispose their containers by burying them (Table 6). The recommended practice of dealing with the used herbicide containers is by burying them. Improper disposal of herbicide containers are sources of

herbicide contamination affecting the users and others who do not use herbicides (Whitehead, 2000). Seventy percent of the applicators wash their sprayers and 13% of them bath after application (Table 6). Bathing after herbicide application is a way of reducing herbicide contamination on the users.

Crop injury was 23% while accident occurrence was 77% (Table 7). Table 7 further indicated that the commonest type of accident is through skin contact (72%) across the three zones while the commonest effect to herbicide accident is skin peel (60%) across the three zones.

The survey identified eight factors limiting herbicide use varying from one zone to the other. The greatest constraint is limited knowledge of herbicide (Table 8). There is the need therefore to create enough awareness on herbicide use among horticultural farmers in the State.

Table 7: Horticultural farmers' response on safety of herbicide use in Rivers State.

Parameters	Agricultural Zones			Mean (%)	Responses N = 1558
	I	II	III		
Crop injury					
Yes	24	19	26	23	358
No	76	81	74	77	1200
Accident occurrence					
Yes	76	83	72	77	1200
No	24	17	28	23	358
Accident type					
Inhalation	16	11	16	14	218
Ingestion	7	17	16	14	218
Skin contact	76	72	68	72	1122
Accident effect					
Skin peel	61	60	59	60	935
Stomach pain	28	20	18	24	343
Others	11	20	23	18	280

Table 8: Horticultural farmers' response (ranking) in Rivers State on factors limiting herbicide use.

Parameters	Agricultural Zones			Means (%)
	I	II	III	
Cost of herbicides	2nd	2nd	2nd	2nd
Limiting knowledge of herbicide	1st	1st	1st	1st
Lack of skill in sprayer operation	4th	3rd	4th	4th
Unavailability of herbicides	3rd	4th	3rd	3rd
Sprayer maintenance	8th	7th	7th	7th
Fatigue in spraying	5th	6th	6th	6th
Safety	6th	5th	5th	5th
Water availability	7th	8th	8th	8th

Conclusion

This work has shown that herbicide uses among the horticultural farmers in the state are not safety conscious of their lives and that of the environment. In conclusion, as much as they are adopting the use of herbicides which is low, the usage should go along with health and safety education.

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