

ASSESSMENT OF FARMERS AWARENESS AND PRACTICE OF HEALTH SAFETY MEASURES IN THE USE OF AGROCHEMICALS IN NIGER STATE, NIGERIA

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ABSTRACT

This study assessed farmers' awareness and practice of health safety measures in the use of agrochemicals in Niger State, Nigeria. A total of 150 farmers were randomly sampled from the three geo-political zones of the State, (that is. Interview Schedule was employed for primary data collection. Data collected were analysed using Descriptive and Inferential Statistics (Chi-Square and Analysis of Variance, ANOVA). Findings showed that majority of the farmers (81.4%) were within 21-50 years old, mostly male (92.0%), with low level of formal education but most of them (70.7%) had more than 20 years farming experience. Results also showed that Yam and Maize crops were being cultivated by majority of the farmers. All the farmers used N.P.K. fertilizer, while between 41.3 and 74.1 percent of them did use Atrazine, Weed off, Apron Plus, Fernasan-D and Urea. Results on farmers' awareness showed that at least 56.7 percent of the farmers were variously aware of 60.0 percent (12) of the health safety measures. Also, at least 62.7 percent of the farmers practised each of the first 12 identified health safety measures, while at least 75 percent of the farmers practice 30 percent of the health safety measures always. Chi-Square test indicated significant relationships between both educational attainment and farming experiences of the farmers, and their awareness of health safety measures ($X^2 = 7.84$, $P < 0.05$ and $X^2 = 6.52$, $P < 0.05$ respectively). This suggests that the higher the educational attainments and farming experiences of the farmers, the more their awareness about health safety measures and vice-versa. Also, Analysis of Variance results showed statistical significant differences between actual practice ($F = 4.81$, $P < 0.05$), regularity of practice of health safety measures ($F = 3.34$, $P < 0.05$) and farmers' awareness of the safety measures. It can be concluded that despite farmers' awareness of health safety measures, not many of them practice most of these measures always. It is recommended apart from the creation of more awareness; farmers should be given adequate orientation about health safety measures

INTRODUCTION

Agriculture is classified among the most hazardous sectors of activity in both industrialized and developing countries with an estimated number of 170,000 agricultural workers being killed each year. The agricultural workers are at twice the risk of dying on the job as compared with workers in the other sectors. For many years now, there has been public concern about the crop protection and pest control agrochemicals, (International Labour Organization, 2000; Sajo and Mustapha, 2007). However, people have long endeavoured to protect field crops from disease, pests and weeds. These methods include breeding resistant varieties to pests and diseases, cultural control of diseases and pests by ploughing and removing crop debris after harvest, hoeing and biotic control using natural enemies. Also, agricultural chemicals are used because they produce rapid effects with less effort.

Agricultural chemicals are chemical agents that are used to control crop-harming organisms such as fungi, nematodes, mites, insects, rodents and viruses which are collectively referred to as diseases and pests. Agricultural chemicals are classified by application target as follows; Insecticide (control of harmful insect pests damaging field crops); Fungicides (control of diseases damaging field crops), Herbicides (weeds control); Rodenticides (rats and other rodents control); Plant growth regulators (to promote or inhibit the growth of field crops); Attractants (for attracting mainly harmful insect pests by odour or other means); Repellants (having repellent action on harmful mammals and birds damaging field crops); Acaricides (Spiders); Desiccant (aids rapid drying of plants); Molluscicide (to control Slugs and Snails

nematodes); Nematicide (nematodes); Algicide (algae) and Spreaders (agents that are mixed with other agricultural chemicals to enhance the adherence of these chemicals).

Awareness on health safety measures in the use of agrochemicals can be based on practical experiences, but farmers also incorporate new information and concepts from colleague farmers, agricultural extension officers, field experience, input suppliers, the media, development workers and others into their knowledge base. Therefore, knowledge and awareness of risks strongly influence how risks are perceived and managed (Peres et al., 2006; Stewart-Taylor and Cherries, 1998). However, increased awareness alone, may not be sufficient to trigger the needed behavioural change but positive media support and improvement in extension activities as well as improved Extension Agents to Farmers ratio can go a long way in ensuring that farmers put these health safety measures into practice.

Precautionary Principle and farmers' perception of health safety measures in agriculture

The precautionary principle states that if an action or policy has a suspected risk of causing harm to the public or to the environment, in the absence of scientific consensus that the action or policy is not harmful, the burden of proof that it is not harmful falls on those who advocate taking the action. There are two forms of the principle, namely; strict form and the active form. The former requires inaction when action might pose a risk, while the latter means choosing less risky alternatives when they are available, and taking responsibility for potential risks (Faunce,

2008). The principle implies that there is a social responsibility to protect the public from exposure to harm, when scientific investigation has found a plausible risk. These protections can be relaxed only if further scientific findings emerge that provide sound evidence that no harm will result.

It is important to emphasize that, although this principle operates in the context of scientific uncertainty, it is considered by its proponents to be applicable only when, on the basis of the best scientific advice available, there is good reason to believe that harmful effects might occur. The precautionary principle is most often applied in the context of the impact of human actions on the environment and human health, as both involve complex systems where the consequences of actions may be unpredictable, (Roberto, 2004). Application of the principle modifies the status of innovation and risk assessment, especially in the agricultural sectors where many agrochemicals are being used. It is not the risk that must be avoided or amended, but a potential risk that must be prevented. Therefore, in the case of regulation of scientific research, there is a third party beyond the scientist and the regulator, who is the consumer or farmer.

Many materials used in agriculture are classified as hazardous substances such as insecticides, herbicides and fungicides, collectively known as pesticides. Safety and health laws require that safety and health information must be provided in the form of Material Safety Data Sheets and labels so that the hazardous substances can be used safely. Farmers' perceptions of health risks may depend on how they obtain their knowledge about these agrochemicals because there are different sources possible and not all are appropriate or adequate. For instance, in Ghana, the media has been one of the main sources of knowledge for farmers, which has also shaped a lot of their perceptions on the risk. As observed in other studies, the media can build complex messages about risks but can also amplify or attenuate risks (Boholm, 1998). Therefore, there should be a balance on presenting risk messages to farmers to ensure that they are rated appropriately, to instigate change to safer practices that are necessary for health protection, (Obuobie, et. al., 2006).

The prevalence of many health related problems of agricultural workers, such as cardiovascular and respiratory diseases, arthritis, skin cancer, hearing loss and amputations among others have been documented, (Kirkhon and Schenker, 2001). Further evidence by Scientist in the developing countries indicated that more than two out of every ten workers in a sugar plantation were involved in one or more occupational accidents, and these were mostly attributed to lack of protective equipment, inadequate awareness and inadequate information about health safety measures as well as inadequate training in the handling of agrochemicals. There is also increasing evidence that language barrier impedes the understanding of safety information on products labels. However, most farmers are

very much aware about the benefits of agrochemicals application than about the harm that its misuse or mishandling can cause, (Ajayi, 2006). Therefore, the research question is that are farmers aware of these health safety measures in the use of agrochemicals and also practice them in Niger state, Nigeria?

Objectives of the study

The broad objective of the study was to evaluate farmers' awareness and practice of health safety measures in the use of agrochemicals in Niger state, Nigeria. The specific objectives were to;

1. describe the socio-economic and demographic features of the farmers in the study area,
2. identify the common agrochemicals being used by the farmers,
3. determine the farmers' awareness about safety measures in the use of agrochemicals and
4. ascertain the regularity at which the farmers' have put these health safety into practice in their agricultural activities.

Hypotheses of the study

1. There is no significant relationship between the socio-economic characteristics of the farmers (age, educational level and farming experience) and their awareness of health safety measures.
2. There is no significant difference between the actual practice, regularity of practice and awareness of health safety measures in the use of agrochemicals by farmers.

METHODOLOGY

Niger State is one of the 12 States created on the 3rd February, 1976. It has a land area of 74,244 square km covering 8 percent of the total land area of the country and about 85 percent of the land is arable. The population of the state is 2,421,581 people (Census, 2006) and 24 local government areas. The 3 major ethnic groups in the state are the Nupes, Gwari and Hausas. Other tribes which are considered as the minority groups include Kadara, Koro, Gana-gana, Dibo, Kambari and Dukkawa.

A total of 150 farmers were randomly sampled from the three geo-political zones of the State. Interview Schedule was employed for primary data collection. The instrument for data collection was validated and tested for reliability using Split-half technique ($r = 0.86$). Data collected were analysed using Descriptive (frequency, percentages and means) and Inferential Statistics (Chi-Square and Analysis of Variance, ANOVA).

Measurement of variables

The socio-economic variables include age, education and farming experience. Both age and farming experience were measured in actual years, while education was based on years of schooling. Awareness, actual practice and frequency of practice of the health safety measures were measured using Likert rating scale, the scores were aggregated and the Mean Weighted Scores (MWS) were calculated for the variables.

Actual practice (Practised = 1point and Not practiced = 0),
 Frequency of practice (Always = 2points and Occasionally = 1point) and
 Awareness (Aware = 1 and Not aware = 0).

RESULTS AND DISCUSSION

Socio-economic and demographic features of the farmers

The variables considered include age, education, sex and farming experience of the respondents. These were categorized as shown in Table 1, and findings showed that majority of the farmers (81.4%) were within 21-50 years old, mostly male (92.0%), with low level of formal education

because only 26.6 percent of them their education beyond primary level, while most of them (70.7%) had more than 20 years farming experience. According to the USDA,(1977) agricultural census, the average age of principal operators was put at 54.3 years. It was further reported that aging of the farm population may lead to increased susceptibility to the diverse effects of occupational hazards. Again, rural farmers in Nigeria are characterized as small holders, mostly illiterate with larger household size, (Olorunfoba and Fakoya, 2003). The low literate level of the rural farmers can affect their abilities to read instructions on product labels of agrochemicals

Table 1: Socio-economic and demographic features of the farmers (n = 150)

Variables	Frequency	Percentage
Age (Years)		
Less than 21	2	1.3
21-30	26	17.3
31-40	56	37.3
41-50	40	26.7
51 and above	26	17.3
Total	150	100.0
Educational level		
Post Secondary	44	29.3
Post Primary	23	15.3
Primary	17	11.3
Non formal education	66	44.0
Total	150	100.0
Farming experience (Years)		
Below 6 years	2	1.3
6-10 years	9	6.0
11- 15years	9	6.0
16-20years	24	16.0
More than 20 years	106	70.7
Total	150	100.0
Sex		
Male	138	92.0
Female	12	8.0
Total	150	100.0

Source: Field Survey, 2009.

Common crops grown by the farmers and contact with Extension Agents(EAs)

The farmers in the study areas cultivated different types of crops and these were presented in Table 2.

Table 2:Types of crops grown by the farmers

Crops grown*	Frequency	Percentage	Rank
Yam	139	92.7	1 st
Maize	137	91.3	2 nd
Sorghum	90	60.0	3 rd
Millet	64	42.7	4 th
Groundnuts	52	34.7	5 th
Rice	46	30.7	6 th
Cassava	37	24.7	7 th
Beans	30	20.0	8 th
Melon	25	16.7	9 th
Soybean	10	6.7	10 th
Sweet potato	4	2.7	11 th
Vegetables	3	2.0	12 th
Contact with EAs			
Regularly	57	38.0	
Irregularly	83	55.3	
No contact	10	6.7	
Total	150	100.0	

Source: Field Survey, 2009. *Multiple responses

Results obtained showed that Yam and Maize crops were being cultivated by majority of the farmers, that is by 92.7 and 91.3 percent of the farmers respectively, while Sorghum, Millet and groundnuts ranked next in that order. Other crops include Rice, Cassava, Beans, Melon, Soybean, Sweet potato and vegetables. More importantly, over one-half of the farmers did not have adequate contacts with EAs who are expected to assist the farmers with necessary agricultural information. This may adversely affect farmers' access to agricultural information needs, including proper handling of agrochemicals.

Types of agrochemicals commonly used by the farmers

Agrochemicals are essential for the control of weeds, pest and diseases by the farmers as well as enhancing plants growth. It is good to note that the types of crops grown will also determine types of agrochemicals being used by the farmers, and these were aptly presented in Table 3. Findings showed that all the farmers used N.P.K. fertilizer, while between 41.3 and 74.1 percent of them did use Atrazine, Weed off, Apron Plus, Fernasan-D and Urea.

Table 3: Types of agrochemicals used

Agrochemicals	Types	Used	Not used
		Frequency (%)	Frequency (%)
Herbicides	Gramazone	124 (82.7)	26 (17.3)
	Atrazine	73 (48.7)	77 (51.3)
	Glyphosphate	37 (24.7)	113 (75.3)
	Weed off	62 (41.3)	88 (58.7)
	Sarosate	4 (2.7)	146 (97.3)
	Paraforce	2 (1.3)	148 (98.7)
	Round up	29 (19.3)	121 (80.7)
	Touch down	21 (14.0)	129 (86.0)
	Scord	3 (2.0)	147 (98.0)
	Insecticides	Actellic dust	7 (4.7)
Phostoxin		15 (10.0)	135 (90.0)
Cypermethrin		3 (2.0)	147 (98.0)
Karate		23 (15.3)	127 (84.7)
Cymbush super		6 (4.0)	144 (96.0)
Diazinon		2 (1.3)	148 (98.7)
Seed dressing chemicals		Apron Plus	104 (69.3)
	Fernasan-D	79 (52.7)	71 (47.3)
	Benlate	4 (2.7)	146 (97.3)
Fertilizers	N.P.K	150 (100.0)	-
	Urea	112 (74.7)	38 (25.3)
	Phosphate	16 (10.7)	134 (89.3)
	Crystallizer	40 (26.7)	110 (73.3)
	Lime	15 (10.0)	135 (90.0)

Source: Field Survey, 2009.

Multiple responses

Awareness and practice of health safety measures in the use of agrochemicals by farmers

Encarta Dictionaries (2009) explain awareness as having knowledge of something from having

observed it or been told about it or knowing that something exists because we notice it or realize that it is happening.

Table 4: Farmers' awareness and practice of health safety measures (n = 150)

Safety Measures	Aware	Not Aware	Total	Practiced	Not Practiced	Total
	Freq.(%)	Freq.(%)		Freq.(%)	Freq.(%)	
1. Identification and protection of adjacent sensitive areas	117(78.0)	33(22.0)	150	94(62.7)	56(37.3)	150
2. Read and follow instructions on label	130(86.7)	20(13.3)	150	123(82.0)	27(18.0)	150
3. Covering and removal of human food and water near areas under treatment	144(96.0)	6(4.0)	150	145(96.7)	5(3.3)	150
4. Covering and removal of animal food and water near treatment areas	24(16.0)	126(84.0)	150	14(9.3)	136(90.7)	150

5. Avoidance of alcoholic consumption before working with pesticides	136(90.7)	14(9.3)	150	120(80.0)	30(20.0)	150
6. Washing of hands before eating, drinking, smoking and touching of any food substances	141(94.0)	9(6.0)	150	111(74.0)	39(26.0)	150
7. Check every essential equipment very well before usage	146(97.3)	4(2.7)	150	36(24.0)	114(76.0)	150
8. Ensure the disposal of empty agrochemical containers	143(95.3)	7(4.7)	150	142(94.7)	8(5.3)	150
9. Wear personal protective coat, boots, hand gloves and nose cover	85(56.7)	65(43.3)	150	31(20.7)	119(79.3)	150
10. Make fresh and clean water available for emergencies	120(86.0)	30(20.0)	150	18(12.0)	132(88.0)	150
11. Avoid drinking, eating, smoking, talking, using toilet or touching your face while applying pesticides	36(24.0)	114(76.0)	150	19(12.7)	131(87.3)	150
12. Keep people away whenever there is spillage	117(78.0)	33(22.0)	150	115(76.7)	35(23.3)	150
13. Do not blow a blocked nozzle with your mouth, but use a soft brush or tooth-pick	28(18.7)	122(81.3)	150	14(9.3)	136(90.7)	150
14. Spray when human activity nearby is unlikely	14(9.3)	136(90.7)	150	12(8.0)	138(92.0)	150
15. Thoroughly wash hand, face and neck when contaminated	17(11.3)	133(88.7)	150	8(5.3)	142(94.7)	150
16. Clean yourself, personal protective equipment and sprayers after use	94(62.7)	56(37.3)	150	94(62.7)	56(37.3)	150
17. Wait for the required pre-harvest interval before harvesting the treated crops	21(14.0)	129(86.0)	150	20(13.3)	130(86.7)	150
18. Only allow people into treated areas during restricted entry intervals if they use proper protective clothing	21(14.0)	127(86.0)	150	13(8.7)	137(91.3)	150
19. Do not work alone when handling very toxic agrochemicals	106(70.7)	44(29.3)	150	13(8.7)	137(97.3)	150
20. Keep agrochemicals out of reach of children	48(32.0)	102(68.0)	150	47(31.3)	103(68.7)	150

Source: Field Survey, 2009. Multiple responses

Based on the findings in Table 4, the study identified 20 important health safety measures that are closely associated with the use of agrochemicals. Results on farmers' awareness of these measures showed that at least 56.7 percent of the farmers were variously aware of 60.0 percent (12) of the health safety measures, while only few of them were aware of the remaining 40 percent measures. Also, at least 62.7 percent of the farmers practised each of the first 12 identified health safety measures. This indicates that despite farmers' awareness of the need to take

health safety measures in the use of agrochemicals, some of them did not put these into practice.

Regularity of practice of health safety measures by farmers

The study had established that farmers were aware of some health safety measures and also put them into practice. However, this section helps to explain the regularity of the actual practice of these health safety measures.

**Table 5: Regularity of practice of health safety measures by farmers**

Safety measures	Always		Occasionally		Total
	Freq.	%	Freq.	%	
1. Identification and protection of adjacent sensitive areas	34	36.2	60	63.8	94
2. Read and follow instructions on label	45	36.6	78	63.4	123
3. Covering and removal of human food and water near areas under treatment	138	95.2	7	4.8	145
4. Covering and removal of animal food and water near treatment areas	4	28.6	10	71.4	14
5. Avoidance of alcoholic consumption before working with pesticides	103	85.8	17	14.2	120
6. Washing of hands before eating, drinking, smoking and touching of any food substances	106	95.5	5	4.5	111
7. Check every essential equipment very well before usage	9	25.0	27	75.0	36
8. Ensure the disposal of empty agrochemical containers	33	23.2	109	76.8	142
9. Wear personal protective coat, boots, hand gloves and nose cover	2	6.5	29	93.5	31
10. Make fresh and clean water available for emergencies	2	11.1	16	88.9	18
11. Avoid drinking, eating, smoking, talking, using toilet or touching your face while applying pesticides	7	36.8	12	63.2	19
12. Keep people away whenever there is spillage	11	9.6	104	90.4	115
13. Do not blow a blocked nozzle with your mouth, but use a soft brush or tooth-pick	4	28.6	10	71.4	14
14. Spray when human activity nearby is unlikely	3	25.0	9	75.0	12
15. Thorough washing of hands, face and neck when contaminated	6	75.0	2	25.0	8
16. Cleaning of body, personal protective equipment and sprayers after use	91	96.8	3	3.2	94
17. Wait for the required pre-harvest interval before harvesting the treated crops	3	15.0	17	85.0	20
18. Only allow people into treated areas during restricted entry intervals if they use proper protective clothing	2	15.4	11	84.6	13
19. Do not work alone when handling very toxic agrochemicals	4	30.8	9	69.2	13
20. Keep agrochemicals out of reach of children	44	93.6	3	6.4	47

Source: Field Survey, 2009

Findings in Table 5 showed that at least 75 percent of the farmers always practice 30 percent of the health safety measures, while majority of them practised others occasionally. Those that they practiced always include the following: Cleaning of body, personal protective equipment and sprayers after use (96.8%); Washing of hands before eating, drinking, smoking and touching of any food substances (95.5%); Covering and removal of human food and water near areas under treatment (95.2%); Keeping of agrochemicals out of reach of children (93.6%); Avoidance of alcoholic consumption before working with pesticides (85.8%) and Thorough washing of hands, face and neck when contaminated (75.0%). This implies that farmers' claims of awareness and practice of health safety measures in the use of agrochemicals do not

necessarily translate to consistent practice except in few cases as indicated in this study.

Results of hypotheses tested

1. There is no significant relationship between the socio-economic characteristics of the farmers (age, educational level and farming experience) and their awareness of health safety measures. Chi-Square test indicated significant relationships between both educational attainment and farming experiences of the farmers, and their awareness of health safety measures in the use of agrochemicals ($X^2 = 7.84$, $P < 0.05$ and $X^2 = 6.52$, $P < 0.05$ respectively). It therefore, suggests that the higher the educational attainments and farming experiences of the farmers, the more their awareness about health safety measures in the use of agrochemicals and vice-versa.

Table 6: Relationship between socio-economic characteristics of respondents (age, education and farming experience) and awareness of health safety measures.

Variables	Chi-Square Value	Df	P- Value	Decision
Age	13.85	8	$P > 0.05$	NS
Educational level	7.84	6	$P < 0.05$	S



Farming experience 6.52 8 P < 0.05 S

NS = Not significant and S = Statistically significant at 5% significant level.

2. There is no significant difference between the actual practice, regularity of practice and awareness of health safety measures in the use of agrochemicals by farmers.

Table 7: Analysis of Variance (ANOVA) results

Variable		Sum of Square	df	Mean	F-Value	P-Value	Decision
Practice of health safety measures	Between groups	2117.577	21	100.837	4.813	P < 0.05	S
	Within groups	2681.996	128	20.953			
	Total	47799.573	149				
Regularity of practice of health safety measures	Between groups	1838.772	21	87.561	3.336	P < 0.05	S
	Within groups	3359.601	128	26.247			
	Total	5198.373	149				

S = Statistically significant at 5% significant level

The Analysis of Variance results in Table 7 showed statistical significant differences between actual practice (F = 4.81, P < 0.05), regularity of practice of health safety measures (F = 3.34, P < 0.05) and farmers' awareness of health safety measures in the use of agrochemicals.

CONCLUSION

It can be concluded that despite farmers' awareness of health safety measures, not many of them practice most of these measures always. It is recommended that apart from the creation of more awareness, farmers should be given adequate orientation about health safety measures. This can be achieved if the Extension Agents are adequately equipped to carry out their functions effectively. Governmental and Non-Governmental organizations as well as relevant stakeholders can also sensitize farmers on the need to always observe the health safety measures with a view to eliminating occupational hazards among farmers.

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