



## **Influence of Institutional Factors and Attitude on the Use of Herbicides by Farmers in Edo State, Nigeria**

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### **Authors' contributions**

This work was carried out in collaboration between all authors. All authors read and approved the final manuscript.

### **Article Information**

DOI: 10.9734/ACSJ/2015/21624

#### Editor(s):

(1) Scaeteanu (Vasile) Gina, Lecturer, Soil Sciences Department, University of Agronomical Sciences and Veterinary Medicine Bucharest, Romania.

#### Reviewers:

(1) Lucas Ricardo Petigrosso, Universidad Nacional de Mar del Plata, Argentina.  
(2) Rosilaine Araldi de Castro, Brazilian Bioethanol Science and Technology Laboratory, Brazil.  
Complete Peer review History: <http://sciencedomain.org/review-history/11580>

**Original Research Article**

**Received 26<sup>th</sup> August 2015**  
**Accepted 15<sup>th</sup> September 2015**  
**Published 28<sup>th</sup> September 2015**

### **ABSTRACT**

The study was conducted to determine the influence of institutional factors and attitude on the use of herbicides by farmers in Edo State, Nigeria. The study was descriptive and experimental. Multistage sampling technique was used. Thus the total sample size for the study was one hundred and twenty (120) respondents. Data was analyzed and presented using percentage, mean statistic and standard deviation respectively. Hypothesis for the study was analyzed using multinomial logistic regression with a  $p \leq 0.05$  level of significance. Majority (90.8%) of the respondents were members of different social organizations with thrift (*isusu*) society ranking highest (50.8%). Farmers in the study were concerned about the harmful effects of herbicides on the environment ( $\bar{x} = 3.70$ ) as such were of the view that alternative weed pest control should be considered ( $\bar{x} = 3.78$ ). Extension contact, access to credit and membership of social organization have significant influence on herbicide use. Based on the findings and conclusion, it is recommended among others, that policy makers, extension agents, NGOs and related organizations should consider the use of social organizations in group education of farmers.

**Keywords:** Influence; institutional factors; attitude; herbicide use and farmers; Nigeria.

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## 1. INTRODUCTION

New production technologies designed to revamp the agricultural sector and boost agricultural production have led to marked increase in crop yields. Problems of food production and distribution have been elaborately analyzed with a variety of policy recommendations, among which is the use of agrochemicals not only to increase food production but to reduce food waste and hopefully enhance farmers' income. The conventional methods of raising farm productivity since the World War II have centered on employing the use of externally acquired inputs like fertilizers and protection chemicals among others [1].

Agrochemical (or agrichemical), a contraction of agricultural chemical, is a generic term for the various chemical products used in agriculture. Agrochemicals are important agricultural inputs to protect crops from diseases, pests and weeds. The uses of agrochemicals contribute not only to healthy growth of crops and animals but also to improve farm work efficiency and stable supply of good agricultural produce. Although many kinds of chemicals are used in agriculture, they can be categorized into simple groups according to the functions they perform. These include insecticides, herbicides, fungicides, molluscicides, and rodenticides etc. [2,3].

According to [4] herbicides, also commonly known as weed killers, are pesticides used to kill unwanted plants. In a similar way to tractors, ploughs and other implements, herbicides have now become an integral part of the complex word of technical inputs required for modern agricultural production [5,3]. For several years humans have utilized herbicides to protect their crops [6,7] from damages caused by weeds leading to an increase of land area under cultivation by farmers, saving high cost of manual weed control thus reducing farming work load. In Nigeria herbicides have since been effectively used to control weeds in agricultural systems [8,9].

The [10] has estimated pre-harvest crop losses due to weed infestation, plant diseases and arthropods (largely insects and termites) to be around 30 to 35%, and post-harvest losses (grain storage, etc.) at an additional 10 – 20%. Thus, chemical weed control has become an increasingly necessary operation in the

consistent and economic production of crops [3,11,12].

With benefits of herbicide control ranking high, negative effects on the environment and human health generated mainly by lack of knowledge and negative attitude regarding safety parameters on the part of users have made herbicide use in agriculture one of today's most controversial issues [7]. During the past four decades, a large number of herbicides have been introduced as pre and post-emergent weed killers in many countries of the world. In Nigeria, herbicides have since effectively been used to control weeds in agricultural systems [8,9]. As farmers continue to realize the usefulness of herbicides, larger quantities are applied to the soil. But the fate of these compounds in the soils is becoming increasingly important since they could be leached; in which case groundwater is contaminated or immobile, and persists on the top soil [13]. These herbicides could then accumulate to toxic levels in the soil and become harmful to micro-organisms, plant, wildlife and man [14]. There is an increasing concern that herbicides not only affect the target organisms (weeds) but also the microbial communities present in soils, and these non-target effects may reduce the performance of important soil functions. These critical soil functions include organic matter degradation, the nitrogen cycle and methane oxidation [15].

## 2. PURPOSE OF THE STUDY

The purpose of the study was to determine the influence of institutional factors and attitude on the use of herbicides by farmers in Edo State, Nigeria. Specifically, the study sought to:

1. Describe respondents' institutional characteristics; and
2. Assess farmers' attitude towards the use of herbicides.

The hypothesis for the study was that there is no significant influence of farmers' institutional factors on their knowledge score on herbicide use.

## 3. METHODOLOGY

The population for the study comprised all farmers in Edo State, Nigeria. Multistage sampling technique was used in selecting

respondents for this study. Three (3) agricultural zones which make up the state were selected in the first stage. In the second stage, two (2) blocks were purposively selected from each zone based on the presence of farmers using herbicides. In the third stage, two (2) circles were selected from each block giving a total of four (4) circles per zone and a total of twelve (12) circles. In the fourth stage, a list of farmers who use herbicides was compiled. From the list, ten (10) farmers were randomly selected from each circle. Thus the total sample size for the study was one hundred and twenty (120) respondents.

Data for the study were collected using interview schedule. Institutional factors were measured as follows: membership of social organization, access to credit, sources of credit, institutional credit sources, non-institutional credit sources, extension contact, secondary occupation and training on herbicide use.

To assess the attitude of respondents regarding herbicide use, respondents were required to respond to statements under the following subject matter: harm herbicide can cause, importance of knowledge regarding herbicide, protection and prevention. Each item was assessed using a five point Likert-type scale, of strongly agreed (5), agreed (4), undecided (3), disagreed (2), and strongly disagreed (1). The values were summed up to get 15 which were divided by 5 to obtain a mean score of 3. Positive attitude statements with mean  $\geq 3$  were regarded as positive attitude while those with a mean  $< 3$  were regarded as negative attitude. Furthermore, negative attitude statements with mean  $\leq 3$  were regarded as positive attitude while those with a mean  $> 3$  were regarded as negative attitude of respondents.

Percentage, mean statistic and standard deviation were used in the analysis and presentation of the data. Hypothesis for the study were analyzed using multinomial logistic regression. Chi-square test was used to test the overall model for goodness of fit-test. The level of significance that was used for the hypothesis was  $p \leq 0.05$ . Maximum likelihood estimation was used to predict the odd ratio for the dependent variable using log likelihood function =  $L = \text{Log}(L^*) = \text{Log}\{\pi_1(1-\pi_1)\} = \text{Log}\pi_1 + \text{Log}(1-\pi_1)$ . The Statistical Product and Service Solutions (SPSS) Version 16 software package was used for analysis.

## 4. RESULTS AND DISCUSSION

### 4.1 Institutional Characteristics of Respondents

As seen in Table 1, majority (90.8%) of the respondents were members of different organizations while 9.2% belonged to no organization at all. On the type of organization belonged to, a greater proportion (50.8%) belonged to thrift (*isusu*) society, while 21.7% belonged to cooperative society. Similarly, 10.0% and 8.3% were members of men/women religious group, and social club respectively. Social affiliation/relationship is characteristic of rural communities; this is an avenue of interaction and obtaining information on events in their locality. This finding on membership organization is in line with [16] who stated that rural dwellers belong to organizations that would help them in satisfying their innate need for belonging and affiliations that would assist them in solving their problems through collective efforts. By implication, information on herbicide use can be disseminated to the farmers through these organizations and this perhaps has a multiplier effect.

Indications from respondents on Table 1 showed that 65.8% had access to credit while the remaining 34.2% do not have access to credit. This implies that majority of farmers in the study area had access to credit. Access to credit is necessary for effective use of herbicide; this is because limited or unavailability of credit could be a limitation to the practices in the use of herbicides as the use of herbicide comes at a cost.

Of the 65.8% that had access to credit, 39.2% sourced credit through non-institutional sources, while 26.7% asserted that they got credit through institutional sources. This could be because of low collateral requirements in assessing credit through non-institutional credit sources.

About 13.3% of the respondents' institutional sources of credit were through Microfinance banks, while 11.7% was through agricultural banks. This could be attributed to the presence of a good number of farmer friendly microfinance institutions in the State.

Among the respondents' who sourced credit from non-institutional sources 29.2% was through thrift society, while personal savings, money lenders

and NGOs accounted for 5.0%, 4.2% and 0.8% respectively. Thrift society was preferred probably because of little or no interest rates and collateral requirements in securing non-institutional credit.

**Table 1. Distribution of respondents according to institutional characteristics**

<b>Institutional characteristics</b>	<b>Percentage (n=120)</b>	<b>Mean (X̄)</b>
<b>Membership of social organization</b>		
Yes	90.8	
No	9.2	
<b>Type of social organization belonged to</b>		
Men/women religious group	10.0	
Thrift society	50.8	
Cooperative society	21.7	
Social club	8.3	
<b>Access to credit</b>		
Yes	65.8	
No	34.2	
<b>Sources of credit</b>		
Commercial bank	1.7	
Microfinance bank	13.3	
Agricultural bank	11.7	
Thrift society	29.2	
Money lenders	4.2	
Non-Governmental Organizations	0.8	
Personal savings	5.0	
<b>Extension contact</b>		
Yes	69.2	
No	30.8	
<b>Number of extension contact in the last one year</b>		
1 – 5	8.4	9
6 – 10	12.5	
11 – 15	44.1	
15 and above	4.2	
<b>Secondary occupation</b>		
Trading	49.2	
Civil/Public Service	21.7	
Artisanship	29.2	
<b>Training on herbicide use</b>		
Yes	60.0	
No	40.0	
<b>Number of times trained</b>		
Once	21.7	
2 – 4 times	30.8	
More than 4 times	7.5	

Findings in the study as presented on Table 1 further revealed that 69.2% of the respondents

reported having contact with extension agents in the last one year, while the remaining 30.8% have not been contacted by extension agents in the last one year. On the number of extension contact, 44.1% of the respondents had 11 – 20 contacts per year, while the remaining 12.5%, 8.4% and 4.2% had 5 – 10, less than 5 and more than 20 contacts in the last one year. The average contact period of extension agents was about 9 times per year. These contacts can be considered as not very low. This is contrary to the Food and Agriculture Organization (FAO) recommendation that farmers are expected to receive at least one extension visit every week during a farming season, which translates to a minimum of 15 extension contacts in a farming season [17]. [18] found that farmers who had access to extension contact adopted new farming technologies more often than farmers who had no access to extension contact. This implies that exposure to extension service could influence the knowledge, attitude and practices of farmers with regards herbicide use.

Findings from the study further shows that about 49.2% of the respondents were engaged in trading as their secondary occupation. This implies that aside farming; the respondents sought other means to make ends meet. Diversification of sources of income by farmers according to [16] helps them to earn ready cash income during slack season in the farming calendar.

On training received in relation to herbicide use, results on Table 1 reveal that majority (60%) of the respondents had training of herbicide use. 30.8% indicated they have had training 2 – 4 times, 21.7% indicated having training once while 7.5% have had the training more than 4 times. This implies that majority of the respondents' knowledge on herbicide use probably were from information received from the training they had on herbicide use. Training on herbicide use and related issues have the potential to significantly increase and sustain high knowledge, positive attitude and improved practices in the use of herbicides. Proper and timely training help farmers to adopt best practices throughout the world despite difficult conditions and the relative lack of resources. Hence the need for national government and civil society organizations (e.g. NGO's) to significantly increase their funding of agricultural extension outreach, training and demonstration services that are focused on sustainable farming practices [19].

#### 4.2 Attitude of Farmers in their Use of Herbicides

Data in Table 2 indicate that farmers in the study area were concerned about the harm herbicides can cause to their children ( $\bar{X} = 4.39$ ). Others include: harm herbicides can cause the consumers and some forms of dangerous herbicides should be banned ( $\bar{X} = 4.29$ ), other weed pest control should be considered ( $\bar{X} = 3.78$ ) and concerns about the harm herbicides can cause the environment ( $\bar{X} = 3.70$ ). Furthermore, respondents cared if herbicide had negative effect on people ( $\bar{X} = 1.78$ ) and decided not to use strong herbicides because it is dangerous to their health ( $\bar{X} = 1.75$ ).

By implication it means respondents care about the effects that herbicides cause to consumers, the environment as such are of the view that dangerous herbicides should be banned and other forms of weed pest control should be considered. This is healthy as those who reside in the study area aside the respondents and their households stand less risk of direct or indirect effects of herbicide use by the farmers.

Table 2 further asserts that respondents had positive attitudes as they decidedly agreed on the importance of knowing the herbicide they are using ( $\bar{X} = 4.29$ ), the signs and symptoms of herbicide poisoning ( $\bar{X} = 4.26$ ), treatment in the advent of herbicide poisoning ( $\bar{X} = 4.12$ ) and not applying herbicides during windy weather ( $\bar{X} = 3.98$ ).

On respondents' attitudes regarding protection and prevention on herbicide use; herbicides should always be kept in areas which are out of reach of children and animals ( $\bar{X} = 4.52$ ), not smoking while using herbicides ( $\bar{X} = 4.32$ ) and

the need to spend time and money to keep protective gear clean and in good condition ( $\bar{X} = 4.06$ ) were deemed critical because exposure to herbicide may cause chronic effects on health such as cancer, interference with the development of the foetus and child, disruption of the endocrine, immune and central nervous systems.

#### 4.3 Institutional Factors Influencing Farmers' Knowledge on Herbicide Use

Results from the multinomial logistic regression analysis on the influence of institutional factors on knowledge of farmers on herbicide use are presented in Table 3.

Variables that had significant influence on knowledge score were; extension contact ( $X^2 = 75.49$ ;  $p = 0.00$ ), access to credit ( $X^2 = 34.03$ ;  $p = 0.00$ ), membership of social organization ( $X^2 = 69.18$ ;  $p = 0.00$ ), training on herbicide ( $X^2 = 34.21$ ;  $p = 0.00$ ) and number of times trained ( $X^2 = 32.30$ ;  $p = 0.00$ ). This result connotes that increases in the magnitude of any of the above variables will lead to increase in the knowledge of farmers on herbicide use in the study area. Therefore, the null hypothesis was rejected for these variables.

From findings, respondents who had contact with extension agents, have more knowledge on herbicide related issues. This could be as a result of exchange of ideas between agents and farmers on herbicide use. Extension service in agriculture is indispensable and it offers more than just expert assistance in improvement of production and processing, it also enables flow of information and transfer of knowledge and scientific findings to practice [20].

**Table 2. Distribution of attitude of farmers in their use of herbicides**

Attitude questions	Mean( $\bar{X}$ )	Std. dev.
<b>Harm herbicide can cause</b>		
I'm concerned about the harm herbicides can cause the environment.	3.70	1.13
I'm concerned about the harm herbicides can cause the consumers.	4.29	0.67
I'm concerned about the harm herbicides can cause my children.	4.39	0.60
Some forms of dangerous herbicide should be banned.	4.29	0.70
Other forms of pest control should be considered.	3.78	0.85
I don't care if people can be affected for as long as I earn money.	1.78	0.83
I have to use strong herbicides even if it is dangerous for my health.	1.75	0.80

Attitude questions	Mean( $\bar{x}$ )	Std. dev.
<b>Importance of knowledge regarding herbicide</b>		
It is important to know the herbicide I'm using.	4.29	0.53
All farmers should know the signs and symptoms of herbicide poisoning.	4.26	0.53
All farmers should know the treatment to herbicide poisoning.	4.12	0.75
I should never apply herbicide during windy weather.	3.98	0.78
<b>Protection and prevention</b>		
Herbicides should always be kept in areas which are out of reach of children and animals.	4.52	0.61
I can leave the sprayer anywhere I like.	2.01	1.05
I should always use protective gear while applying Herbicide.	3.88	0.80
The cost of risk of herbicide poisoning outweighs the cost of buying protective gear.	3.95	0.97
It is worthwhile to spend time and money to keep protective gear clean and in good condition.	4.06	0.60
I should never smoke while applying herbicides.	4.32	0.69
There is no excuse for not using protective gear while applying herbicides.	3.90	0.93

**Table 3. Institutional factors influence on knowledge score of farmers on herbicide use**

Effect	Model fitting criteria	Likelihood ratio tests	
	-2 log likelihood of reduced model	Chi-square ( $X^2$ )	Sig. (p-value)
Intercept	253.018	49.78	0.00
Extension contact	2.787E2 <sup>a</sup>	75.49	0.00
Access to credit	2.373E2 <sup>a</sup>	34.03	0.00
Membership of social organization	2.724E2 <sup>a</sup>	69.18	0.00
Training on herbicide	2.374E2 <sup>a</sup>	34.21	0.00
Number of times trained	2.355E2 <sup>a</sup>	32.30	0.00

Intercept only = 524.492; Final -2 Log Likelihood = 203.234;  $X^2 = 321.258$ ;  $p \leq 0.05$

## 5. CONCLUSION AND RECOMMENDATION

Based on the findings, the following conclusion was deduced that the attitude of the respondents was good but need to be sustained and improved through continuous training and extension contact with farmers.

From the aforementioned, the study recommends:

1. Government and stakeholders in agriculture in Edo State, Nigeria should organize training programmes to further enhance farmer's attitude in the use herbicides [basic objectives of education are to ensure that farmers understand the health hazards of relevant pesticides, use protective equipment properly, practice personal hygiene measures, become familiar with and adopt proper work practices, recognize early symptoms of overexposure to pesticides, and obtain first aid at the earliest time possible].

2. Policy makers, extension agents, NGOs and related organizations should consider the use of social organizations in group education of farmers. The implication is that information on herbicide use can be disseminated to farmers through these organizations and this perhaps has a multiplier effect.
3. The use of agrochemicals can be minimized through an integrated pest management including continuous monitoring of adversities such as weeds, pests and diseases.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

## REFERENCES

1. Avav T, Oluwatayo JI. Environmental and health impact of pesticides. Jolytta Publications, Makurdi; 2006.

2. Ayoola GB. The marketing of agricultural pesticides in Nigeria. National workshop on the pesticides industry in Nigeria. University of Ibadan, Publication No. 11; 1990.
3. Kughur PG. The effects of herbicides on crop production and environment in Makurdi Local Government Area of Benue State, Nigeria. *Journal of Sustainable Development in Africa*. 2012;14(4).
4. Kellogg RL, Nehring R, Grube A, Goss DW, Plotkin S. Environmental indicators of pesticide leaching and runoff from farm fields. United States Department of Agriculture Natural Resources Conservation Service; 2000.
5. Lever GB. *Crop Production Chemicals*. E. Horward Ltd, England; 1990.
6. Gale E. Peterson The discovery and development of 2,4-D. *Agricultural History*. 1967;41(3):243–254.
7. Miller GT. *Living in the environment*. (12<sup>th</sup> Ed.). Praeger Publishers, London; 2002.
8. Adenikinju SA, Folarin JO. Weed control in coffee in Nigeria with gramozone prod. Sixth annual Conf. Weed sci. Six Nigeria. 1976;1-8.
9. Ogundero VW, Sebiomo A, Bankole SA. Effect of four herbicides on microbial population, soil organic matter and dehydrogenase activity. *African Journal of Biotechnology*. 2011;10(5):770-778,31.
10. Food and Agriculture Organization. Food and Agriculture Organization of United Nations Committee on Agriculture Survey Sessions. 1993;77:9-13.
11. Gianessi LP. The increasing importance of herbicides in worldwide crop production. *Pest Management Science*. 2013;69:1099-1105.
12. Kisamo D, Mndeme R. The impact of agrochemicals in production and protection. *Africa Newsletter on Occupational Health and Safety*. 2002;12:17-20.
13. Ayansina ADV, Ogunshe AAO, Fagade OE. Environment impact assessment and microbiologist: An overview. Proceedings of 11<sup>th</sup> Annual National Conference of Environment and Behaviour Association of Nigeria (EBAN). 2003;26-27.
14. Amakiri M.A. Microbial degradation of soil applied herbicides. *Nig. J. Microb.* 1982;2: 17-21.
15. Hutsch BW. Methane oxidation in non-flooded soils as affected by crop production. Invited paper. *Eur. J. Agron.* 2001;14:237-260.
16. Ekong EE. *Introduction to Rural Sociology* 3<sup>rd</sup> Ed. Uyo: Dove Educational Publishers; 2010.
17. Idrisa YL, Ogunbameru BO, Ibrahim AA, Bawa DB. Analysis of awareness and adaptation to climate change among farmers in the Sahel Savannah agro-ecological zone of Borno State, Nigeria. *British Journal of Environment & Climate Change*. 2012;2(2):216-226.
18. Onu DO. Socio-economic factors influencing farmers' adoption of alley farming technology under intensified agriculture in Imo State, Nigeria. *The Philippine Agricultural Scientist*. 2006;89(2):45-52.
19. Binns P. Opportunities and challenges facing farmers in transitioning to a green economy agriculture practice. UNEP Environmental Paper Discussion. 2012;5.
20. Zivkovic D, Jelic S, Rajic Z. Agricultural extension service in the function of rural development. 113<sup>th</sup> EAAE Seminar "The Role of Knowledge, Innovation and Human Capital in Multifunctional Agriculture and Territorial Rural Development", Belgrade, Republic of Serbia December. 2009;9-11.

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