



COMPLIANCE TO AGROCHEMICAL SAFETY PRACTICES AMONG ARABLE CROP FARMERS IN OLA-OLUWA LOCAL GOVERNMENT AREA OF OSUN STATE, NIGERIA

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ABSTRACT

The study examined the compliance to agrochemical safety practices among arable crop farmers in Ola-Oluwa local government area of Osun state. Random sampling was used to select 127 farmers from the list of 254 registered farmers provided by the Arable Crop Farmers Association, 110 were retrieved in the study area. Data was obtained using structured interview schedule and described statistically with PPMC for the hypotheses. The study revealed that most (65%) respondents were male, 43.6% in the age of 41-49 years. Majority (65.5%) of the respondents was married and had primary education (26.4%). Most of the respondents accessed information safety practices through Farmers association (146), Radio (117) and Television (109). Also, majority of the respondents indicated their low compliance to agrochemical safety practice before application (57.0%), during application (63.5%) and after application (52.6%). Major constraints to safety practices identified by respondents in the study area were poor reading attitude of farmers (129), lack of technical knowhow on safety practices (120) and farmers' poor literacy level (120). PPMC analysis used for the hypotheses revealed that there was significant relationship between the respondents' income generated and their compliance to agrochemical safety practices ($r=21.256$, $p=0.019$). Also, there was significant relationship between respondents' sources of information and their compliance to safety practices ($r=10.231$, $p=0.012$). It is therefore recommended that information on agrochemical safety practices should be simplified to avoid ambiguity and easy interpretation due to their literacy level.

Keywords: Agrochemical, Safety Practices, Arable Crop Farmers

INTRODUCTION

Agrochemicals are any substance used to help manage an agricultural ecosystem, or the community of organisms in a farming area. Agrochemical include fertilizers, liming and acidifying agents, soil conditioners, pesticides and chemicals used in animal husbandry such as antibiotics and hormones. The use of agrochemical to manage pest and weed has become a common practice around the world. Agrochemical are used almost everywhere, not only on agricultural fields

but also in homes, buildings, parks, forests and roads. In addition, agrochemical residue can be found in the food we eat, air we breathe, and the water we drink. (Hong *et al* 2007).

Overtime, repeated application increases pest resistance while its effect on other species can facilitate the pest resurgence (Damalos, 2011). Each pesticides class comes with a specific set of environmental concerns. Such undesirable effects have led many pesticides to be banned, while regulations have reduced the use of others.

Pesticides are toxic to both pests and humans. However, they need not to be hazardous to humans and non-target animal species if suitable precautions are taken. Even farmers who are well aware of the harmful effects of pesticides are sometimes unable to translate this awareness into their practices (Pimentel, 2005). Even though the development of toxicity references levels for pesticides incorporates uncertainty factors that serve to achieve this regulation standard, in reality, we may never know whether a pesticides is safe under all circumstances, nor we predict with certainty its performance in hypothetical situations (Coronado *et al.* 2004).

Major hazard to the human health and environment connecting with agricultural activities are linked to arbitrary use of agrochemicals particularly pesticides. This is resulted from inadequate knowledge of farmers on pesticides safety. It is important to know that pesticides and agrochemicals are produced under a stringent measure so as to minimize its impact on environment and human health. Serious attentions have been given to health risks resulting from occupational exposure and agrochemicals residuals in drinking water and food (Damalas and Eleftherohorinos, 2011). Over 98% of sprayed insecticides and 95% of herbicides reach a destination other than their target species, because they are sprayed or spread across entire agricultural fields (George tyler miller, 2004).

Similarly, the measures taken before, during and after the pesticides application including other agrochemicals, dose applied and prevailing weather condition including will determine the effect of agrochemical toxicity (Damalas and Eleftherohorinos, 2011). It is however necessary for agrochemical users to strictly comply with the safety practices before, during and after the application.

General awareness about the effect of agrochemical use on human health and

environment as well as compliance to safety practices is doubted. Agrochemical have been linked to a wide range of range of human health hazard, ranging from short- term impacts such as headache and nausea to chronic impacts like cancer, reproductive harm and endocrine disruption (Baumann, 2006). It is against this background that this research focused on the Compliance to agrochemical safety practices among arable crop farmers in Ola-Oluwa local government area of Osun state as the general objective. The specific objectives are: to examine the socio-economic characteristics of the respondents in the study area, to ascertain the respondents' sources of information on agrochemicals safety measures in the study area, to determine the level of respondents' compliance to agrochemicals safety practices in the study area and to ascertain the constraints to compliance to agrochemical safety practices in the study area.

MATERIALS AND METHODS

Study Area

This study was carried out in Ola-Oluwa local government area of Osun state. The study area is in the southern western part of the state and it has an area of 328km² and a population of 76,593 at the 2006 census (National population Census, 2006). The study area is situated within the tropic rain forest region, agricultural and other petty trading is predominant occupation in the study area. The climate in the study are tropical type with two distinct rainfall patterns. The rainy season which mark the agricultural production season is normally between the month of April and October.

Experimental Design

Purposive sampling was used to select six (6) prominent villages out of sixteen (16) because of the predominance of arable crop farmers in the area. List of registered farmers were obtained in the selected six villages. These include: Igege (46), Telemu (68), Ogbaagba (54), Ikire ile (36), Bode osi (28), and Asa (22). Lastly, fifty percent of the registered farmers were selected to give a total of

127 respondents. Out of the 127 questionnaire administered, 110 were retrieved. Data were collected using primary and secondary source. Primary data were collected from arable farmers.

Data Analysis

Both descriptive and inferential statistical tools were used to analyze the data collected such a frequency, percentage and Pearson Product Moment Correlation (PPMC).

RESULTS

The table 1 shows that most (65.5%) of the respondents were male who involved in arable farming. Majority (65.5%) of the respondents were married while few (13.6%) were single. Also, 43.6% of the respondents fell within the age range of 41-49 years age bracket, 31.8% were between the age ranges of 26-40years while only 3.6% between the age range of 18-25years. Educational level shows that 16.4% had informal education, 15.5% adult education while primary education (26.4%) were in the highest category. Also majority (60.9%) were Christians, 36.4% were Islamic religion, while 2.7% were traditional religion. Household size showed that 60.9% were between the ranges of 1-5 members, 23.6% were between the ranges of 6-10, while 15.5% were above 10. The result further shows that 40.0% has 100,000 as their income, 42.7% has 100,000-200,000 as their income while 17.3% earned above 200,000 as their income. Land area cultivated shows that 41.8% cultivated one hectare of land, 30.0% cultivated two hectare of land, 13.6% of the respondents cultivated three hectare of land while 14.6 % cultivated area of land less than 1 hectare.

The results in table 2 indicate the sources of information mostly used by respondents according to the weighted score was information through farmers association (146), this was followed in descending order by information on radio (117), information on television (109), then followed by cooperatives societies (104). The least ones in term

of prominence were family (84), internet (86), handbill (91), and research institutes (94).

Compliance to Agrochemical Safety Practice

Table 3 showed the compliance to safety practice before the application of agrochemical according to the weighted score revealed that most of the respondents complied to a greater extent instruction that says agrochemical passengers and food stuff must not be transported together (143). This was followed in descending order of prominence by accepting that agrochemical must not be stored together in the room with consumable items (139). Also, some of the respondents complied to information that agrochemical should be kept out of the reach of the children (137), reading carefully the label of agrochemical containers for specific instruction (132) and that solid agrochemical should be stored above liquid ones (130). On the other hand, the result further revealed that most of the failed to complied to instruction that agrochemical should not be transferred from original container (101) and that agrochemical with missing or illegible label should not be accepted (114).

The result in Table 4 revealed the compliance of respondents by weighted score in the order of prominence showed that information that says never eat or drink while spraying (139) was ranked first. This was closely followed by instruction indicating that a set of approved aid kit should be readily available (135). Also, most of the respondents complied to a greater extent instruction on mixing agrochemical in a well ventilated area (125) as well as not mixing dusty agrochemical under windy environment (122). The result further showed that information indicating not to spray while walking in the direction of wind was ranked least in order of prominence, followed by wearing of overall with long sleeves, glove and goggles when spraying (110) and wearing of nose mask when using low volume chemical sprayer (119).

The result in table 5 showing the compliance to agrochemical safety practices after application

revealed that information on washing spraying equipment thoroughly with clean water was ranked first. This was closely followed by washing hand with clean water (147), returning all concentrated chemicals to the store immediately after use (131) and disposing agrochemical which are no longer required (131) while information indicating that

accurate record of agrochemical usage be kept for future reference (121) was the least in term of level of compliance. The result as revealed in Table 5 shows that majority of the respondents had low level of compliance before (57%), during (63.5%) and after (52.6%) the application of agrochemicals.

Table 1: Socioeconomic characteristics of the respondents

Variable	Frequency	Percentage
Sex		
Female	38	34.5
Male	72	65.5
Marital status		
Single	15	13.6
Married	72	65.4
Widowed	7	6.4
Separated	16	14.6
Age		
< 26years	4	3.6
26-40years	35	31.8
41-50years	48	43.6
51-60years	13	11.8
61-70years	10	9.1
Educational background		
No formal education	35	31.9
Primary education	21	26.4
Secondary education	25	22.6
Tertiary education	29	19.1
Household size		
1-5	67	60.9
6-10	26	23.6
Above 10	17	15.5
Area of land cultivated		
<1 Hectare	16	23.1
1 Hectare	46	41.8
2 Hectare	33	30.0
3 Hectare	15	13.6
Income/annum		
<100,000	44	40.0
100,000-200,000	47	42.7
Above 200,000	19	17.3

Table 2: Sources of Information on Agrochemicals Safety Practices

Variables	Never	Occasionally	Regularly	Weighted score
Families	39(35.5)	58(52.7)	13(11.8)	84
Friend	35(31.8)	53(52.7)	22(20.0)	97
Extension agents	38(34.5)	47(42.7)	25(22.7)	97
Radio	17(15.5)	69(62.7)	24(21.8)	117
Farmers association	18(16.4)	38(34.5)	54(49.1)	146
Handbills	32(29.1)	65(59.1)	13(11.8)	91
Seminar	38(34.5)	47(42.7)	25(22.7)	97
Newspapers	32(29.1)	57(51.8)	21(19.1)	99
Television	25(22.7)	61(55.5)	24(21.8)	109
Cooperative societies	33(34.5)	50(45.5)	27(24.5)	104
Internet	38(34.5)	50(45.5)	27(24.5)	86
Research institutes	36(32.7)	54(49.1)	20(18.2)	94

Percentage in parenthesis Mean=101.72

Table 3: Compliance to agrochemical safety practices before application

Variable	Greater Extent	Lesser Extent	Not Complied	Weight
Do not buy or accept agrochemical if damaged or repacked	15(13.6)	61(55.5)	34(30.9)	129
Do not accept agrochemical if label is missing or illegible	29(26.4)	48(43.6)	33(30.0)	114
Do not transfer agrochemical from original containers at any point in time	31(28.2)	57(51.8)	22(20.0)	101
Keep agrochemicals out of reach of children at all times	18(16.4)	47(42.7)	45(40.9)	137
Agrochemical passengers/foodstuff must not be transported together	19(17.3)	39(35.5)	52(47.3)	143
Solid agrochemical should be stored above the liquid ones	22(20.0)	58(52.7)	30(27.3)	130
Agrochemical should not be stored in the same room, animal feed and other consumable items	20(18.3)	41(37.3)	49(44.5)	139
Read carefully the label on the agrochemicals containers for specific instruction	25(22.7)	38(34.5)	47(42.7)	132

Mean=121.3

Table 4: Compliance to agrochemical safety practices during application

Variables	Greater extent	Lesser extent	Not complied	Weighted score
When using low volume chemical sprayer, wear nose mask	26(23.6)	67(60.9)	17(15.5)	119
Wear overall with long sleeves, gloves and goggles when spraying chemicals	15(13.6)	80(72.7)	15(13.6)	110
Never spray while walking in the direction of wind	13(11.8)	67(60.9)	30(27.3)	93
Avoid walking through area of crop or weed already sprayed with chemicals	27(24.5)	68(61.8)	15(13.6)	122
Never eat or drink while spraying the chemical	46(41.8)	47(42.7)	17(15.5)	139
A set of approved aid kit should be readily available	37(33.6)	61(55.5)	12(10.9)	135
Mix agrochemical in a well ventilated area	27(24.5)	71(64.5)	12(10.9)	125
Do not mix dusty agrochemical under windy environment	29(26.4)	64(58.2)	17(15.5)	122

Mean=121.3

Table 5: Compliance to agrochemical safety practices after application

Variables	Greater extent	Lesser extent	Not complied	Weighted score
Human and livestock should be kept out of chemical treated area till the period elapse	25(22.7)	74(67.3)	11(10.0)	124
Accurate records of agrochemicals usage should be kept for future reference	26(23.6)	69(62.7)	15(13.6)	121
All empty container should not be re-use	31(28.2)	65(59.1)	14(12.7)	127
Regular users agrochemical should go for medical checkup regularly	41(37.3)	48(43.6)	21(19.1)	130
Wash spraying equipment thoroughly with clean water	48(43.6)	54(49.1)	8(7.3)	150
Wash your hand with clean water after handling agrochemical	54(49.1)	39(35.5)	17(15.5)	147
All concentrated chemicals should be returned to store immediately after use	34(30.0)	65(59.1)	11(10.0)	133
Dispose agrochemicals which are no longer required in chemical disposal pits	33(30.0)	65(59.1)	12(10.9)	131
Crush empty agrochemical containers	32(29.1)	59(53.6)	19(17.3)	123

Mean=121.3

Table 6: Categorizations of respondents based on compliance before, during and after application

Category	Before		During		After	
	Frequency	Percentage (%)	Frequency	Percentage (%)	Frequency	Percentage(%)
High	50	43	40	36.5	52	47.4
Low	60	57	70	63.5	58	52.6
Total	110	100	110	100	110	100

The results in table 7 indicates the constraint faced by respondents in using agrochemical safety practices according to the weighted score revealed that poor reading attitude (129) was ranked first, this was followed in descending order of prominence by lack of technical knowhow on the use of agrochemical (120), constraint on poor literacy level (120), poor storage facilities (119). The least ones in term of constraint were lack of training or technical support on the use of agrochemical (101), constraint on inadequate users guide/instruction (102), inadequate constraint on

safety use of agrochemical (106) and poor pictorial or diagrammatic representation or labeling.

The table 8 shows that there is significant relationship between respondents' income generated and their compliance to agrochemical safety practices ($r=21.256$, $p=0.019$). Also, there is significant relationship between respondents' sources of information and their compliance to agrochemical safety practices ($r=10.231$, $p=0.012$).

Table 7: Constraints to agrochemical safety practices

Variables	Not a constraint	Mild Constraint	Severe constraint	Weighted Score
Lack of training on safety	23(20.9)	73(66.4)	14(12.7)	101
Poor labeling or diagram	29(29.4)	52(47.3)	29(26.4)	101
Inadequate guide	37(33.6)	44(40.0)	29(26.4)	102
Inadequate information on safety use	20(18.2)	74(67.3)	16(14.5)	106
Poor storage facilities	24(21.8)	53(48.2)	33(30.0)	119
Lack of technical know-how	12(10.9)	69(62.7)	29(26.4)	120
Poor literacy level	22(20.0)	56(50.9)	32(29.1)	120
Poor reading attitude	20(18.2)	51(46.4)	39(35.5)	129

Percentage in parenthesis

Mean=113.375

Table 8 PPMC analysis relationship between respondents' income generated, sources of information and compliance to agrochemical safety practices

Variables	r-value	p-value	Decision
Income generated and compliance to agrochemical safety practice	21.256	0.019	S
Sources of information and compliance to agrochemical safety practice	10.231	0.012	S

DISCUSSION

The result analysis revealed that most (65.5%) of the respondents were male who involved in arable farming. This means that arable crop farming is male dominated engagement probably because of the intense effort and energy involved. This is supported by Nnena (2011) which says majorly males are into arable crop farming than females. Majority (65.4%) of the respondents were married while few (13.6%) were single. This shows high sense of responsibility and commitment in the society. It suggests the capability of the respondents to take up multiple roles which will lead to greater achievement and development. Also, 43.6% of the respondents fell within the age range of 41-49 years age bracket. It means that majority of the respondents were below 50 years. This shows that most of the farmers who engaged in arable crop farming are still in their active age. Similar work of Awotide *et al.*, (2015) found the mean age to be 47 years. This is supported by the

work of Jallow *et al.*, (2017) who found that most the farmers were between 21-40 years. Educational level shows that primary education (26.4%) was indicated as the highest level of formal education among the respondents. This shows that most of the respondents had low level of educational attainment. This suggests low access to information and knowledge on improved farming practices due to respondents' literacy level. Farmers with high educational level will have better advantage over those with poor education in terms of access to information on good and recommended practices. Similar study of Jallow *et al.*, (2017) found that most of the farmers had below secondary education. Also majority (60.9%) of the respondents were Christians. It means Christians were predominant among the respondents who involved in arable farming. Household size showed that most (60.9%) of the respondents were between the range of 1-5 members. This shows that the number of household

members were considerably moderate. This result showed reduced number when compare with the finding of of Awotide *et al.*, (2015) who reported 11 as average household size. The result further shows that 42.7% of the respondents earned annual income between the ranges of ₦100,000 - ₦200,000. It means that majority of the respondents generated low income annually from their farming operation. This might be attributed to some of the constraints associated with their farm practices. Land area cultivated shows that 41.8% of the respondents cultivated one hectare of land. This means that the area of land cultivated was considered to be small when considering farm mechanization. This suggests that most of the arable crop farming activities is less mechanically practiced in the study area. This is in line with the findings of Eifediyi *et al.*, (2014) who found that most of farmers cultivated between 1-2 hectares of land.

Sources of information mostly used by respondents according to the weighted score shows that farmers mostly access information through farmers' association, radio, television and cooperative societies. This shows that respondents considered these sources as medium through which they receive information on their farming activities including agrochemical safety practice. This suggests that the respondents relied on these sources of information probably because they are available to them most time and easy to access by farmers. The information sources via these channels when properly utilize could influence high level of compliance to agrochemical safety practice. This implies that these channels should be considered in dissemination of information particularly those that demand urgent compliance. This is in line with Munyua, (2000) pointed out that the least expensive input for improved agricultural development is adequate access to knowledge and information in areas of new agricultural technologies.

Most of the respondents complied with a lesser extent to instruction on agrochemical safety practice before the application. Information instructing farmers not to transport agrochemicals, passengers and food stuff together (143) received highest level of compliance. This means that information that may directly affect the health of the users received high compliance than the otherwise. The result further revealed that most of the respondents failed to comply with instruction that agrochemical should not be transferred from original container (101). This might be due to their perception on agrochemical safety practice which might be unfavourable to the expected compliance level. This means that smaller proportion of farmers find it easy to comply with safety practices before application while larger percentage considered it to be a difficult task to comply. This is in line with the work of Jallow *et al.*, (2017) who reported that most of the farmers did not read or follow agrochemical label instructions.

The result of analysis in table 4 further reveals the compliance of respondents to agrochemical safety practice during the application as indicated by weighted score shows that most of the respondents had low compliance at the point applying these chemicals. This shows that compliance to agrochemical safety practice during the application was low to a greater extent. This suggests that farmers pay little or no attention to safety practice provided by the manufacturers of these agrochemicals. This finding is supported by the work of Jallow *et al.*, (2017) who found that most of the farmers did not use protective wears and equipment when handling agrochemicals.

Table 5 showing the compliance to agrochemical safety practices after application revealed that information on washing spraying equipment thoroughly with clean water was ranked first. This shows low level of compliance while few of them to a larger extent show high level of compliance This might be linked to the fact that some of these

instructions were not given priority most especially when their immediate needs have been satisfied.

In summary, the result showed that majority of the respondents had low level of compliance before (57%), during (63.5%) and after (52.6%) the application of agrochemicals. This shows that most of the respondents did not comply to safety practices involved in agrochemical usage. This result indicated that compliance during the application had highest level of incompliance. This suggests that most of the farmers pay little or no attention to agrochemicals safety practice necessary to safeguard health hazard related to usage. This implies that information on safety practices on agrochemicals is not sufficiently enough to promote farmers compliance. Similar work of Abegunrin *et al.*, (2019) found that most of the arable crop farmers had low level of agrochemical safety practice.

The results of analysis in table 7 indicates the constraint faced by respondents in using agrochemical safety practices according to the weighted score reveals that poor reading attitude (129) was ranked first. It means that farmers find it difficult to read and follow the instructions on the label of some of the agrochemicals. This shows the literacy level some of the respondents in the study area. It suggested that farmers with high literacy level will show high inclination to read instruction than illiterate farmers. This might influence the level of compliance to agrochemical safety practice. This shows that level of compliance of most of the respondents were affected by some of the constraints identified in the study area.

The PPMC analysis as revealed in table 8 shows that there is significant relationship ($p>0.05$) between respondents' income generated and their compliance to agrochemical safety practices. This means that farmers' income influences the level of compliance. It suggested that farmers will be interested in good practices such as use of

agrochemical and safety practice that will enhance their income generating activities. The implication is that the farmers with higher income will show high inclination to comply with agrochemical safety practice. Also, there is significant relationship ($p>0.05$) between respondents' sources of information and their compliance to agrochemical safety practices. It means that access to regular sources of information on agrochemical safety practice will promote good compliance. This implies that effective sources of information will influence compliance among the farmers.

CONCLUSION

There were more males who engage in the arable crop farming than the females within the age range of 26-40 years, majority of the respondent were married these implies that arable crop farming are mostly done by married peoples. Most of the respondents had primary education. The major sources of information mostly used by the respondents in the study area were farmers association, radio and television. Constraint identified by respondents as major constraint was poor reading attitude due to poor literacy level. Majority of the respondents had low compliance level to agrochemical safety practices in the study area.

RECOMMENDATIONS

- i. The recommendation for the study includes;
- ii. Government agencies and non-government agencies alike who take interest in environmental safety practices should direct their efforts on compliance to agrochemical safety practices.
- iii. Training and support services on guide and safety practices of agrochemicals should be rendered to crop farmers in the study area. This will prevent the farmers from unnecessary exposure to hazard associated with the unwholesome safety practices.

- iv. Due to poor literacy level of crop farmers, information on agrochemical user guide should be simplified and devoid of any ambiguity for easy interpretation. Also, producers of agrochemical should always

put different languages on their product so that it will be easier for users to understand the instruction written on the chemical labels.

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