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Preliminary Studies on Herbicide Usage in Sissala West District Area of Upper West, Ghana

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ABSTRACT

Herbicides are integral components of integrated weed management which is a crucial factor in a worldwide increase in agricultural production. Farmer's knowledge and participation in herbicide usage is very important. The purpose of this study was to assess farmer's knowledge and usage of herbicides. The study was conducted in the Sissala District of the Upper West Region of Ghana. The farmers grow crops like maize, vegetables, yam and use herbicides to control weeds that attack these crops. Farmers' knowledge and attitude towards the usage of herbicides were investigated based on the use of questionnaires and interviews. Questionnaire items included demographic characteristics of farmers, crops cultivated, types and sources of herbicides, use of protective clothing and post-application handling of herbicides. The study revealed that each farmer used either pre-emergence or post-emergence herbicides to control weeds. Herbicides mostly used by farmers include Glyphosate, Paraquat, Atrazine and Pendimenthalin. About 50% of the farmers had to cover quite a distances (5-8Km) to have access to herbicides and other agro-chemicals. About 60% of the farmers had no formal education and with limited knowledge on application of herbicides; thus obtained such information from input dealers or other farmers. About 96% of farmers did not use any protective clothing during application of herbicides; and their reasons being high cost of such items, lack of education and heat stress. Eighty-six percent (86%) of farmers dispose of herbicide containers by leaving them on the farm or any available space. Left-over herbicides were poured on the farm (61%), stored for reuse (32%) or used for other purposes (7%). Farmers showed little knowledge with regards to herbicide application and safety measures. Farmers need to be educated on integrated weed management, appropriate handling of herbicides and formulation, use of protective clothing and proper disposal of left-over herbicides.

INTRODUCTION

Weeds are the most universal of all crop pests, proliferating each year on every farm in Africa (Obuo *et al.*, 1997). A review of crop pests in Sub-Saharan Africa indicated that weeds are the most important pest to control in all zones studied (Sibuga, 1997). Losses in crops caused by uncontrolled weeds exceed $7.5 million annually (Loux and Stachler, 2005). Worldwide, 10% loss of agricultural production may be attributed to the competitive effect of weeds and it is considered

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that the loss due to weed is 7% in Europe, but 16% in Africa (Broadbent, 1978). Carson and Atchule (1978) also estimated that 43.9% of fruit and vegetable crops were lost to weed competition in the Northern Region of Ghana. The use of chemicals for the control of weeds offers the greatest possibilities for weed control and research has shown that herbicides produce greater yield at less cost than the typical practice of hand weeding (Chikoye *et al.,* 2007). The use of herbicides to remove weeds required only 2 hours of labor per hectare (Gouse *et al.*, 2006) compared to 30-90 hours per hectare required with hand weeding to remove weeds before planting (Kienzie, 2002). Ogungbile and Lagoke (1986) demonstrated that the use of herbicides reduced the need for labour at the peak period by 29-42%. Acreages of crops under herbicide application have increased steadily from less than one million hectares in the early 1970s up to more than 60 million hectares in 2000 (Zhang, 2001).

Aside the numerous benefits derived from herbicide usage in controlling weeds, their excessive, ecological unfriendly and inappropriate use have created side effects such as resistance to pesticides, outbreak of new or secondary pests, toxicity, poisoning, causing cancers and genetic disorders (Shadnia *et al*., 2007; Soltaninejad *et al*., 2007; Heidari, 2010). Macauley *et al*. (2006) estimated that each year, 3 million workers in agriculture in the developing world experience severe poisoning from pesticides, with about 18, 000 of them losing their lives. In addition to the problem of pesticides resistance, millions of dollars' worth of crops have been lost as a result of improper pesticide application (Pimentel and Pimentel, 2005). According to Makanganise *et al*. (1999), lack of knowledge is the most limiting factor in the adoption of herbicide technology. The greatest obstacle between herbicide technology and African farmers is lack of awareness and training. The objective of this study was to assess farmer's knowledge on herbicide application and safety measures.

MATERIALS AND METHODS

Study Area

The study was conducted in the Sissala West District of the Upper West Region, Ghana. The District shares boundaries with Langbushie/Kani district to the West, Sissala East District to the East, Burkina Faso to the North and Wa West district to the South. It covers a total land area of 411,289km^2 which is about 25% of the tatal land mass of Upper West region. It has a population of 5,186 people based on the 2010 population and housing census.

Rainfall pattern is unimodal with annual rainfall between 1,000 and 1,200mm. The wet season begins in July and ends in October. The mean annual temperature and relative humidity lies in the ranges of 26 - 30^{0}C and 70-90% respectively. The vegetation of the study area is predominantly grassland with few scattered drought resistant trees such as shea (*Vitellaria paradoxa*) and dawadawa (*Parkia biglobosa*). The common grasses found in the area include Northern gamba grass (*Adrpogon gayanus*), Spear grass *(Imperata cylindrical*) and Bahamma grass (*Cynadom*

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dactlon). The soil type is laterite and with some hydrated ions. The texture is clay loam and sandy loam.

The area is dominated by Sissalas among other tribes like Dagaabas and Kasinas. The main occupation in the area is farming. Crops such as tomatoes, garden eggs, pepper, maize, groundnut, soybean, yam and animals such as cattle, sheep, goat and poultry are mostly grown and reared in the district.

Data collection

Questionnaire Administration

Questionnaires were administered randomly in ten communities namely: Gwollu, Zini, Jawia, Sorbelle, Bouti, Kwalla, Gball, Fatchu, Puzene and Nemora. Farmers were selected based on farmers who use herbicide with the help of extension officers. In each community, five (5) respondents were selected using systematic Sampling technique (SST) to obtain a sample size of fifty (50) respondents. Secondary data and other relevant information were obtained from Ministry of food and Agriculture (MoFA) and the district assembly. The Questionnaire covered areas like age, educational background, type of herbicide used, use of protective clothing, distance covered for herbicide acquisition and disposal of left over herbicides.

Data Analysis

The data obtained from the questionnaire was analyzed with the version 10 of the SPSS programme.

RESULTS AND DISCUSSION

Background of respondents

Herbicide use was high (88%) among farmers aged 18-45 years (Table 1). This was an indication that most of the farmers are youth and the communities have a very high labor force. It was realized in the course of the interview that average agricultural experience among respondents was 15 years which is an indication that the farmers have some experience in agriculture and are not entirely new to the enterprise. Majority (90%) of the respondents were males (Table 1). This could be attributed to the fact that farms are owned by men and women by virtue of their positions and roles in the households. A larger (60%) percentage of the respondents had no formal education (Table 1). Considering the high illiteracy rate among herbicide users, it is obvious that rate, time and method of application may not meet the required specification as most farmers cannot read labels on the herbicide containers that gives recommended dosage and precautions. In the course of the face-to-face interview, it was realized that most of the farmers were indulged in serious malpractices in pesticide application such as wrong use of nozzles, mixing together of different classes of herbicides, inability to distinguish one herbicide from the other especially if containers are similar, use of wrong formulations and doses, wrong timing of application and lack of knowledge on the time needed for degradation of herbicides. Asogwa (2008) reported similar problems in a study conducted.

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Table 1: Demographic characteristics of respondents

Factors	Categories	Frequency	Percentage (%)
Age (yrs)	18-30	9	18
	31-45	35	70
	46+	6	2
Sex	Male	45	90
	Female	5	10
Education	No formal education	30	60
	Primary	13	26
	Secondary	4	8
	Tertiary	3	6

Farming practices of respondents

Majority (58%) of the respondents used hand weeding during land preparation (Table 2). This is in agreement with Vissoh *et al*. (2004) who reported that hand weeding is the predominant weed control practice on smallholder farms. Adolfsson (1999) also reported that in Africa, 80% of the cultivated land is currently prepared by hand; 16% by animal draught power and only 4% with mechanical power. Most (88%) of the respondents are small holder farmers (1-2 acres, 3-5acres and 6-8acres) which confirms Asuming-Brempong *et al*.'s (2004) report that in Ghana smallholdings are considered to constitute 90–95 percent of farms. Types of crops mainly grown by respondents are cereals (36%), (22%), root and tuber (8%) and vegetables (14). Twenty percent (20%) of the respondents are into mixed farming.

Table 2: Farming practices of respondents

Factors	Categories	Frequency	Percentage (%)
Farm size	1-2 acres	14	28
	3-5 acres	15	30
	6-8acres	15	30
	9 or more acres	6	12
Land preparation	Tractor usage	7	14
	Hand weeding	29	58
	Herbicide usage	14	28
Types of crops	Cereal	18	36
	Legume	11	22
	Root and tuber	4	8
	Vegetables	7	14
	Mixed farming	10	20

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Herbicide access and usage

Majority (70%) of the respondents used both selective and non-selective herbicides (Table 3). It was realized in the course of the interview that some respondents combine selective and non-selective herbicides. This is a dangerous practice because active ingredients of some of the selective and non-selective are incompatible. The study revealed that the majority (98%) of the respondents used knapsack sprayer as a means of herbicide application (Table 3). Most of the farmers agreed to the fact that they do not have knowledge on different types of knapsack sprayers and the nozzle type to use when applying either insecticide or herbicides. According to NRC (2009) lightweight herbicide sprayer would benefit farmers and transform agriculture in Sub- Sahara Africa (NRC, 2009).
A sizeable percentage (50%) of the respondents had to travel quite a distance (4-6Km and 6-8km) to purchase herbicides (Table 3). The distance travelled by farmers to acquire herbicide will have negative influence on the right type of herbicide to use in every weed control methods. Using the right type of herbicide will influence efficient use of herbicides which can improve the economic returns of smallholder farms (Kibata *et al.*, 2002) because crop loss due to weed competition will reduce hence increase in yield.

Table 3: Herbicide acquisition and usage by Farmers

Factors	Categories	Frequency	Percentage (%)
Type of herbicide	Selective herbicide	7	14
	Non-selective herbicide	8	16
	Selective and non-selective	35	70
Distance for acquisition	0-2KM	10	20
	Above 2-4KM	15	30
	Above4-6KM	10	20
	Above 6-8KM	15	30
Usage period	Land preparation	14	28
	Before planting	8	16
	Immediately after planting	10	20
	During crop growth	18	36
	Occasionally	-	-
Herbicide application	Knapsack usage	49	98
	Motorized sprayer	1	2
Frequency of application	Once	41	82
	Twice	9	18

Farmers' knowledge and experience of herbicide usage

Most of the farmers (94%) applied herbicides without protective clothing's with reasons being lack of education, high temperature and humidity in the region, unavailability and high cost.

Most of the respondents (82%) rinsed their empty container only once before disposal and some even did not wash the knapsack after usage (Table 4). This is

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because they lack knowledge on how to use this equipment for spraying. It is recommended that Pesticide containers be triple rinsed before disposal and each rinse solution (rinsate) be poured into the spray tank mixture and use the product according to the label. This method reduces the potential for environmental damage by converting these containers from hazardous waste to solid waste. Also, triple rinsing ensures that all the pesticide product is incorporated into the tank mixture so that applicators get their money's worth. According to Arnold (1991), concentrated pesticide residue that leaks from unrinsed or discarded containers can cause significant environmental contamination. This practice by the farmer can be attributed to the high illiteracy rate because education of the respondents also plays a significant role in the acquisition and use of information, hence technology adoption.

Majority (61%) of respondents poured away left-over herbicides on the ground while 32% store left-over's (Table 4). Storage of left-over herbicide could pose danger as it could be mistaken as a drink and can cause poisoning and death. According to Eidth (2007), about 25 million workers in developing countries suffer mild pesticide poisoning.

Ideally, the need to dispose excess pesticides can be eliminated by educating farmers in planning the job and buying only the amount of product needed and also manufacturers packaging them into smaller quantities since most of the farms are small-holdings.

Most of the respondents (94%) did not use Protective clothing when applying herbicides (Table 4). The reasons given by respondents for not wearing them included discomfort, particularly while working in hot weather which occurred frequently in this region; unavailability and high cost of protective clothing's. Also, it was realized in the face-to face interview that the few (6%) respondents who owned protective clothing's used them improperly.

Seventy-eight percent of the respondents (Table 4) never experienced sym46ptoms during or after herbicide application. However, 22% of them often had headaches, fatigue, dizziness, loss of appetite with nausea, stomach cramps, tearing, and throat irritation. Farmers assumed that such symptoms were normal with herbicide application, so they ignored them.

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Table 4: Knowledge on application and safety measures

Factors	Category	Freq.	Percentage (%)
Source of information on application	Container	5	10
	Colleagues	32	64
	Extension staff	4	8
	Input dealers	9	18
Knowledge on protective clothing	Yes	46	92
	No	4	8
Usage of protective clothing	Yes	3	6
	No	47	94
Handling of left over chemical	Pour away	31	62
	Kept for next use	3	6
	Other purpose	16	32
Number of times empty containers are rinsed	None	5	10
	Once	41	82
	Twice	4	8
	Thrice	0	-
Health-related problems after application	Headaches	2	4
	Itching eye	5	10
	Stomach aches	-	-
	Dizziness	1	2
	Nausea	3	6
	No symptoms	39	78

CONCLUSION

From the study, farmers' knowledge regarding herbicide usage, safety and application techniques was inadequate. The problem of the farmer's health should be an important concern to the country hence farmers should be properly educated. Educational programs should be organized for farmers on how to adopt Integrated Pest Management and the benefit of taken preventive measures on the farm so that they can remain healthy and to produce in accordance to the new European Union (EU) Legislation on Maximum Residue Levels (MRLs) allowed in agricultural produce. There is also the need to train extension workers on herbicide technology because agricultural extension services play a pivotal role in ensuring that the clientele (farmers) have access to improved and proven technologies and that their concerns and needs are properly addressed by relevant service providers who would in turn train the farmers. There is also a need to develop extension materials for farmers. If the smallholder farmers are given technical support, they would take advantage of herbicide technology and improve crop production.

There should be legislation to promote safer use of herbicides like use of protective clothing's and proper disposal of left over herbicides and containers. Continuous risk communications are necessary to continuously decrease farmer risk of herbicides exposure and increase awareness of health effects. Finally, a joint pesticide monitoring and regulatory task force should be set up to enforce the removal of all banned chemicals from circulation.

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REFERENCES

Adolfsson, N. (1999). *Appropriate Technologies in Sub-Saharan Africa: The Transition of Cultivation Techniques*. Swedish University of Agricultural Sciences.incomplete

Asogwa, E. U. (2006). Preview of rational pesticide use protocols. Extracts from round table discussions at the NCDC-sponsored farmers field school master trainers and supervisors training workshop. CRIN Ibadan, June 5 – 16, 2006. 12pp.

Asogwa E. U. (2008). Crop protection practices for cashew and cocoa production in Nigeria. Paper presented at the National Training Workshop for Farmers Development Union (FADU) Officials on Cocoa and Cashew Production in Nigeria. Ibadan, May 8-9, 2008. 43 slides.

Asuming-Brempong, S, Al-Hassan, R., Sarpong, B.D., Kwadzo, G., Akoena, K. K. S., Sakyi-Dawson, O., Mensah-Bonsu, A., Amegashie, P. K. D., Egyir, I. and Ashley. S. (2004). Poverty and Social Impact Analysis (PSIA) Studies for Ghana: Final Report submitted to the National Development Planning Commission (NDPC)/ Ministry of Food and Agriculture (MoFA), and DFID, Ghana, submitted in June 2004 by the Department of Agricultural Economics & Agribusiness, University of Ghana and Department of Economics, University of Ghana with technical support from The IDL Group, U.K.

Broadbent, I. (1998). Crop protection-its role in production. Section M (Agriculture). pp 26.

Carson, A.G. and Atchule, J. (1978). Weed control in Ghana. In Proc. Of IITA conf. on weeds and their control in humid and sub-humid tropics. Pages 150-158.

Chikoye, D., Udensi, E., Udensi, A., Fontem, L. and Friday, E. (2007b). Rimsulfuron for Post Emergence Weed Control in Corn in Humid Tropical Environments of Nigeria. *Weed Technology*. 21:977-981.

Eidith, C. (2007). The health dilemma of pesticide use in modern agriculture. Proceeding s the 25th biennial conference plenary presentation, Accra August, 2007.

Gouse, M., Jenifer, P. and Colin, T. (2006). Output and Labour Effects of GM Maize and Minimum Tillage in a Communal Area of Kwazulu-Natal. *Journal of Development Perspectives*, 2(2):71-86.

Heidari, A. 2010. Pesticide Use in Iran.*in* Conference of Half a Century of the Pesticide Usage in Iran, Tehran, Agricultural Research, Education and Extension Organization.

Kibata, G.N., Maina, J. M., Thuranira, E.G., Musembi, F.G., Nyanyu, G., Muthamia, J. G. J. N, Okuro, J. O., Mutura, I., Amboga, S., Micheni, A. N., Overfield, D. and Terry, P.J. (2002) Participatory Development of Weed

ISSN: 0855-6350

Management Strategies in Maize Based Cropping Systems in Kenya. *Thirteenth Australian Weeds Conference.* 343-344.

Kienzie, J. (2002). *Labour Saving Technologies and Practices for Farming and Household Activities in Eastern and Southern Africa*. South African Regional Poverty Network.
http://www.sarpn.org.za/mitigation_of_HIV_AIDS/m0012/index.php

Loux, M.M and Stachler, M.J. (2005). Weed control guide for Ohio and Indiana. Ohio State University Extension, Department of Horticulture and Crop Science. Bulletin 789,178.

Macauley, L.A., Anger,W.K. Keifer,M., Langley, R., Robson, M.G. and Rohlman, D. (2006). Studying health outcomes in farm worker. Macmillan, pp: 39.

Makanganise, A., Mabasa, S., Jasi, L. and Mangosho, E. (1999). Farmer participation and evaluation of their perceptions on integrated weed control methods with specific reference to herbicide technology in communal areas of Zimbabwe. *17th East African Biennial Weed Science Conference Proceedings.* Pp. 97-107.

NRC. (2009)**.** *Emerging Technologies to Benefit Farmers in Sub-Saharan Africa and South Asia*. National Academies Press. Washington, DC.

Oduwole, O.O. (2001). Sustainable cocoa production in Nigeria: Farmers perception characteristics and social economic factors in adoption decision. Proceedings of the 13th international cocoa research conf. incompletepp. 1147-1152.

Okuro, I. M., Amboga, S., Micheni, A.N., Mureithi, F., Overfield, D. and Terry, P. J. (2002). Participatory Development of Weed Management Strategies in Maize Based Cropping Systems in Kenya. *Thirteenth Australian Weeds Conference,* 343-344.

Obuo, J. E., Adipala, E. and Osiru, D. S. O. (1997). Weed Suppression in a Cowpea/Sorghum Intercrop. *16th East African Biennial Weed Science Conference Proceedings*. 113-118.

Ogungbile, A. O. and Lagoke, S.T.O. (1986). On-farm Evaluation of the Economics of Chemical Weed Control in Oxen-mechanized Maize Production in Nigerian Savanna. *Tropical Pest Management*. 32(4):269-273.

Pimentel, D. and Pimentel, M. (2005). Food, Energy and Society. Edward Arnold ltd. London, pp: 165.

Poston, F.L., Pedego, L. P. and Welch, S.W. (2003). Economic injury levels: reality & Practicality. Bull. Entomol. Soc. Ann.volume number, pp: 49

ISSN: 0855-6350

Shadnia, S., H. Esmaily, G. Sasanian, A. Pajoumand, H. Hassanian-Moghaddam, and M. Abdollahi. 2007. Pattern of acute poisoning in Tehran-Iran in 2003. Human and Experimental Toxicology 26:753-756.

Sibuga, K.P. (1997). Weed management in Eastern and Southern Africa: Challenges for the 21st century. *16th East African Biennial Weed Science Conference Proceedings*. ??5-

Soltaninejad, K., M. Faryadi, and F. Sardari. 2007. Acute pesticide poisoning related deaths in Tehran during the period 2003-2004. Journal of Forensic and Legal Medicine 14:352-354.

Zhang, Z.P. (2001). Agricultual weeding in conjunction with herbicide application in rice. In: proceedings of the 18th Asian-Pacific Weed Science Society Conference (Beijing, China, 28thMay-2nd June 2001). China, Beijing, 211-214.

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