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Assessment of Pesticide Use by Farmers in Assosa District, Benishagul Gumuz National Regional State of Ethiopia

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Abstract: Pesticide use is a common practice to control pests and diseases in agriculture fields, but often at the expense of the environment and human health. Pesticides use for Ethiopian farmers, to be obligatory tools in combating damage from weeds and insects. The surveying study was conducted to assess pesticide use and their risk in selected kebeles of Assosa Districts of Beneshnagul Gumuz National Region state of Ethiopia in 2021 cropping season. Therefore, assessing pesticide use of farmers must be aware of pesticide managements and consequences in misuse of pesticides. In this study, Districts of Assosa Zone in the Beneshnagul Gumuz Regionall state of Ethiopia was considered to most pesticide users. Through sample Kebele based study was conducted using semi-structured interview administered questioners were used to collect primary data. Based on this survey result, more than 95% of the respondents claimed that use of pesticide in absence of protective devices that can induce effect on environment and/or their health. This holds true for developing countries, including Ethiopia where good agricultural practices are often poorly implemented. Farmers should adopt pesticide caution and awareness regarding safe use of pesticides and provide protective device. As well as the concern body should support the local farmers those devices.

Keywords: Pesticides, Assessment, Pesticide Handling, Farmer Practice

1. Introduction

Pesticide refers to a wide range of compounds including insecticides, herbicides, fungicides, rodenticides, molluscicides and plant growth regulators. Pesticides use as crop pesticides in the agricultural sector were introduced in Ethiopia with the development of commercial farms in the beginning 1960s [1]. Following the introduction, use of chemical pesticides was applied as integrated package projects including the Chilalo Agricultural Development Unit (CADU), Wolaita Agricultural Development Unit (WADU), Minimum Package Project (MPP) under the Extension and Project Implementation Department (EPID) by the Ministry of Agriculture. Ethiopia imports diverse types of pesticide with the amount expected bout 3346.32 metric tons annually [2].

Pesticides have played an important role in the success of modern food production since, the green revolution in the early 1970 [3]. However, the intensive use of pesticides had adverse effect on the environment and human health, making it an important public health concern [4]. Ethiopia has a long history of cultivation and is now becoming the largest consumer of pesticides with the amount of pesticide use in Ethiopia increasing in recent years. Therefore, the growth of pesticides use will continue as agricultural production becomes more intense to meet the demand of food security. Pesticide sprayer is regularly engaged in spraying pesticides at different growing stages of a particular crop. These pesticides are prepared in different formulation, and usually applied as an aerosol produced from knapsacks, and simple sprayers.

Generally, misuse or overuse of pesticides carries high risk to farmers' health and environment in the country [5]. Some pesticides are highly toxic, persistent, and bio-accumulative pesticides such as chlorinated pesticide have been completely disqualified since 1983, but some of these are commercially available [6]. High level of pesticides residues are detected in soils and water [7]. The poisoning and suicide case from pesticides are reported frequently [8]. Ethiopia like other developing countries, the largest proportions of chemical pesticides was used by resource poor rural farmers. Methods

for storage, handling, and application of pesticides are poorly used in the most developing countries particularly in Africa [9]. Similarly incident was developed among rural farmers. In Assosa district, pesticide have been demonstrated to be obligatory tools in combating damage from weeds, insects, and other pests to ensuring sustainable food production with improved yield and greater availability of food year round.

On the other hand, Assosa district farmers use intensive agriculture which needs to be favors over seasoning methods of pests because of availability of limited land. In addition to this, poor usage of pesticides in the area can cause direct human poisoning, accumulate as residues in environment and lead to the development of resistance in pests in the study area which cannot be controlled by the help of the same insecticide or herbicide again. Moreover, the study area has variable climate, which is not suitable during pesticide application and also have suitable condition to develop chronic resistance in pests because of farmers use single pesticide year after year. Therefore, this study was designed to fill those gaps in the issues and further researchers can also be used to further investigations. This study therefore, attempt to assess pesticide use and their risk in selected farmers of Assosa kebeles.

2. Methodology

2.1. Description of the Study Area

This study was conducted in Assosa District of Benishagul-Gumuz National Regional state (Figure 1). It was located approximately 660 km distance far from Addis Ababa in western Ethiopia. According to Assosa District office of Agricultural report [10] it was inhabited with total households of 24,497 people distributed in 74 kebeles. Assosa district was got a rainfall which varies between 850-1200 mm within main rainy season and temperature of the area fluctuates between 20°C - 32°C. Agricultural production in this area has an important role in food security of the area. The district farmers were used intensive agriculture production, this could result in development of resistance in pests to pesticide and there was no cleared set out disposal of pesticides in the area.

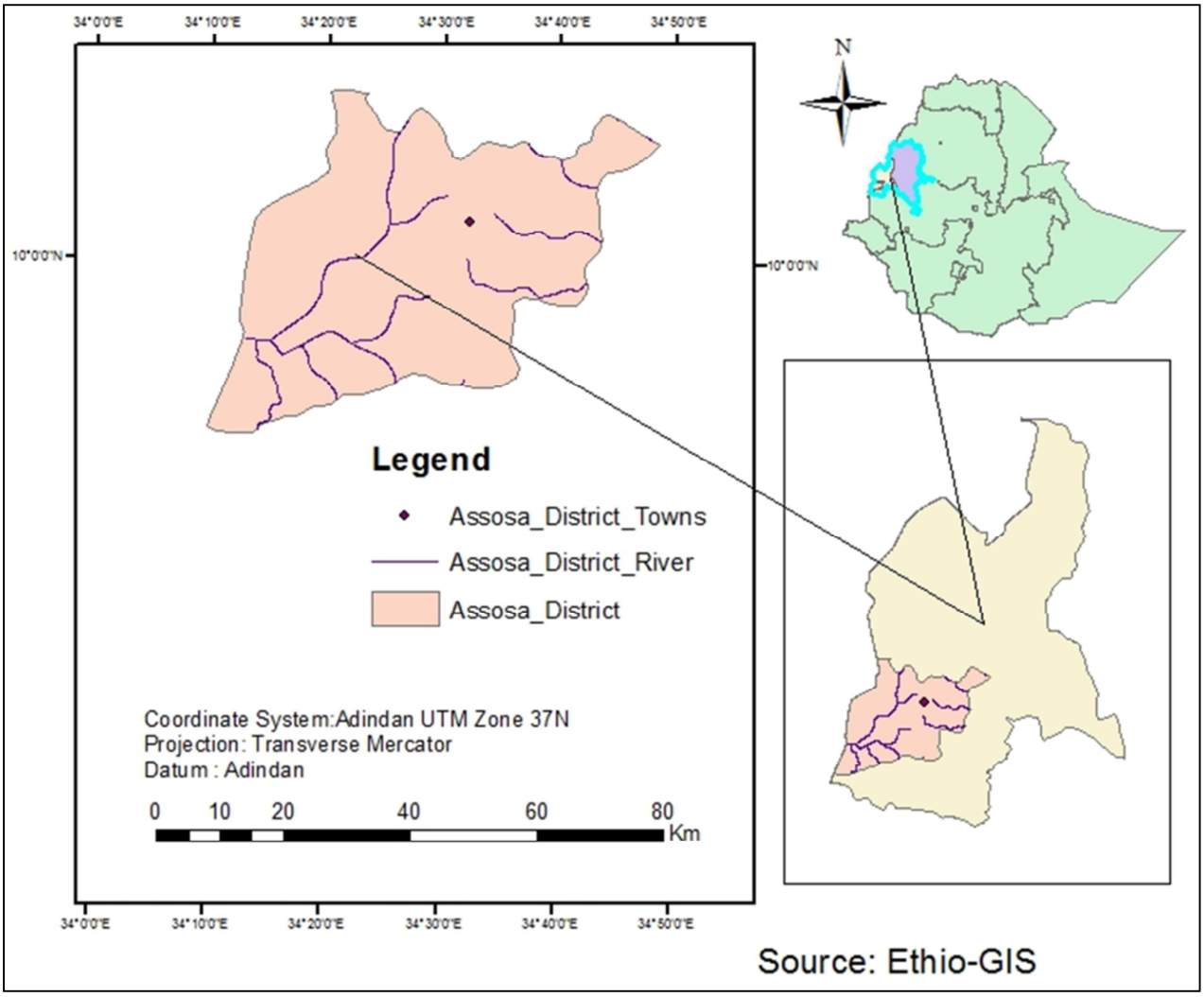

Figure 1. *Map of the study area.*

2.2. Research Design and Sample Size

The survey data was collected by sem-structured questionaire through interviews and focus group discussions. Focus group discussion was carried out among expert of agriculture, government official's leaders and local farmer or elders. The informant interview was collected from DAs, Kebele leaders and model farmers of the area with better knowledge than others regarding pesticide use. The sample size was determined using a single population proportion formula. The sample size was determined using a single population proportion formula. Because similar pesticide use will not be found in the study area, and taking the assumption that 50% of the users had lower knowledge than others regarding good pesticide use practice. The minimum sample size (n) for the study was calculated as follow. Where the critical value of (Za/2) is 1.96 at 95% confidence interval d (degree of precision) is 0.05 and p (proportion of good pesticide use).

$$n = \frac{(Za/2)^2\, P(1-P)}{d^2} = \frac{(1.96)^2\, 0.5(1-0.5)}{0.05^2} = 384$$

2.3. Data Collection Procedures and Data Analysis Tools

A semi-structured interview administered questioner was used to collecting primary data. A respondent was individuals who did the most farm work and used pesticides. The questioners were developed by referring different literatures and modified according to the objectives of this study. The questioner was first developed in English and it was translated into local language i.e (Amharic) for data collection. Prior to data collection, the questioners were pre-tested on selected farmers in the study area which was not included in the data collection. All the data generated from the house hold survey was statistically analyzed using frequencies and percentages was performed to test significance relationships between pesticide use and application techniques by farmers and various households variables such as age, level of education, sex and other all variables using the statistical package for social science software (SPSS version 20). Results were presented in tables, and figures.

3. Result and Discussion

3.1. Socio-Economic Characteristics of Respondents

As show from the table 1, below most of the respondents were male 331 (86.42%) and 52 (13.58%) of respondents were females.

Table 1. *Socioeconomic Characteristics of the respondents (n=383).*

Variables	Frequency (n)	(%)
Sex		
Male	331	86.42
Female	52	13.58
Age		
Below 20	62	16.19
20-40	137	35.77
40-60	118	30.81
Above 60	54	14.09
Education level		
Illiterate	152	39.68
Primary school	124	32.37
High school complete	78	20.36
College complete	29	7.57
Marital status		
Single	4	1.04
Married	364	95.04
Separated	7	1.83
Divorced	5	1.3
Widow	3	0.78
land holding		
<0.5ha	35	9.14
0.5-1ha	96	25.06
1-3.5ha	230	60.05
5-10ha	21	5.48
Working types		
Crop production	224	58.48
Animal production	131	34.2
Trading	24	6.26

Source: Survey data of Asossa District in 2020/2021.

From the total numbers of respondents male was more use pesticide than female in study area. The mean age of the respondents was with an age range of 20-40 years. Majority of the respondents were belongs to an age range 20-40 with frequency of 137 and 40-60 with frequency of 118 in percentages of 35.77% and 30.81% respectively. Most of the respondents were young enough and matured to give reliable information for this study.

From the random sample brought educational level distribution of 152 (39.68%) of the respondents were illiterate, 124 (32.37%) of the respondents had primary school education, 78 (20.36%) had high school education, and only 29 (7.57%) few had college level education. Generally, education plays important role to address problems of pesticide use, and where ever the households must have adequate education to effectively use pesticide. As well as most of the respondents were married 364 (95.04%). The mean landholding size of the sample was in the range 1-3.5 (60.05%) and majority of the respondents 224 (58.48%) were based on Crop production as well as 131 (34.2%) animal rearing farming system with some trading activity. As it was illustrated on the table farming activities of the farmers in the study area depended only on crop production for living as well as some of them work animal rearing besides of their farming, and some were traders besides their farming. In this study, the lifestyle characteristics of farmers are important for understanding the diversity within a social and to understand how at individual level different social practices are integrated [11].

3.2. Major Types of Pesticides Used in the Study Area

The types of pesticides commonly used by farmers in Asossa District were herbicides 327 (85.37%), Insecticides

359 (93.73%), Rodenticides 83 (21.16%), and Fungicides 18 (4.70%). Most probably herbicides and insecticides were used to control pests from agriculture fields. In the study area majority of farm holders were using commonly similar types of pesticide as the climatic and topographic areas of study were the same. This might have health implications for those farmers that do not follow proper use practices [12] figure 2.

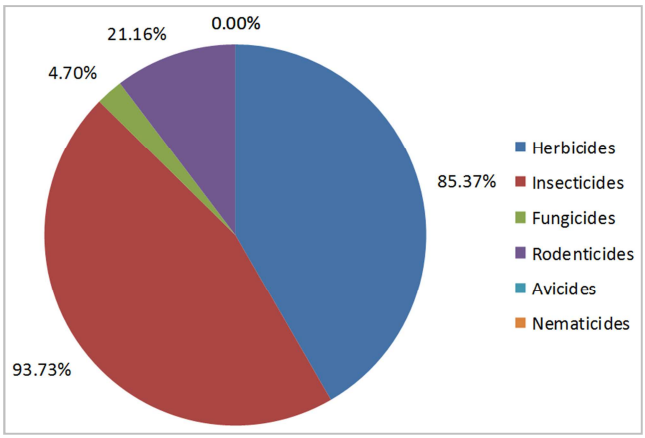

Figure 2. *Type of Pesticides Used by farmers.*

3.3. Farmers Pesticide Use Practices

The survey result show that respondents were spent approximately about 99 (25.8%) with frequency application pesticide ranges 1-2 times per year, 214 (55.9%) with application frequency of pesticide ranges 3-4 times per year, and application 70 (18.3%) with frequency range above 5 times per a year figure 3.

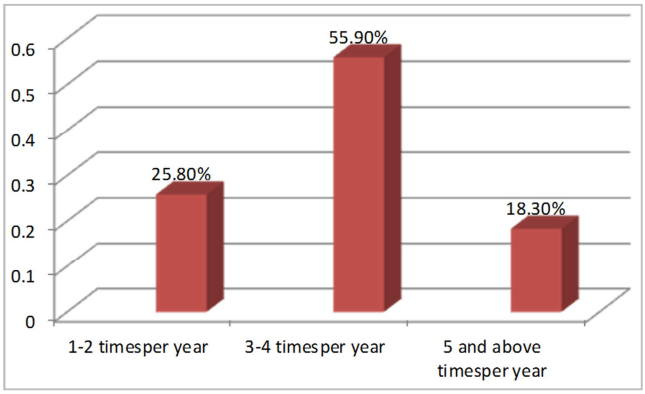

Figure 3. *Frequency of Pesticide use by farmers in the study area.*

Even if the majority of farmers apply pesticides ones per agricultural crop growing season but some farmers use twice and three times. On the other hand, according to Shemsu [13], an assessment conducted in Bule Hora Districts of Ethiopia majority of farmers use pesticides four times per year. It's possible to conclude that as the frequency of pesticide application is increasing its impact including honey yield minimization, killing flowering plants, reduce pollination service, and others will be increasing. As a result, it may bring social conflict among farmers, economic and even ecological impact.

3.4. Farmers' Protective Devices Utilization

Among the farmers who take part in spray operation, the only 45 (13.60%) worn any ordinary suit hat and Protect mouth and nose using mask 12 (4%) during spraying and formulation table 2.

Table 2. *Farmers' protective devices utilization status in Asossa District during 2020/2021 (n=383).*

Variables	Frequency (n)	(%)
Wear Hat		
Yes	45	13.60
No	329	86.40
Protect mouth and nose using mask		
Yes	12	4
No	289	96
Impermeable clothes		
Yes	28	7.70
No	337	92.30
Put on leg boots		
Yes	103	27.6
No	270	82.40
Put on hand gloves		
Yes	34	10.93
No	277	89.07
Wear glasses to protect eyes		
Yes	54	15.30
No	300	84.70

Asossa District survey data in 2019/2020.

Indeed, these protective devices were absent. However, comparable percent; i.e. 103 (27.6%) of sprayers fulfilled any leg boots. Around 34 (10.93%) Put on hand gloves, this indicated that they don't know pesticide residual effect on their health or 54 (15.30%) of them responded that they used Wear glasses to protect eyes.

It has been observed that behavior contributes to the farmers increased the exposure to pesticides which could be detrimental to their health in the short and long term [14]. Therefore, it can be seen that using protective equipment during spray operation is mandatory in the area, to minimize the exposure to pesticide during formulation and spraying. Generally, very little portions of the farmers used personal protective materials while spraying. It can be postulated that non-availability of such personal protective equipment could be the reason why very few utilized them. People who work with these chemicals should receive proper training on their safety use and personal protective equipment to minimize exposure and health risk [15].

3.5. Pesticide Handling Practices of Farmers

The survey made in the study indicated that, farmers were utilized without read pesticides label but some of them did it 23 (6.1%), 365 (95.8%) of the farmers were read the pesticide direction only and 65 (17%) read the pesticide precaution table 3.

Table 3. *Pesticides handling by farmers during utilization in Asossa District (n=383).*

Variables	Yes		No	
	no.	(%)	no.	(%)
1) Label read				
Every topic on the label	23	6.1	358	93.9
Directions only	365	95.8	16	4.2
Caution only	65	17	316	83
2) pesticide storage before use				
stored in homes	278	83.2	56	16.8
Stored a places of well ventilated.	40	12	294	88
kept in dry and out of reach of children	319	95.5	15	4.5
kept in a secure place	320	95.5	14	4.5
3) Empty pesticide containers disposals after use				
left in the field after use	192	60.9	123	39.1
buried in soil	99	31.4	216	68.6
sold at shop	37	11.7	278	88.3
washed and re-used	204	64.8	111	35.2
did not have locations for storing after use	221	71.2	94	29.8

Source: Survey data of Asossa District in 2019/2020.

Even though 278 (83.2%) of the respondents were stored pesticides in their home before application, and very small numbers 40 (12%) were stored in a places of well ventilated target area as well as kept in dry and out of reach of children with secured place. Farmers in the study area about 192 (60.9%) were left empty pesticide containers in their farm field while 204 (64.8%) of them re-used as liquid substances container. In addition to this most of farmers were not have locations for storing containers 221 (71.2%) after use. Thus, farmers in the study area did not know effect of pesticides on environment and human health. The most pesticides are highly persistent in the environment, with a reported half-life of between 2-25 years and are immobile in the soil [16]. Due to their extremely low solubility in water, pesticide will be retained to a greater degree by soil and soil fractions with higher proportions of soil organic matter [17].

3.6. Understanding of the Study Area Farmers Regarding Pesticide Use

Most of the respondents were not agreed that pesticide use in crop production reduces the food safety. However, they were well aware that pesticides are harmful to the environment and human health Table 4.

Table 4. *Respondents understanding on pesticide use.*

variables	Agree		Disagree	
	Freq. (n)	(%)	Freq. (n)	(%)
Pesticide use reduces safety of food value of a crop	66	17.23	317	82.77
Environmental pollution	367	95.8	16	41.77
Human health	370	96.6	13	3.39

The majority the respondents were disagreed 317 (82.77%) that whether pesticide use aversely reduces the food quality of production. The majority of them agreed that pesticide use adversely affects human health and the environment. Most of the respondents (nearly more than 95%) believed that human health caused by pesticide exposure and environment pollution, they claimed that attempted to use pesticides properly.

4. Conclusions

Age, sex, educational level, marital status, land holding, and farming activity of the community were identified as factors which influence pesticides use. The pesticide use assessment of farmers in Assosa district was poorly managed. In spite of regular use of pesticide, farmers were lacking of safe handling of pesticides, which is leading to an increase potential risk of pesticide effect on environment and/or human healthy due to absence of protective device. Hence, we suggest that an urgent need to train farmers and give awareness regarding safe handling of pesticides use in the study area.

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