DOI: 10.21276/haya.2016.1.3.4

Haya: The Saudi Journal of Life Sciences **ISSN 2415-623X (Print)**
Scholars Middle East Publishers **ISSN 2415-6221 (Online)**
Dubai, United Arab Emirates
Website: http://scholarsmepub.com/

Research Article

Assessments of Pesticide Use and Practice in Bule Hora Districts of Ethiopia

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Abstract: The actual situation in Ethiopian farmers is alarming and calls for an intensive work on assessing pesticide use and practice, educating the farmers on good pesticide managements; sensitize the local community about consequences in misuse of pesticides. In this study one of the largest Districts of Borena Zone in the Oromya region of Ethiopia was considered to survey the pesticide use and practice of farmers. Kebele based cross-sectional comparative study was conducted using self administered questionnaires. A total of 413 study units were involved in the survey with response rate of 98 %. About 82 % of the study participants use chemical pesticides at different levels. Among the farmers who take part in spray operation, 92.48 % worn any ordinary suit with old rubber shoes during spraying and formulation. Based on the survey 75.22 % of the respondents claimed illness after pesticide spraying. Communities should adopt no-pesticide policies and launch community education programs.
Keywords: Pesticides, assessment, protective devices.

INTRODUCTION

Man struggles to obtain adequate supplies of food against all the elements, including pests of various sorts which reduce the quantity and quality of output, by physical damage, disease, etc. Aside from pests interfering with production of food, pests cause damage by spreading disease and as nuisances by their mere presence where man does not want them [1]. As a result most agricultural production relies on the use of chemicals. Pesticides such as DDT are also commonly used in the health sector as vector control for mosquito. However, most of pesticides can have adverse effect on human beings, animals, plants and the environment [2].

A short history of pesticide use [3], describes that the use of chemicals to control insects possibly dates back to classical Greece and Rome. The Chinese were using chemical insecticides at least by the sixteenth century, like arsenic and nicotine [1]. Pesticide use in crop production has been suspected of being a major contribution to environmental pollution. There are widespread and growing concerns of pesticide over-use, relating to a number of dimensions such as contamination of ground water, surface water, soils and food, and the consequent impacts on wildlife and human health [4]. Insecticide choice in the developing world is often older, broad-spectrum compounds belonging to the organophosphate, organochlorine and carbamate classes chemical families noted for their acute toxicity [5]. The source of pesticide exposure could be their occupation as farmers, agricultural workers, sprayers, exterminators, formulators, or other jobs. It could be from potential pesticide exposures from living near farm, in an agricultural spray area, near a pesticide factory, or other environmental exposures and consuming pesticide contaminated food [6].

Good pesticide management practices could help to minimize the risks of pesticide poisoning and pollution of the environment. Some of the good management practices to consider when working with pesticide are: follow pesticide label directions, use protective devices, avoid spills, disposal of pesticide wastes and containers properly, elimination of unnecessary application and use of proper pesticide storage [7]. How many of the Ethiopian farmers are aware of the good pesticide management practices? Do they have awareness about health effects of various pesticides being utilized. To answer such questions one has to research out or evaluate pesticide use and practice in the country. It is unfortunate that there are very limited studies that address this subject in the country. For example in rift valley state farms such as Middle Awash and Upper Awash Agro Industry Enterprise are among the place where there was an intensive past history of pesticide application [2, 8]. Study conducted on 420 farmers selected from 23 villages in Ziway and Arsi Negele Districts of Ethiopia indicated that 94.3 % of the farmers used pesticides as part of their agriculture input [7]. In 2009 a survey was made, on 226 farmers in other parts of the contry, (Sidama zone,) on the practice and risk associated with the utilization of pesticide in the zone. The result of the

study showed that 174 (77 %) of the farmers use DDT for agriculture pest control [9].

Therefore, the actual situation in Ethiopian farmers is alarming and calls for an intensive work on assessing pesticide use and practice, educating the farmers on good pesticide managements; sensitize the local community about consequences in misuse of pesticides. In this study one of the largest Districts of Borena Zone in the Oromya region of Ethiopia was considered to survey the pesticide use and practice of farmers. To our knowledge no study has been made to investigate the status of pesticide use and practice in the area. Therefore, this study is the first of its kind aimed to assess pesticide use and practice in the District.

METHODOLOGY

Study area

Bule Hora District is located in southern part of Ethiopia. It is bounded with Dugda Dawa District in the South, Amaro and Burdgi Districts in the West, Gedeb District of Gedeo Zone in North and Melka Soda District in the East. It has a distance of 470 Kilometers from Addis Ababa capital city of Ethiopia. The District has 45 rural Kebeles and 3 town Kebelels. In Bule Hora Woreda various food crops like maize, barely, wheat, teff and inset are cultivated, coffee and khat are also widely cultivated in the District as cash crops. Different agro- ecological zones in the District includes; Woina Dega 55 %, Dega 11 %, and Desert 34 % [10].

Study Population and Sample Size

The Source of population included farmers in Bule Hora District. The number of farmers to be included in the study (participants) was determined using single population proportion formula. Because similar studies were not found in the study area, taking the assumption that 50 % of the farmers had low level of knowledge regarding to good pesticides practice.

$n = \frac{(Z\alpha/2)^2 p(1-p)}{d^2}$ and the final sample size was 422.

Data collection tools

A structural questionnaire was used as data collection tool. The questionnaire was developed by referring different literatures and modified according to the objectives of this study. The questionnaire has four parts which enabled to collect information on general background to the household and farmers, pesticide practice, pesticide knowledge and perception and pesticide use and environmental effects. The questionnaire was first developed in English and it was translated in to local language (Oromifa) for data collection. Prior to data collection, the questionnaire was pre-tested on selected farmers in the study area which were not including in the main data collection. It was, therefore, check for its clarity and some corrections were made.

Sampling Procedures

Just before the sampling process, personnel's and extension workers in agricultural and rural development offices were interviewed. This is because the data source was considered to be important since there was no prior knowledge about particular Kebeles in which farmers are using pesticides. Among 45 rural Kebeles 25 Kebeles were selected based on the information received from the agricultural professionals in agricultural and rural office for the study. Kebele based cross-sectional comparative study was conducted using self administered questionnaires. Households also selected randomly from chosen Kebeles and the intended data was collected according to aim of the study.

Data analysis and treatment

Frequency and percentage were used to describe the profile of the respondents in terms of socio-demographic, educational and pesticide related factors. Results were presents using charts and graphs.

RESULTS AND DISCUSSION

Responses of agriculture Department experts

According to the experts from agricultural and rural development offices, pesticide handling is the responsibility of the farmers, the professionals and extension experts. However the involvement of the expert is most of the time in relation to the infestation of the crops by foreign plants or insect pests on a large scale. Thus, they confirmed that farmers are used different types of pesticide by themselves.

Socio-Demographic Characteristics

As it is illustrated in the table 3.1, a total of 413 study units were involved in the survey with response rate of 98%. The mean age of study participants was 43.5 with minimum of 15 years and maximum of 70 years. 351 (85 %) were male, 62 (15 %) were female and 396 (96 %) of the study participants were the head of their families. 122 (29.5%) were illiterate, 230 (55.8 %) were with primary school level, 26(6.3 %) were with junior school level and 33 (7.96 %) were with high school level. Most of the farmers in the study area 328 (79.5 %) depended only on agriculture for living whereas 62 (15 %) of them work as civil servants besides their farming, 20 (5 %) were traders besides their farming.

Table 1: Socio-demographic characteristics of farmers in Bule Hora Woreda, 2013

No.	Variables	Frequency	Percent
1	**Sex**		
	Male	351	85
	Female	62	15
2	**Head of the family**	396	96
3	**Educational level**		
	Illiterate	122	29.5
	Primary level	230	55.8
	Junior school level	26	6.3
	High school level	33	7.6
4	**Occupation**		
	Farmer	328	79.5
	Farmer and civil servant	62	15
	Farmer and trader	20	5

Crops produced and Pesticide utilization

Of the crops produced using pesticides in the study area, Teff and Wheat is produced by 393 (95.15%) of the study participants. Regarding to chemical pesticide utilization, the majority, 338 (82 %) of the study participants said that they use chemical pesticides at different levels (regularly or occasionally) and 75 (18 %) said that they don't use chemical pesticides for crop production. The utilization of artificial fertilizers was indicated majority of the study participants and some of the participants indicated that they use manure for crop production. Some of the participants responded that, veterinary use of chemical, especially to prevent ticks from cattle. From the respond the probability of direct exposure as well as exposure through food, air and water could be high.

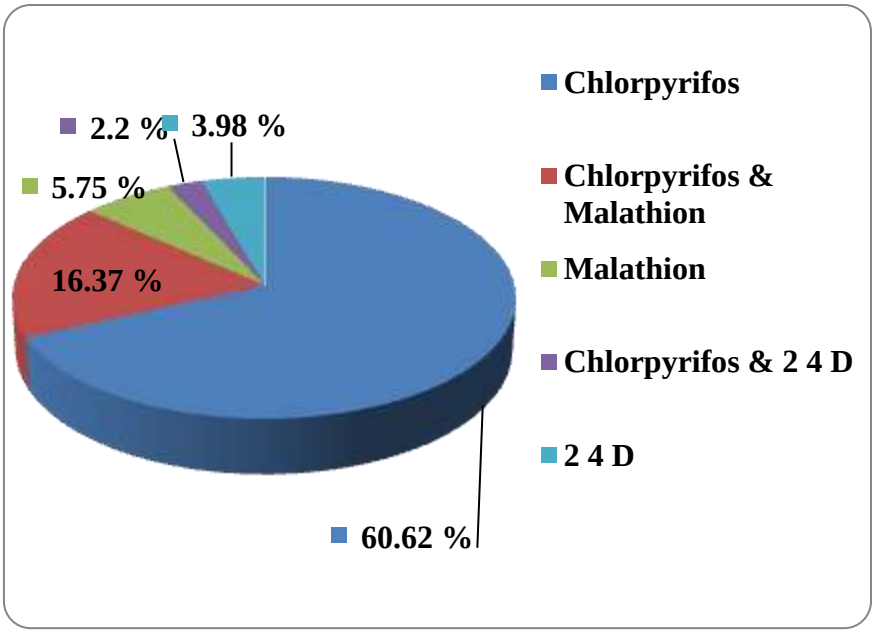

Fig-1: Pesticide utilization trends of BuleHora District farmers

Majority of farmers used chemicals pesticides to improve the yield of agricultural products by preventing foreign plants or insect pests especially during the time it occurred on a large scale. As it is indicated in the figure 3.1, 60.62 % of farmers used a solution of Chlorpyrifos dissolving in water, 16.37% used the solution of Chlorpyrifos and Malathion, 5.75 % used the Malathion, 2.2 % used a mixture of Chlorpyrifos and 2 4 D, 3.98 % used 2,4 D alone. The minimum (1.33 %) of respondents apply pesticides once a year while the others apply with varying frequency. For instance, 85 % of the respondent applied pesticides four times per year.

Pesticide practices of farmers

Some of the respondents were used chemicals / pesticides/ by consulting extension professionals from agriculture sector. However most of farmers were used different types of pesticides like 2, 4 D by themselves without any consult. From this it can be suspected that respondents exposure to pesticide during formulation, spraying and storage due to unsafe handling and mismanagement could be high.

The status of protective devices utilization

Among the farmers who take part in spray operation, 92.48 % worn any ordinary suit with old rubber shoes during spraying and formulation. Indeed, the protective devices such as glove, shoes, eye-glass, cap, face coveralls and hand-kerchief were all absent. However, very small percent; i.e. 3.09 % of sprayers fulfilled the body protection requirement. Therefore, it can be seen that using protective equipments during spray operation is mandatory in the area, to minimize exposures to pesticide during formulation and spraying time. Around 65.3 % indicated that they hang empty pesticide container near the farm for they don't know the resulting environmental contamination. 2.1 % of them responded that they used empty pesticide container for other house hold purpose. Regarding expiry date of pesticides, only 9.5 % consider the availability of it on the original container.

Trainings provided for farmers

The importance of public awareness raising trainings just prior to the preparation and spray operation of pesticides is vital. This is because, irrational usage of strange pesticides may result in danger directly to the handler and indirectly through food chain to handler and to those who are not take part in pesticides processing and application [11, 12]. As it is illustrated in figure 3.2, even though 69% of the respondents indicated that they could read labels on pesticide containers, only 26% could understand and follow instructions. Some of them also responded that they even bought pesticides without labels. As it was observed from the respondents, even though awareness raising trainings were taken place by professionals, it is not so enough. This situation implies that in addition to governmental aid, NGOs support is of paramount importance to minimize intoxication of chemical handlers and concentration of pesticides in the environment.

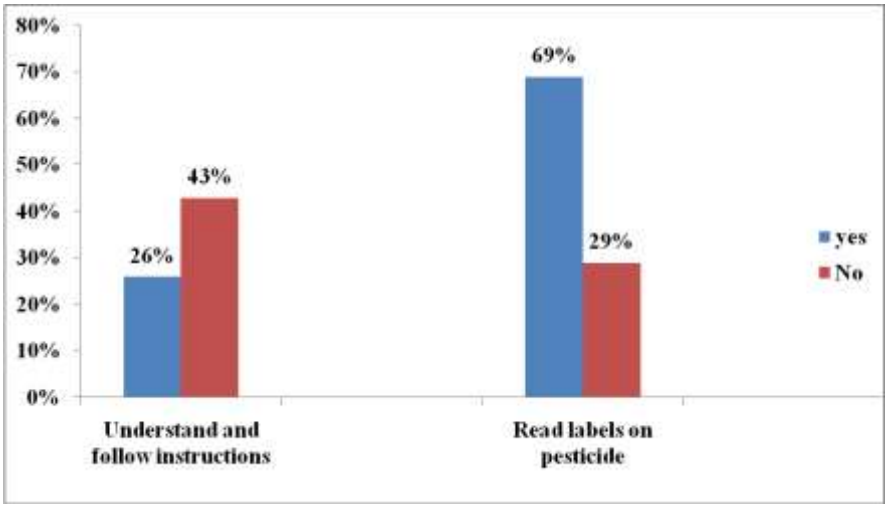

Fig-2: Farmers in Bule Hora Woreda ,who read and understand labels on pesticide containers

Farmers' knowledge and perception on pesticide effects

Awareness on the nature of pesticide and their effect by farmers is crucial to prevent risk associated to pesticide application. However do farmers have awareness about health effects of various pesticides being utilized? Accordingly the perception of 93.8% of the farmers was considering pesticides as useful. 0.4% of the farmers perceived pesticide as always harmful. From this we can conclude that almost all of the farmers need further training and education on pesticide management, handling and associated adverse effects. As the harmful effects of pesticides, 0.3 % of farmers indicated that pesticides cause damage to all human, animal and wildlife health and water bodies and the remaining did not responds the angle of its effect. In line with the damages pesticides could cause, the farmers were asked if it would be possible to protect the damage and only 0.2 % of them responded that it is possible.

Pesticides spraying and public health

Good pesticide management practices could help to minimize potential hazards of pesticide poisoning and pollution of the environment. As it is discussed above, some of the good management practices to consider when working with pesticide are: follow pesticide label directions, use protective devices, avoid spills, disposal of pesticide wastes and containers properly, elimination of unnecessary application and use of proper pesticide storage. Based on the survey 75.22 % of the respondents claimed illness after pesticide spraying, head ache, vomiting, skin irritation, nausea, dizziness, .loss of appetite, colds, difficulty in breathing, weakness, fever and depression. However most of them drink milk and take bath after spraying, this help them to relief their illness. Even though, they knew about the channel of reporting of pesticide incidents none of them reported their sense of illness to concerned body.

Pesticide spraying and Environment

Most pesticides are highly persistent in the environment, with a reported half life of between 2-25 years [13, 14] and are immobile in the soil. Routes of loss and degradation include runoff, volatilization, photolysis and biodegradation (aerobic and anaerobic) [15]. These processes generally occur only very slowly. Due to their extremely low solubility in water, pesticides will be retained to a greater degree by soils and soil fractions with higher proportions of soil organic matter [16]. It may accumulate in the top soil layer in situations where heavy applications are (or were) made annually.

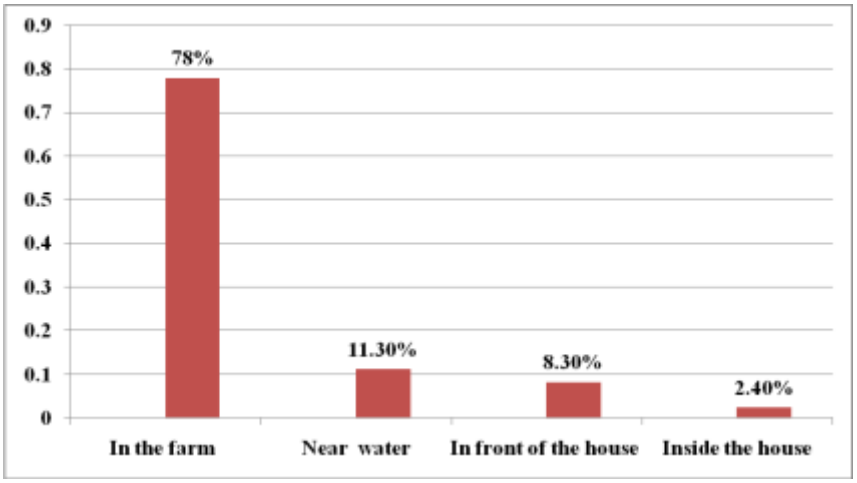

Fig-3: Pestides formulation trends of farmers in Bule Hora District

The survey made in this study indicated that, when farmers mix pesticides most of them did it in the farm (78 %). 11.3% did it near well water, 8.3% of them did it in front of their house and 2.4% did it inside the house figure 3.3. Even though 89.2% of the respondents consider wind direction during application of pesticides, chemicals disperse away from target area and to soil, water body and on the sprayer him/her self. Thus, the sprayer is victim of chemical hazard and the soil and water bodies (if present near spraying area) are too.

CONCLUSION AND RECOMMENDATION

Use of pesticides (especially those persistent organic pesticides) as agricultural input is not recommended. However the result of the study in Bule Hora District showed that, farmers use pesticides for agriculture pest control. According to the assessment carried out in this study, the awareness level in the community is low. As it is clear that, proper application of pesticide can minimize, the environmental and public health impacts being caused by inappropriate utilization of pesticides. Additional education is needed on the use of protection equipment and follow-up of protection precaution in the study area.

The result of these study highlight the need for further study and monitoring of the level of different pesticides in different food crops including cereals and other biological samples. Key to effecting change in response to pesticide contaminations is community-based programs that replace toxic pesticides with alternative non-chemical practices and products. Communities should adopt no-pesticide policies and launch community education programs.

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