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# Safe Pesticide Utilization and Associated Factors among Farmers in Guagusa Shikudad District, Northwest Ethiopia

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**BAHIRDAR UNIVERSITY  
COLLEGE OF MEDICINE AND HEALTH SCIENCE  
SCHOOL OF PUBLIC HEALTH**

**SAFE PESTICIDE UTILIZATION AND ASSOCIATED FACTORS  
AMONG FARMERS IN GUAGUSA SHIKUDAD DISTRICT,  
NORTHWEST ETHIOPIA**

**BY  
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## ACRONYMS AND ABBREVIATIONS

FAO	Food and Agriculture Organization
GIT	Gastro Intestinal Tract
PPE	Personal Protective Equipment
SPSS	Statistical Package for Social Science
WHO	World Health Organization



## ABSTRACT

**Background:** - Pesticides are widely used in agriculture to increase yielding of crop by preventing plant and animal pest and other plant pathogens. A significant increase in pesticide use with poor implementation of pesticide regulation and in adequate knowledge of farmers on safe pesticide utilization now a days become a great public health concern. This paper assesses safe pesticide utilization practice of farmers in Guagusa Shikudad District Northwest Ethiopia.

**Objective:** - The aim of this study is to assess the magnitude of safe pesticide utilization practice and associated factors among farmers in Guagusa Shikudad district Northwest Ethiopia 2020.

**Method:** - A community based cross-sectional study was conducted among farmers in Guagusa Shikudad district from March 07/2020 to May 02/ 2020. A total of 650 farmers who utilize pesticides for farming were selected using systematic random sampling technique from registration in kebele manager office. Structured interviewer administered questionnaire was used to collect the required data from family member (at their home) having experience on pesticide utilization. Application of face mask, coverall, glove, long boots , disposing of empty pesticide container safely and body washing after spray were used as safety criteria. Bivariate (using p-value 0.25 as a cutoff point) and multivariable logistic regression (using p-value 0.05 as a cutoff point) were applied in analysis to assess the association of factors with dependent variables.

**Results:** - A total of 650 farmers were participated in the study (with the response rate of 99.38%) and the overall safe pesticide utilization practice was only 4.5%. the mean ( $\pm$ SD) age of the respondent was 44.85(11.60) years. Factors associated with safe pesticide handling practice were history of previous illness [AOR = 5.68, 95% CI (1.56, 20.74)], buying full pesticide container together with friends [AOR = 4.10, 95% CI (1.45, 11.61)], using two types of pesticide at once [AOR = 4.44, 95% CI (1.46, 13.56)].

**Conclusions:** - Very low proportion of farmers in Guagusa Shikudad District were utilize pesticide safely. There is a need for provision of education and practically supported training for farmers to have safe pesticide utilization practice

# 1. Introduction

## 1.1 Background of the study

It is already known that the number of people living in the world currently is very high and will be more for the future (1) which triggers production of food to be increased as a mandatory in proportional to the increasing population to prevent hunger (1, 2). Unfortunately there are about 9,000 species of insects and mites 8,000 species of weeds and 50,000 species of plant pathogens that causes catastrophic losses of crop production globally in which pesticide utilization become very important to overcome this problem (3)

Currently the agricultural system develops different technologies to produce more food within the already existing land to address the requirements of people for food consumption. Pesticide utilization is one of the technologies used to increase agricultural production while harvesting and prevent crop distraction during storage. (4)

According to Food and Agricultural Organization (FAO) pesticides are define as “any substance, or mixture of substances of chemical or biological ingredients intended for repelling, destroying or controlling any pest, or regulating plant growth that helps for effective crop and food protection during production and in storage” (5) Based on the type of pest they control, pesticides can be named as herbicide, insecticides, fungicides, rodenticide, miticides, molluscicides, and they are available in the form of sprays, liquids, powders, granulates, baits and foggers (6).

Pesticides are important on livestock production by protecting domestic animals from different ectopic parasite infestation in which arthropod pests like flies (house fly, heel fly, horn fly and stable fly), louse, tick and other arthropods that feed on domestic animal's body tissues like blood, skin, hair and inside the wounds (7). Besides the agricultural activities, pesticides are important for the control of malaria and other vector borne diseases (8), for charming of garden and sport fields, disinfection of healthcare equipment, flower production, promote biodiversity (since pesticides allowing farmers to produce more crops per acre by controlling weeds , no need for deforestation to have additional farm land therefor different plant species are preserved and variety of wild animals use them as a habitat) and property protection (by controlling termites that destroy wooden properties like home and different furniture coasting huge amount of money and sentimental values which are not replaceable) (9).

Currently pesticide utilization in Ethiopia is considerably increasing. With this fact the band (pesticides having nature of bio magnification and persistent for a long period of time) pesticide like DDT was applied on food crops without giving attention on its health impact. Direct import of pesticide without the control of Ethiopian registration authority are also an other problems reported(10).

Safe pesticide utilization practice is defined as an activity performed to prevent pesticide handlers from pesticide exposure while working with pesticide that includes reading and following label information and direction, wearing clean personal protective equipment (PPE), washing hands and other exposed body parts before eating, drinking, smoking and using toilet and finally disposing leftover pesticides and empty pesticide containers in condition of safer to human and environment (11-13)

Since pesticides are designed to be poisonous for pests, they can be also extremely hazardous to human and other living organism when they are poorly handled(14) while transporting, storing, mixing, applying and disposing of leftover pesticides and empty pesticide containers. So when ever working with pesticides and to safely utilize them, it needs implementation of pesticide application guidelines and wearing full personal protecting equipment such as hat, goggle, facemask, respirator, coveralls, protective boots; in line with these equipment application, avoiding eating or drinking of foods, smoking tobaccos, talking while mixing or applying pesticides, taking shower and washing working clothing/equipment/ immediately after mixing or applying pesticides are also important(12).

## **1.2The statement of the problem**

Safe pesticide utilization practice becomes an essential issue for pesticide users. A considerable number of people in both developed and developing countries uses high amount of pesticide to enhance the yielding of crop production by controlling pests (15, 16). China and united state uses 3,981,548,455 and 850,948,332 pound of pesticide every year respectively(17)

Even though pesticides are important in agricultural and nonagricultural activities (7-9, 18) , they can case unwanted effect to environment (contaminate water, soil, and other vegetation and other non-target organisms like birds, fishes, beneficial insects )and human being because originally they are designed to destroy pests by their toxic effect (19). Pesticides causes both acute(respiratory tract irritation, sore throat and/or cough, allergic sensitization, eye and skin

irritation, nausea, vomiting, diarrhea, headache, loss of consciousness, extreme weakness, seizures and/or death) and chronic health problems(Parkinson's disease; asthma; depression and anxiety; attention deficit and hyperactivity disorder (ADHD), cancer, including leukaemia and non-Hodgkin's lymphoma, endocrine disruption, and congenital defect to new born (20). Morbidity and mortality related to pesticide is recently increased globally as well as in developing countries including Ethiopia in which 964,000 people die and 20,986,153 people are suffering from illness every year due to pesticide exposure (21). Studies also showed that 5-6% of deaths due to non-communicable diseases is contributed by pesticides(22). As WHO stated there are about 9 – 36 million suicide attempts worldwide every year. And there are about 900,000 deaths from suicide every year worldwide. This phenomenon is due to easily accessibility of pesticide and around 73% suicidal deaths in Asian countries like china is due to pesticide (23)

Since utilization of pesticide increase in both developed and developing countries and the developing countries apply pesticides with lack of knowledge, in adequate pesticide registration and control policy implementation, in adequate PPE application, and at the same time most farmers complain pesticide intoxication immediately after pesticide application(24); safe pesticide handling of farmers needs to be assessed.

Due to weak pesticide registration and distribution policy in Ethiopia (25) there is illegal import of pesticides directly without control of that particular law, pesticides like DDT (which are banded in developed countries due to their bio magnification and persistent effect) and Endosulans are applied on food crops unlawfully(26). Majority of pesticide handlers were apply pesticides without adequate training, knowledge and safety measures(10).

Even though death due to unsafe pesticide utilization is not well documented in Ethiopia , 89% and 85.94 % of farmers reported as they were suffering from illness immodestly after pesticide application in the study done south west Ethiopia and north Shewa respectively (27, 28)

To minimize pesticide related morbidity and mortality, determining safe pesticide handling practice of farmers' status and linked factors is important. There are few researches done in Ethiopia on knowledge, attitude and practice of farmers towards pesticide utilization other than this study area; However these studies were mainly focused on pesticide utilization behavior of

farmers at vegetative / growing /stage of crops. But there is a lack of evidence on safe pesticide utilization practice at both pre (vegetative) and post (storage) harvesting stage of crops in this study area. There were also rumors of pesticide related deaths in the study area, but studies to evaluate pesticide utilization practice of farmers are not documented. So, the aim of this study is to assess safe pesticide handling practice and associated factors among farmers in Guagusa Shikudad district.

### **1.3 Significance of the study**

This result used as an evidence of unsafe pesticide handling practice among most farmers in Guagusa Shikudad district. So decision makers in both agricultural and health sectors can plan to find solution for farmers to avoid risky of pesticide exposure. It is important for farmers to handle pesticides safely and prevent themselves as well as other food consumers from pesticide exposure. Researchers can do further study on chronic health effect related to pesticide exposure among farmers in this district.

## **2. Literature review**

### **2.1 prevalence of safe pesticide utilization**

Status of safe pesticide utilization practice is vary with in different studies conducted. Prevalence of safe pesticide using practice north Iran 84.8% (with PPE application 65.7% ,body washing after pesticide spray 30% , disposal of empty pesticide container safely 9.3% and 13.7% of respondent complain pesticide related illness) and North Greece 58.9% and south India was 45.9% ( with 95% of participant wash their body after pesticide spray and 51.2% of them dispose empty pesticide container safely ) (29-31)

Whereas in African countries like Sudan, farmers had good pesticide using practice in which 93% of farmers had got training on pesticide use and 100% of farmers use PPE while utilizing pesticide and 100% of farmers wash their hands immediately after pesticide application(32). In the study done in Kenya 39% of farmers do not apply full gear of safety precautions(respirator, hand glove, and face mask) and 60% of farmers did not wear personal protective clothing(33). The study done in Tanzania showed that only 21% of farmers were utilize pesticide safely(with 79% of farmers store pesticides un safely in there hose and 93% of farmers complain illness due to pesticide ) (34). But on the other study conducted in Nigeria only 11% of farmers wear full PPE, 48 % store pesticides unsafely and 53% of farmers reuse empty pesticide container (35) and Rwanda only 5% of farmers practice the minimum requirement of safe pesticide utilization practice which is stated by 80% of farmers store pesticides unsafely and 90% farmers complain pesticide related illness immediately after pesticide application(36). Also a study done in Egypt shows that only 20% farmers were utilize pesticides safely(37)

A study done in Ethiopia like north Shewa indicates that application of safe pesticide utilization practice among farmers while they formulate and apply pesticides was 5% and 85.94 % of farmers felt discomfort immediately after application of pesticide(38), also a study done in Gondar shows 36.2% of farmers had safe pesticide handling practice(39).

### **2.2. Factors associated with safe pesticide utilization**

#### **2.2.1 Sociodemographic:-**

A study done in north Greece, Asian farmers, Kuwait and two different studies in Nepal shows as age was negatively significant for safe pesticide handling practice i.e. old individuals are not responsive to apply safety measures(30, 40) (41-43). Similarly age is negatively significant for safe pesticide handling as study show in Egypt and Tanzania (34, 37) but age was not significant

in the study done at Jima zone ,central rift valley in Ethiopia and Gondar (27, 39, 44). Also in this study age was not significantly associated for safe pesticide handling practice

A study done in north Iran showed that sex has no significant association for safe pesticide handling practice((29)). But a study done in Cameroon and Kenya shows that gender is significantly associated for application of PPE in which males protect themselves from pesticide exposure while handling pesticide as compared with females (33, 45) whereas a study done in Gondar(Chalie Mequanint, 2019) shows sex was not significant for safe pesticide handling practice.

Being educated is positively significant for safe pesticide handling practice on reading the labeling, storing, mixing, applying and disposing of pesticides in safer manner as shown in studies like South India, Kuwait, North Greece, and Nepal(30, 41, 42, 46). Educational level is also positively significant as shown in the study of African countries like Tanzania, Cameroon, Kenya, and Egypt (33, 34, 37, 45). But not significant as shown in the study done in Rwanda(36). whereas the study done in Gondar as informal education, elementary education level, secondary educational level and certificate and above were significantly associated for safe pesticide handling practice(39).

The study done in north Greece showed that having smaller size of farm land was significant factor for safe behavior of farmers while handling pesticide Christos A. Damalas 1, 7 February 2019,)

**Income:** - having good income is positively significant for safe utilization of pesticide(able to by PPE) as shown in the study done in Nigeria (47), Kenya(33). A systematic review research done in Chiang Mai University (Thailand) also shows as income has positive significant association to use personal protective equipment and safe pesticide use(48).

**PPE availability:-** it has its own influence as shown in the study done in Kenya , 79% of farmers do not use PPE due to its unavailability (33)

### **2.2.2 Behavioral factors**

#### **Knowledge related to pesticide:-**

**Perception as pesticide affect human health (toxicity):-** having knowledge towards pesticide toxicity positively significant to affect safe pesticide handling practice as shown in the study done in North Greece, Nepal, and Egypt(30, 37, 42). But it was not significant as shown in

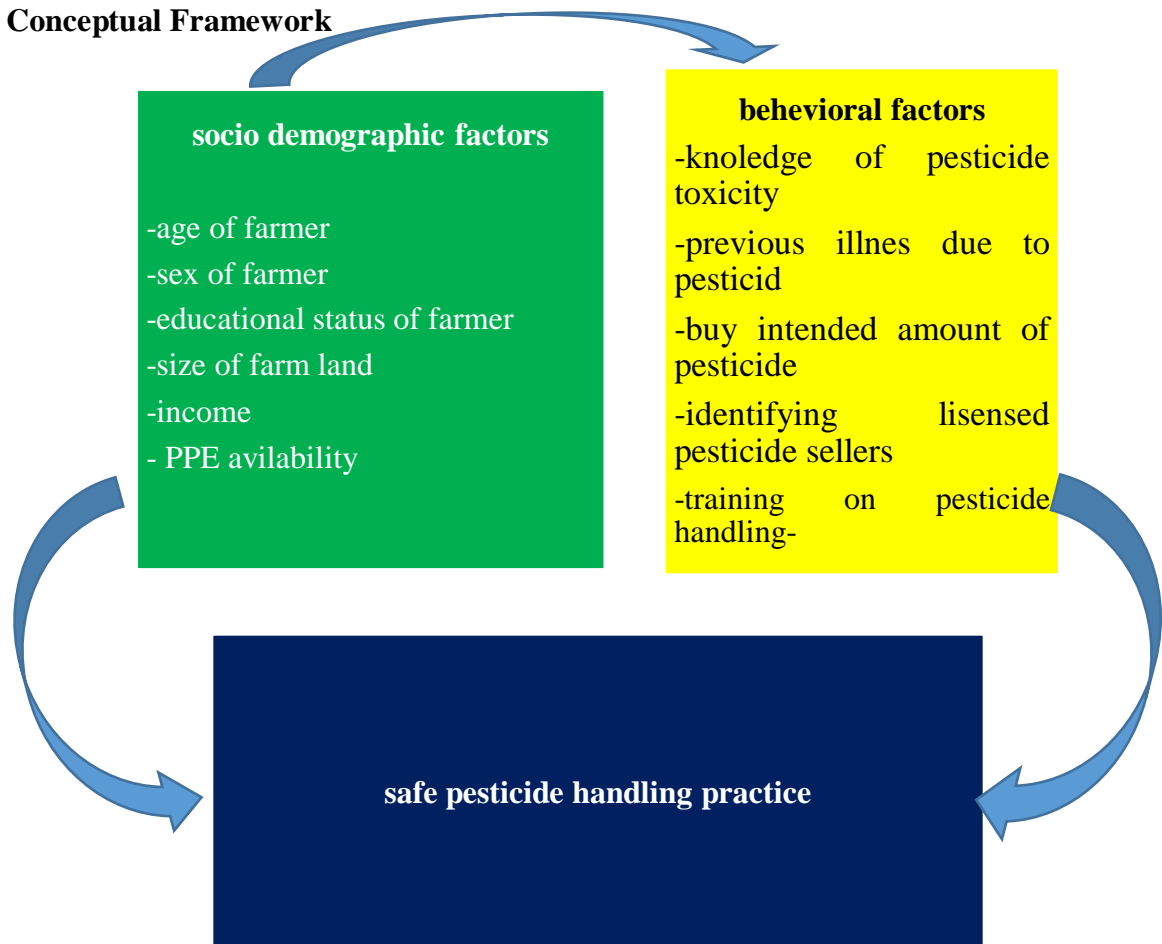


studies conducted in North Iran, two different study of South India and Kuwait due to know –do-gap.(29, 31, 41)

A study conducted in southwest Ethiopia (Jima zone) shows as having knowledge on name of pesticide, method of pest control and use of glove to prevent exposure were significant to have positive attitude of farmers to implement safe pesticide handling practice. But their practice is not as expected from their knowledge ( there is know– do-gap)(49) Similarly the study done in Gondar shows having good knowledge and attitude towards safe pesticide application has positive significant effect for safe pesticide handling and storage practice(39). Whereas in this study having history of previous illness due to pesticide exposure was positively significant for safe pesticide handling.

**Training on pesticide handling:-** being trained for how to handle pesticide safely was positively associated for safe pesticide utilization as show in studies done in Nigeria (47) Pieria /north Greece/, Mazandaran( north Iran),Nepal (50, 51) (52)

### 3 Conceptual Framework



**Figure 1 Diagram of conceptual frame work showing relationship between dependent and independent variables**

## **4. Objectives**

### **4.1. General objective: -**

The general objective of this study was to assess magnitude of safe pesticide utilization practice and associated factors among farmers in Guagusa Shikudad Woreda Northwest Ethiopia 2020.

### **4.2. Specific objective: -**

- To determine magnitude of safe pesticide utilization practice among farmers in Guagusa Shikudad district.
- To identify factors associated with safe pesticide utilization practice among farmers in Guagusa Shikudad district.

## **5. Methods and material**

### **5.1 Study design and period: -**

A community based cross-sectional study design was conducted on Guagusa Shikudad district farmers from March 07/2020 to May 02/ 2020

### **5.2. Study area and population/ the setting: -**

The study was conducted in Guagusa Shikudad Woreda. It is one of the Woredas in Awi zone. It is located 432 km away from Addis Ababa the capital city of Ethiopia towards northern direction and 129 km away from Bahr Dar city the capital city of Amhara Regional State to the southwest direction on the main road of Bahr Dar to Addis Ababa. The Woreda has 16 Kebeles in which two of them are urban and the rest 14 are rural. The total number of people live in this Woreda are 108, 145 with 25,150 households. Its geographical situation is both hilly and sunken. Its range of annual rain fall and temperate is 1834.6mm and 11.2-25.5 respectively(53). Wheat, potato, maize, tteff, barley, bean and pea are the commonest crops cultivated. Barley, wheat, potato, maize and some other vegetables like carrot, beet root are commonly cultivated in irrigation areas of this Woreda. Butter, honey, egg and hen are also produced.

### **5.3. Source population: -**

All household in Guagusa Shikudad district during data collection period.

### **5.4. Study population: -**

All household in selected Kebeles and engaged in agricultural activities

### **5.5. Study unit: -**

Those family members (having experience on pesticide application) in selected household who are selected by systematic random sampling to be interviewed. -

### **5.6. Inclusion criteria: -**

Farmers who live in the selected area and utilize pesticides for harvesting crops.

### **5.7. Variables**

**Dependent variables: -** safe pesticide utilization practice

**Independent variables:-**

Socio demographic characteristics (Age, Sex, Educational status, Farm size)

Behavioral factors (Awareness of pesticide toxicity, Identifying licensed pesticide sellers, buying intended amount of pesticide, history of previous illness)

Governmental factors (training on pesticide handling,

**5.9. Operational definition: -**

**Safe pesticide handling practice:** - Those farmers who applied all of the minimum requirement of safety measures were considered as safe practice. If they fail to apply one of the requirement, then it is considered as unsafe handling practice.

**Minimum requirement:** - Apply PPE (Wearing glove, face mask, coverall, long boot), and dispose empty pesticide container at secured place. Even though these are not the only safety measures to handle pesticide safely, they are commonly asked in different studies like north Greece, Nigeria, Kuwait(30, 35, 41) and other safety pesticide books mostly recommend(54, 55) (53, 54) So according to this study area, at least these should be applied by farmers as a minimum requirement.

**Formal education:** - those farmers who learn in the school starting from grade one proceed to above level.

**Informal education:** - those who are able to read and write that acquire this skill through learn out of school (only to read and write but not beyond that) like in the case of priests, “meserete timihrt” in Amharic,)

**Farm size:** - one hectare represents four “kadas”

**Good disposal of empty pesticide container:** - those farmers who, those who dump to toilet

**Poor disposal:** - those farmers who are laying empty pesticide container anywhere, re use for food utensils and pesticide storage while sharing on other time.

**Secured period for consumption:** - those farmers who eat pesticide mixed stored crop by waiting at least two months after mixing with pesticide

**insecure period for consumption;**- those farmers who eat pesticide mixed stored crop by waiting less than two months after mixing with pesticide

**Acceptable period for selling:** - those farmers who sell pesticide mixed stored crop by waiting at least two months and above after mixing with pesticide

**Inacceptable period for selling:** - those farmers who sell pesticide mixed stored crop by waiting less than two months after mixing with pesticide

**Protected residue reduction:** - those farmers who apply residue reduction methods like washing with water, soaking with water, peeling, cooking with heat before eating of crop

**Unprotected residue reduction:** - those farmers who did not apply any of residue reduction methods before eating of crops

### 5.10. Sample size and sampling methods

By using a single population proportion formula. The minimum sample size (n) for the study was calculated using the following assumptions, where the critical value ( $Z_{\alpha/2}$ ) is 1.96 at 95% confidence interval, d (degree of precision) is 0.05 and P (proportion of safe pesticide handling practice based on previous study 36.2%) (39).

$$n = \frac{(z_{\alpha/2})^2 p (1 - p)}{d^2}$$

$$d^2$$

$$n = \frac{(1.96)^2 (0.362) (1 - 0.362)}{(0.05)^2}$$

$$(0.05)^2$$

$$n = \frac{(3.8416) (0.362) (0.638)}{(0.0025)}$$

$$(0.0025)$$

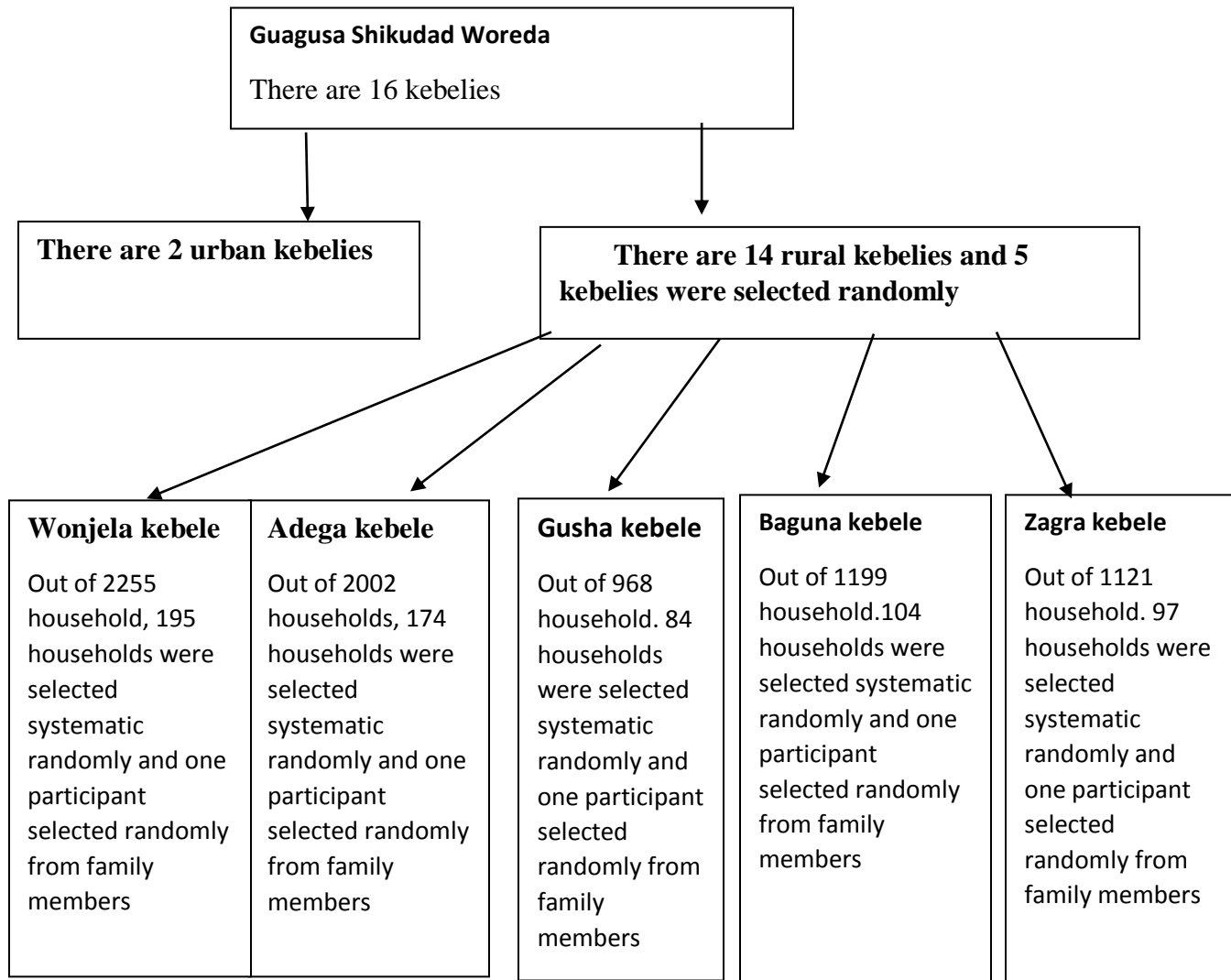
So sample size will be (n) = 354.896    n ≈ 355

**Table 1 Sample size determination based on factors of the previous study(39) by using 95% CI and 80% power and ratio 1(unexposed: exposed). Odds ratio (1.77) and % outcome from unexposed group (49.1) in previous study**

S.No	Associated factors on previous study	Frequency in percent in previous study	AOR of previous study	Calculated sample size by epi info
1	able to read and write	34	3.05	106
2	Primary educational level	13.4	5.38	62
3	Secondary educational level	11	9.51	36
4	Certificate and above educational level	2.7	6.00	180
5	Having good knowledge towards safe pesticide handling	39.4	3.23	96
6	Having good attitude towards safe pesticide handling	49.1	1.77	396

So the largest sample size was 396. By using design effect 1.5, the sample size was  $396 \times 1.5 = 594$  and by adding 10% for none response rate 10% of 594  $\approx 60$  so, the final Samples size was  $594 + 60 = 654$

This Woreda has 16 kebeles in which 2 of them were urban and 14 of them are rural. So from 14 rural kebeles 5 of them were selected randomly by lottery method to do this study. The total samples (654) were assigned to the 5 selected kebelies proportionally based on their population. Study subjects were selected by using systematic random sampling technique (there is a list of household/ individuals in the registration of kebele manager) from selected kebekies.



**Figure 2**diagram showing sample selection procedures from districts to study subjects

Out of 7545 households eligible for the study, 654 households were selected systematic randomly from registration in selected kebelies. The first household was selected randomly by lottery method and the rest were selected with interval of 11 i.e. one in every eleven farmers. From each selected households, one study participant having experience of pesticide application was selected randomly from family members to be interviewed.

**5.11. Data collection instrument and method: -**

Interviewer administered structured questioner was used to collect data from the study participants. The questioner has 61 question. It is categorized as part one containing sociodemographic characteristics, part two knowledge related to safe pesticide handling questions



and part three safe pesticide handling practice related questions to examine factors that influence safe pesticide handling practice of farmers. Application of pesticide on pre and post harvesting, application of PPE while mixing and applying (spraying) of pesticide are also included. Application of PPE was assessed from various PPE items with yes or no answers such as hat, goggle, face mask, respirator, coverall, long boot. Health effects (symptoms) related to pesticide exposure questions are also included. The above variables were selected from a review of the existing literature(31, 39) and some of them are added newly. All of them are considered in to the local farming conditions of the study area.

The district has 16 kebelies in which 2 of them are urban .From 14 rural kebelies 5 of them were selected randomly by lottery method and 654 households were allocated proportionally to selected kebelies based on the amount of household then one study participant( having experience of pesticide application) was selected randomly and interviewed. When participants in the selected household are not found in their home with two consecutive visits, the next household members were interviewed. Data was collected by 3 kebele managers and 6 health extension workers.

#### **5.12. Data quality assurance: -**

Questionnaire was properly designed, prepared in English and translated to Amharic then translated back to English to check for consistency. Pesticide venders, Woreda Agriculture Officers and community members were involved to improve context of questionnaire. Pretest was done on 33 individuals to evaluate questioner. Two important questions (Did you wear PPE while you are assisting spraying person on farm and how long do you wait for pesticide treated crop before selling for consumers ) and some choices( example, mixing of pesticide inside sprayer, mixing of pesticide by using spray lance, mixing of pesticide near to water source, assisting spraying person on farm while he spray, using chemically soaked quintal for storage of crop, mixing of crop with pesticide on plastic sheet) for some questions were added after pretest.

Orientation on objective of the research, data collection process including ethical issues while data collection was given for data collectors (3 kebele managers and 6 health extension workers) additionally practically supported training was given for data collectors at the study area.

### **5.13. Data management and analysis:-**

Data was checked for its completeness from paper of each questionnaire, coded and entered using Epi data version 3.1 and exported to SPSS version 23. Internal consistency of data was also checked by observing frequency and assorting (ascending and descending) in SPSS. Bivariate and multivariable logistic regression was computed to test the factors associated with pesticide handling practice. Some variables were categorized for bivariate and multi variable logistic regression analysis. P-value  $<0.25$  was used as a cutoff point to identify candidate variables and p-value  $<0.05$  was used as a cutoff point to identify significantly associated factors of safe pesticide handling practice.

### **5.14. Ethical considerations: -**

Official letter was received from Bahr Dar University School of Public Health and submitted to Guagusa Shikudad Woreda health Office. Then the health office wrote letter for each selected kebelies. Study participants were informed of the purpose, advantage, and disadvantage of the study, with the right to refuse at any stage of the interview. Confidentiality for all the information they provided was assured and informed verbal consent was obtained from study participant prior to interview.

## 6 Result

### 6.1. Socio-demographic characteristics of respondents: -

From 654 selected samples 650 study subjects were participated in this study with the response rate 99.38%. The majority of farmers 638(98.2%) were male and the mean ( $\pm$ SD) age was 44.85 (11.60).The minimum and the maximum age was 22 and 82 years respectively.

**Table 2** sociodemographic characteristics of farmers who utilize pesticide in Guagusa Shikudad district 2020(n=650)

Variable	frequency	Percent (%)
<b>Sex</b>		
Male	638	98.2
Female	12	1.8
<b>Age</b>		
18-30 years	69	10.6
31-64 years	542	83.4
$\geq 65$ years	39	6
<b>Educational status</b>		
Unable to read and write	189	29.1
Informal education	235	36.1
Formal education	226	34.8
<b>Size of farm land in hectare</b>		
0.0-0.25	29	4.5
0.25-0.52	99	15.2
0.52-0.90	59	9.1
0.90-1.52	429	66
>1.52	34	5.2

## 6.2 Knowledge of farmers related to pesticide

Out of 650 respondents 633(97.4%) of them had information as pesticide could affect human health. From these respondents 221(34.9%), 330(50.8%) and 80(12.3%) of them had information as pesticides affect health by ingestion, inhalation and eye contact respectively. whereas 3 (0.3%) of respondents were perceive other ways.

**Table 3 knowledge of farmers related to pesticide in Guagusa Shikudad district 2020**

<b>Variable</b>	<b>frequency</b>	<b>percent</b>
<b>information on safe pesticide utilization(n=650)</b>		
<b>Yes</b>	639	98.3
<b>No</b>	11	1.7
<b>Source of information on safe pesticide utilization(n=639)</b>		
<b>Friends</b>	237	37
<b>pesticide sellers</b>	179	28
<b>Agricultural officers</b>	155	24
<b>reading labeling</b>	69	10.8
<b>training on pesticide utilization (n=650)</b>		
<b>Yes</b>	22	3.4
<b>No</b>	628	96.6
<b>Awareness on license availability for pesticide seller (n=650)</b>		
<b>Yes</b>	235	36.2
<b>No</b>	415	63.8
<b>Awareness on health effect due to pesticide(n=650)</b>		
<b>Yes</b>	633	97.4
<b>No</b>	17	2.6
<b>Ways of exposure to pesticide(633)</b>		
<b>Oral rout</b>	221	34.91
<b>Inhalation</b>	330	52.13
<b>Eye contact</b>	80	12.64
<b>Other</b>	2	0.32

About 98% of farmers had got information on safe pesticide using in which the source of information was from friends 237(37%), pesticide sellers 179(28%), agricultural officers 155(24%) and from labeling of pesticide container 69 (10.8). But only 22(3.4) farmers had got formal training from governmental organization (health and agricultural sectors) on how to apply pesticide.

### **6.3. Pesticide utilization practice during vegetation stage of crops among farmers in Guagusa Shikudad district 2020**

From 650 respondent farmers 615(94.5%), 338(52%), 417(64%) and 54(8.3%) of farmers were utilize herbicides, insecticides, fungicides and rodenticides respectively (for spray and rodenticides); here more than one type of pesticide utilization was common i.e.96 (14.8%) of farmers utilize one type of pesticide, 338(52%) of farmers utilize two type of pesticide and 216(33.2%) of farmers utilize more than two type of pesticides.

Almost all 638 (98.2%) of farmers buy pesticide from privet venders. 447(68.8%) of farmers buy pesticides together with friends and share later (when sellers do not open pesticide container to sell reduced amount and sell as it is packed from manufacture, it is costly to buy as well as surplus to use it at once for a farmer. So the pesticide stay in one of the farmers house and each of them spray their portion at the same day), 121(18.6%) of farmers buy the reduced amount from sellers (sellers open the pesticide container which is packed by manufacture, to reduce the full quantity in to different smaller quantity and repack with other local container without labeling) and 82(12.6%) of farmers buy the full pesticide container individually even though it is surplus to use it at once.

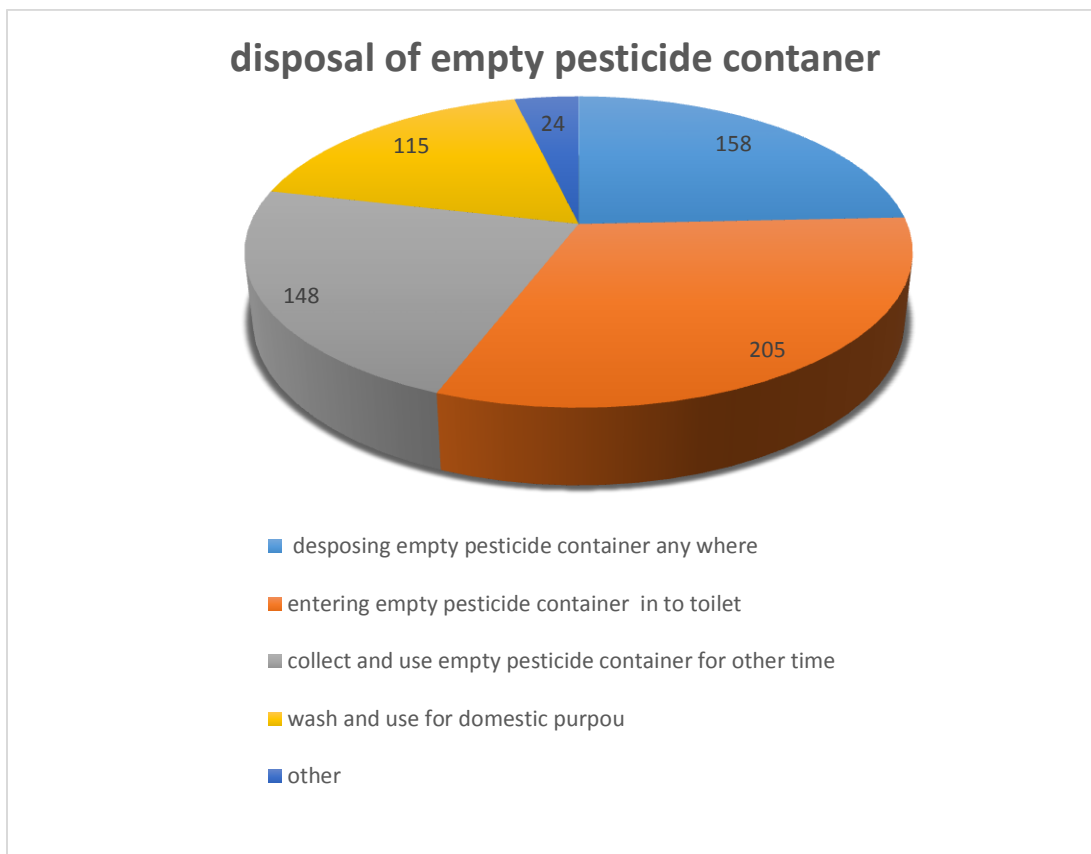
Nearly half 299(46%) of farmers do not read the labeling of manufacture on the pesticide container due negligence 20% and unable to read 60%. Two hundred fifty four (39.1%) and 274(42.2%) of farmers store pesticides in living room and store room with other materials respectively before spray.

**Table 4 safe pesticide utilization practice during growing of crops among farmers in Guagusa Shikudad district 2020**

<b>variable</b>	<b>frequency</b>	<b>Percent%</b>
<b>Place of pesticide storage (n=650)</b>		
Living room	254	39.1
Store room with other material	274	42.2
Kitchen	77	11.8
Other	45	6.9
<b>Containers used to store pesticide (n=650)</b>		
Its own container	468	72
Food utensils	180	27.7
Other	2	0.3
<b>Place of mixing pesticide with water(n=650)</b>		
Living room	12	1.8
Near to water source	220	33.8
On farm	418	64.3
<b>Used materials to mix pesticide with water(n=650)</b>		
Mix inside spray container	366	56.3
Mix inside spray container by using spray lance	219	33.7
Mix by using wooden stick	63	9.7
Mix by using free hands	2	0.3
<b>Considering wind direction while spray(n=650)</b>		
Yes	454	69.8
No	196	30.2
<b>Washing PPE at the day of spray(n=112)</b>		
Yes	36	32.1
No	76	67.9
<b>Washing body immediately as spray completed(n=522)</b>		
Yes	216	41.4
No	306	58.6
<b>Application of PPE while mixing pesticide(n=650)</b>		
yes	56	8.6
no	594	91.4
<b>Application of PPE while assisting other spray person(n=196)</b>		
yes	0	0
no	196	100
<b>Application of PPE while they spray themselves(n=424)</b>		
yes	112	26.4
no	312	73.6
<b>Illness due to pesticide exposure on the day of spray</b>		

yes	391	61.8
no	242	37.2

.One hundred ninety six farmers were assisting the spraying person while he spray pesticide on their farm (they walk in front of him by marking the spraying area i.e. drop leaves to sketch line on the land), out of these farmers none of them were used PPE. From 650 respondents 30 of them not apply spraying but they provide pesticide for other person to spray on their farm land with payment



**Figure 3 Empty pesticide container disposal practice among farmers in Guagusa Shikudad district 2020**

**Table 5 Pesticide utilization practice during storage of crops among farmers in Guagusa Shikudad district 2020**

<b>Variable</b>	<b>frequency</b>	<b>percent</b>
<b>Containers used to store crop (n=650)</b>		
<b>Gota</b>	<b>169</b>	<b>26.1</b>
<b>Chemically soaked quintal</b>	<b>26</b>	<b>4.5</b>
<b>Chemically non soaked quintal</b>	<b>455</b>	<b>70</b>
<b>Insecticide application while storing crops</b>		
<b>Yes</b>	<b>576</b>	<b>88.6</b>
<b>No</b>	<b>74</b>	<b>11.4</b>
<b>Pesticides used for protection of crop from weevil</b>		
<b>powder</b>	<b>357</b>	<b>54.9</b>
<b>Granulate</b>	<b>330</b>	<b>50.77</b>
<b>liquid</b>	<b>153</b>	<b>23.54</b>
<b>Fogger (ethiopoxure)</b>	<b>53</b>	<b>8.15</b>
<b>Place of mixing pesticide with crop while storing(n=576)</b>		
<b>Inside gota</b>	<b>48</b>	<b>8.3</b>
<b>On floor of living room</b>	<b>82</b>	<b>14.2</b>
<b>On plastic sheet in living room</b>	<b>218</b>	<b>37.8</b>
<b>Inside quintal</b>	<b>226</b>	<b>39.2</b>
<b>Other</b>	<b>2</b>	<b>0.3</b>
<b>Waiting period to eat stored pesticide mixed crop(n=583)</b>		
<b>Secured period</b>	<b>220</b>	<b>37.7</b>
<b>Insecure period</b>	<b>363</b>	<b>62.3</b>
<b>Waiting period to eat stored pesticide sell crop(n=583)</b>		
<b>Acceptable period</b>	<b>41</b>	<b>7</b>
<b>Unacceptable period</b>	<b>542</b>	<b>93</b>
<b>Residue reduction(n=583)</b>		
<b>Protected</b>	<b>217</b>	<b>37.2</b>
<b>unprotected</b>	<b>360</b>	<b>62.8</b>

Out of 576 of farmers who utilize pesticide to preserve stored crops, 357 of farmers used powder form pesticide (malathion), 330 farmers used granulate form pesticide (celphose), 153 farmers used liquid form pesticide (diatinon and malathion.) and 53 farmers used spray form pesticide which is called ethio poxure (it is illegal because this pesticide is intended to be used for destruction of anopheles mosquito to prevent malaria but not for crop preservation); here there were farmers who



used more than one type of pesticide. i.e.274 (42.2%) farmers use only one type of insecticide, 288(44.3%) farmers used two type of insecticide and 14(2.2%)

Out of 576 farmers who applied pesticide on store crops; 164(28.47%) of farmers were apply peeling (meshekshek in Amharic), 46(7.99%) of farmers apply washing and 8(1.39%) of farmers apply cooking to reduce pesticide residue from stored crops before consumption whereas 365(63.39%) of farmers did not do anything to reduce pesticide residue from crops before eating. Three hundred eighty three (66.4%) of farmers sell the pesticide mixed store crops for consumers at any time without respecting waiting time to consume.

More than one third of farmers 222(35.1%) were reported as previously they were suffering from illness at the day of spray due to pesticide exposure and only 10.4% of farmers were visited health institution to relief from that illness.

**Table 6 variables used to measure safe pesticide utilization practice of farmers in Guagusa Shikudad District 2020**

<b>Variables used to categories farmers on status of pesticide utilizing practice(safe/unsafe)</b>	<b>frequency</b>	<b>percent</b>
<b>Wearing face mask</b>	27	4.2
<b>Wearing glove</b>	87	13.4
<b>Wearing coverall</b>	79	12.2
<b>Wearing long boots</b>	89	13.7
<b>Disposing empty pesticide container safely</b>	206	31.7
<b>Body washing after spay</b>	217	33.4
<b>Overall safe utilization of pesticides(n=650)</b>		
<b>safe</b>	29	4.5
<b>unsafe</b>	621	95.5

*In the above table, application of more than one safety precaution per farmer is possible.*

Out of this 30 farmers, only 9 of them were safe (dispose empty pesticide container safely and not involved on spraying). From 424 farmers who spray themselves, only 20(4.7%) of them were fulfil the minimum safety handling criteria like apply PPE (wear glove, mask, coverall and long boots), dispose empty pesticide container safely. So among 650 farmers in Guagusa Shikudad District, those who apply all minimum requirement were 29 (4.5%).

**Factors associated with pesticide utilization practice:-**

Educational status , size of farmland, buying option on amount of pesticide, time of reading labeling, history of illness due to pesticide exposure, types of pesticide used at once and awareness on availability of license for seller , were factors with P value < 0.25 in the bivariate analysis which are candidates for the multivariable logistic regression. In the multivariable regression analysis, history of illness due to pesticide exposure, types of pesticide used at once, and. buying option on amount of pesticide were factors with p-value of < 0.05

The study subjects with history of privies illness due to pesticide exposure were 5.68 times more likely to have safe pesticide utilizing practice [AOR = 5.68, 95% CI (1.56, 20.74)] as compared with those who had not history of illness due to pesticide exposure. The study subjects who buy full pesticide container together were 4.10 times more likely to have safe

pesticide utilization practice [AOR =4.10, 95% CI (1.45, 11.61)] as compared with those who buy full container individually. Farmers who use only two types of pesticide at once were 4.44 times more likely to use pesticide safely[AOR = 4.44, 95% CI (1.46, 13.56)] as compared with farmers who use more than two types of pesticide at once.

**Table 7 binary and multiple logistic regression showing candidate variables and associated factors of safe pesticide handling practice among farmers in Guagusa Shikuda District 2020**

variable	category	practice		COR(95% CI)	AOR(95% CI)	P-value
		Safe (%)	Unsafe (%)			
Buying option on amount of pesticide	Buy full container individually	9(11)	73(89)	1	1	
	Buy full container together with friends and share later	14(3.1)	433(96.9)	3.81(1.59, 9.13)	4.10(1.45,11.61)	0.008
	Buy the reduced (reduced in different amount and repacked by sellers) one	11(22.9)	37(77.1)	2.36(0.81, 6.92)	3.46(0.67, 17.93)	0.140
Types of pesticide used at once	More than two types	14(6.5)	202(93.5)	1	1	
	Only one type	8(8.3)	88(91.7)	0.76(0.31,1.88)	2.28(0.46,11.29)	0.312
	Only two type	7(2.1)	331(97.9)	3.28(1.30,8.26)	4.44(1.46,13.56)	0.009
Previous illness due to pesticide exposure	yes	18(4.6)	237(97.9)	2.29(0.83,6.24)	5.68(1.56,20.74)	0.009
	no	5(2.1)	373(95.4)	1	1	
Educational status	Formal education	9(4%)	217(96)	1		
	Unable to read	4(2.1)	185(97.9)	1.92(0.58,6.33)		
	Informal education	16(6.8)	219(93.2)	0.57(0.25,1.31)		
Time of reading	While buying	11(7.3)	139(92.7)	1		
	Before mixing	7(4.1)	164(95.9)	1.85(0.7,4.91)		
	While spray	5(13.9)	31(86.1)	0.49(0.16,1.51)		
Awareness on availability of license	no	12(2.9)	403(97.1)			
	yes	17(7.2)	218(92.8)	0.38(0.18,0.81)		
Size of farmland	≤ 1 hectare	21(5.6)	354(94.4)	1.98(0.86,4.54)		
	1 hectare	8(2.9)	267(97.1)			

Hosmer–Lemeshow-good-of fit 0.681

## 7. Discussion

Even though pesticides play an important role in farming to increase the productivity of agriculture, they can cause acute pesticide poisoning as a major problem for those who are directly involved in the handling of pesticides, particularly farm workers in many developing countries. (56)Farmers are routinely exposed to high levels of pesticides while they are storing, preparing, spraying, cleaning up of pesticide spraying equipment and disposing of leftover pesticides and empty pesticide containers.

In this study, the overall safe pesticide handling practice of the respondents was low which is nearly similar to the study done in north Shewa(5%) and Rwanda(5%)(28) (57). But it is lower than the study done in Gondar(36.2%), Kenya(16%), Tanzania(from safety criteria of the study 66.6% do not use PPE at all, only 9% of farmers store pesticide safely, only 20% of farmers calibrate spraying equipment and 28.9 % of farmers dump unwanted pesticide on farm), North Greece(41.1%)(33, 39).(30, 34),

The difference may be due to awareness of safe pesticide handling practice is mainly acquired from their friends and pesticide sellers which is informal and inadequate to have knowledge and also due to lack of training in this study area. More than one third of farmers of this study area report as they had got illness at the day of spray due to pesticide.

Due to very low safe pesticide utilization practice of farmers; more than half of farmers 391(61.8%) were reported as previously they were suffering from illness at the day of spray. Acute poisoning during pesticide application in this study is lower than in the study done in north Shewa(85.94%), Rwanda(90%), and south India(76.02%)(28) (36) (46)

Whenever working with pesticide, application of PPE is very important to prevent body from pesticide exposure. In this study only 19.7% of farmers use at list one type of PPE while working with pesticide (spraying, mixing). It is more than in the study done in North Shewa(9.37%) and Rwanda( only 0.5% of farmers were practically observed as they were using PPE)(28, 36) but it lower than in the study done in Nepal(84%) and Southern India(74%) (42, 46)

When applying spray any one should be sure as there is no children, animals or water sources nearby and can be contaminated(55, 58)(54, 57 in this study, from 196 farmers who assist the other person while he spray , none of them were apply PPE(58)(57)

More than one third (36.2%) of farmers informal educated, 34.8% of farmers are formal educated whereas nearly one third (29.1%) of farmers are unable to read and write. Lower level of education is negatively affects safe pesticide handling practice of farmers due to difficulty to understand safety directions of manufacture written of pesticide containers and calibration while mixing pesticide (Minnikanti Venkata Satya Sai, 2019).

Illiteracy ( unable to read and write ) of respondent in this area is lower than in the study done in Gondar(38.9%), Jima(32.5%) but it is higher than in the study done in Rwanda(17.5%) and south India(25.6%) (27, 31, 36, 39),

Reading the labeling posted on the pesticide container is very important that helps to know about the characteristics of that particular pesticide and prevent pesticide handlers from its poisoning (59). The result showed in this study more than half (54%)of respondents read labeling before application which is more than other studies like north Shewa(13.54%), Egypt(6.2%)(60) and Nepal (61). This may be due to educational status i.e. in this study farmers who are unable to read and write were below one third where as in Egypt more than half of farmers were unable to read and write

Since farmers exposed to pesticide in farming through inhalation, skin contact, ingestion, eye contact (56), they should apply PPEs like hat, goggle face mask, respirator, coverall long pant and long boots. The result in this study area reviled that application of PPE was low (26.4%)which is lower than other studies done in south west Ethiopia(52%), Nigeria(67%) but almost it is similar to a study done in south India(26%) (49, 62) (31) . The difference may be due to higher educational level among farmers in Jima and Nigerian farmers.

To apply PPE properly while spraying pesticide and to prevent pesticide handlers from exposure, it is better to get formal training from professionals(63). The result from this study shows that farmers who had got training on pesticide spraying was low(3.4%) and it is lower than other studies done in Egypt(23.3%) (60) and Nepal(17%) (64)

Even though not well implemented, Pesticide registration and regulation policy is important for a country to control the flow or application of pesticides in safer way (appropriate pesticides should be sell out by appropriate and legalized person at their proper time of function).(65) Providing license for venders and controlling them how they are working is one of the activity

of this policy(26). Knowing the pesticide sellers whether they are legalized or not is important for farmers to get appropriate pesticide, because there may be illegal vendors that may sell illegal pesticides (66). The study done in this study area showed that more than half (63.8%) of respondents do not know whether pesticide sellers are licensed or not (if sellers are not licensed they are practicing illegally and they may sell illegal pesticides which causes serious health problems).it is lower than the study done in north Shewa (77.6%)(28)

Knowing pesticides as they are poisons is helpful to prevent exposure for pesticide handlers. Study done in this area revealed that most (97.4%)of farmers had awareness as pesticides can affect human health which is more than the study done in central rift valley Ethiopia(76%), Nigeria(71.4%), north Greece(25%) (62, 67) (68). This difference may be, most of farmers of this study area get awareness about safe pesticide handling practice informally from their friends and pesticide sellers easily.

Storage of pesticide in safer place (locked cabinet, well ventilated utility area or garden shed) is very important to prevent contamination and poisoning due to pesticide exposure(69).Among the participants of this study area, nearly half (42.2%)of them stored pesticide with other household materials at their home until application and more than one third of respondents store in living room which is unsafe. It is more than in the study done in north Shewa(37.5%)(28) but it is lower than in the study done in Tanzania (79% store at home and only 9% of farmers store safely)(34)

Since empty pesticide containers contains 2% pesticide left in the packaging material (67) it should be disposed safely to prevent contamination of environment(soil ,water bodies) and exposure of humane(70). Based on guidelines empty containers should be collected safely and send to factory for recycling but never be burned, burial or apply for domestic purpose(71) . In this study nearly one fourth (17.7%) of farmers reported as they reuse the empty pesticide containers for domestic purpose as other utensils which is a great cause of exposure. Almost similar to studies done in Gondar(16.4%)(39) but lower than a study done in Nigeria(53.3%)(35) and more than in study done in Kuwait (6%)(72). This may be due to lack of knowledge about pesticide containers that residual chemicals could present in the container and due to lack of hazardous collection site easily accessible by farmers.

Buying only the recommended amount of pesticide is helpful to avoid storage of leftover

pesticide which is risk for contamination; in this study most(68.8%) farmers buy the recommended amount of pesticide together with friends from vendors and share it while they are spraying, and some(12.6%) other respondents buy alone the full container (having surplus amount of pesticide) and either they use the leftover pesticide on other time or they sell for other individuals by using local container (without labeling). Nearly one fifth (18.6%)of farmers buy only the reduced amount which is prepared and repacked by sellers which is lower as compared in the study done in Nigeria(83%)(35)

Washing, peeling and cooking of pesticide mixed crops as well as vegetables before eating is important to reduce residues and health effect of pesticides(73) .in this study more than half of farmers not attempt to reduce residue by any means.

As much as possible it is better to eat organic food crops as well as to use pesticides with less toxicity level to prevent toxicity(74) (75). In this study more than half of farmers used Malathion powder (WHO toxicity category II i.e. moderately toxic), diathinon liquid form (WHO toxicity category II), half of farmers used celphos/tanphose and considerable numbers (one tenth) of farmers used ethiopoxure for prevention of weevil. Here Etiopoxure is used for distraction of anopheles mosquito to prevent malaria .i.e. it is illegal to apply it on food crops in which it is poisons pesticide for human.

As the witness from respondents they mix wheat with diathinon to prevent crop from weevil distraction, on other time they soak wheat in to water to make malt for preparation of local alcohol but it was not germinate due to diatinon. On other situation, farmers were sow the wheat (which was mixed with diatinon) for harvesting, still it was not germinate. So it is possible to imagine how diatinon affects wheat and should be also consider effect on human health.

Waiting a recommended period after mixing insecticides with crop as well as on grasses for livestock production is important to reduce residue (76). Most farmers in this study wait at least two months before consuming insecticide mixed stored crops (which is important to reduce concentration of insecticides residue from crop) but more than half of respondents 58.9% did not wait any time to sell insecticide mixed crops for consumers and 24.5% of farmers wait less than two month before selling insecticide mixed stored crops which is risk for consumers to be poisoned by pesticide residues.



## **8 Limitation: -**

Since the season in which data was collected is not the time of spray, it was difficult to observe the farmers and this may affect the finding to recall bias. And involvement of health extension workers in data collection, a little bit might lead to bias.

## **9 Conclusions: -**

Very low proportion of farmers in Guagusa Shikudad District were use pesticide safely. Complete (covering all parts of body) application of personal protective equipment among these farmers is also low. Acute poisoning due to pesticide exposure was relatively high. Consumers are at high risk for pesticide exposure because most of study participant sell pesticide mixed crops without respecting recommended waiting period.

History of illness due to pesticide exposure, types of pesticide used at once, and buying option on amount of pesticide were identified as the factors associated with safe pesticide utilization practice among farmers working in agriculture

## **10 Recommendations: -**

To safe farmers from pesticide exposure, Guagusa Shikudad Woreda Agricultural office shall provide training for farmers on how to utilize pesticide safely and supportive supervision while farmers spray on their farm. Or it is also possible to train some individuals from pesticide users that sued as a model for other farmers

Guagusa Shikudad Woreda Health Offices also shall to provide health education for farmers on health impact of unsafe pesticide utilization.

## 11. Reference

1. Affairs PDoUNDoEaS. World Population Prospects 2019: Highlights UNITED NATION: 2019.
2. <WDR 2008 - English.pdf>.
3. Zhang W. Global pesticide use: Profile, trend, cost/benefit and more. Proceedings of the International Academy of Ecology and Environmental Sciences. 2018;8(1):1.
4. Lebleu T. Future of Farming: How technology is transforming food production. Climate Nugget March 06, 2019.
5. FAO. ENVIRONMENTAL AND SOCIAL MANAGEMENT GUIDELINES  
2014.
6. NPIC. types of pesticides. national pesticide information center. january 28,2020.
7. I. PEKaEN. Pesticide Safety around Animals. January 2019.
8. Organization WH. Global vector control response 2017–2030 2017.
9. Petrutz DC. The Benefits of Pesticides A Story Worth Telling2006.
10. Beyene Negatu<sup>1</sup>, Hans Kromhout<sup>1</sup>, Yalemshay Mekonnen<sup>3</sup> and Roel Vermeulen<sup>1</sup>. Use of Chemical Pesticides in Ethiopia: A Cross-Sectional Comparative Study on Knowledge Attitude and Practice of Farmers and Farm Workers in Three Farming Systems Ann Occup Hyg, . 2016.
11. wki. HOW TO HANDLE AND APPLY PESTICIDES SAFELY. wikiHow. OCTOBER 3,2019.
12. Control AI. safe handling and application of pesticides.
13. Standards FlaE. SAFE HANDLING AND APPLICATION OF PESTICIDES.
14. Sarwar\* M. The Dangers of Pesticides Associated with Public Health and Preventing of the Risks International Journal of Bioinformatics and Biomedical Engineering 2015;1(2):130-6.
15. Iriti M, Vitalini S. Sustainable Crop Protection, Global Climate Change, Food Security and Safety—Plant Immunity at the Crossroads. Vaccines. 2020;8(1):42.
16. JENNY SMART JS, JOEY GOEB AND DAVID TSHHIRLEY. High pesticide use among smallholders in africa south of the sahara poses risk for health, environment. IFPRI. november 14,2018.
17. Pariona A. <top pesticide using countries>. world atlas. April25,2017.
18. FAO. Environmental and SOCIALMANAGEMENT GUIDLINES pest and pest management. FAO of the uited nation. 07-2011.
19. Kumelachew Mulu Lohaa ML, Jana M. Weissb, Jacob de Boera,\* Import, disposal, and health impacts of pesticides in the East Africa Rift (EAR) zone: A review on management and policy analysis Elsevier Ltd. 2018;112:322-31.
20. Kim K-hk, Ehsanul, Jahan, Shamin Ara. exposure to pesticide and the associated human health effect,. Science of the Total Environment. 2017;575:525-35.
21. UNEP. global chemical outlook 2012.
22. Dang HV, Nguyen LT, Tran HT, Nguyen HT, Dang AK, Ly VD, et al. Risk factors for non-communicable diseases in vietnam: a focus on pesticides. Frontiers in Environmental Science. 2017;5:58.
23. Bertolote JM, Fleischmann A, Butchart A, Besbelli N. Suicide, suicide attempts and pesticides: a major hidden public health problem. SciELO Public Health; 2006.
24. Sharma A, Kumar V, Shahzad B, Tanveer M, Sidhu GPS, Handa N, et al. Worldwide pesticide usage and its impacts on ecosystem. SN Applied Sciences. 2019;1(11):1446.
25. Mengistie\* BT. Policy-Practice Nexus: Pesticide Registration, Distribution and use in Ethiopia SM Journal of Environmental Toxicology Dec 30, 2016 2.
26. Mengistie B. Policy-practice nexus: pesticide registration, distribution and use in Ethiopia. SM Journal of Environmental Toxicology. 2016;2(1):1006-19.
27. HailayAbrhaGesese<sup>1</sup>, KifleWoldemichael<sup>1</sup>,DesalegnMassa<sup>1</sup>,LillianMwanri<sup>2</sup>. Farmers Knowledge,Attitudes,Practicesand HealthProblemsAssociatedwithPesticide UseinRuralIrrigationVillages,Southwest Ethiopia. PLOS ONE. September13,2016

28. Kalayou H, Amare A. Assessment of pesticide use, practice and environmental effects on the small holder farmers in the North Shoa Zone of Amhara National Regional State of Ethiopia. *Res J Agric Environ Sci*. 2015;2:16-24.
29. Mohammad Hossein Taghdisi<sup>1</sup> BAB, Tahere Dehdari<sup>1</sup>, Fatemeh Khalili<sup>1</sup> Knowledge and Practices of Safe Use of Pesticides among a Group of Farmers in Northern Iran *Int J Occup Environ Med*. April, 2019; Vol 10, ( 2):66-72.
30. Christos A. Damalas <sup>1</sup>, Spyridon D. Koutroubas <sup>1</sup> and Gholamhossein Abdollahzadeh Drivers of Personal Safety in Agriculture: A Case Study with Pesticide Operators. *Agriculture* 7 February 2019;9(34).
31. Kautilya V, Hegde SP, Begum K, Chandrashekar P. Knowledge, attitude and practice of pesticide safety measures among paddy farmers in south India. *Indian journal of forensic and community medicine*. 2017;4(2):138-42.
32. Awad O. Mohamed \*<sup>1</sup> AAM, Ahmed M.A. Hammad <sup>2</sup>, Abd Elaziz S.A. Ishag <sup>2</sup> Ali M. Eldein <sup>3</sup>, Elsadig M. Eltayeb <sup>4</sup>, Asia A. Dahab <sup>4</sup>, Ahmed Abdul Gader <sup>5</sup>, Azhari O. Abdelbagi <sup>2</sup>. knowledg attitude and practice of farmers towards pesticides use and handling in greenhouse farms, sudan. *International Journal of Research - GRANTHAALAYAH* September 2018;6(9).
33. Ngolo Peter<sup>1</sup> NM, Machocho Alex<sup>1</sup> and Oyieke Hilda<sup>2\*</sup>. Pesticides Use in Pest Management: A Case Study of Ewaso Narok Wetland Small-scale Vegetable Farmers, Laikipia County, Kenya. *Journal of Agriculture and Ecology Research International* 2018;14(2):1-8.
34. Elikana E Lekei AVNaLL. farmers knowledge,practice and injuries associated withpesticide exposure in rural farming villages in tanzania. *BMC Public Health* 2014;14(389).
35. Adesuyi Adeola Alex<sup>1\*</sup> NKL, Akinola Modupe Olatunde<sup>1</sup>, Nnodu Valerie Chinedu<sup>2</sup>. Pesticides related knowledge, attitude and safety practices among small-scale vegetable farmers in lagoon wetlands, Lagos, Nigeria *Journal of Agriculture and Environment for International Development*. 2018;112(1):81-99.
36. Benjamin Ndayambaje <sup>1</sup>, \*, Hellen Amuguni <sup>3</sup>, Jeanne Coffin-Schmitt <sup>3</sup>, Nancy Sibö <sup>1</sup>, Martin Ntawubizi <sup>4</sup> and Elizabeth VanWormer <sup>2,5</sup> Pesticide Application Practices and Knowledge among Small-Scale Local Rice Growers and Communities in Rwanda: A Cross-Sectional Study. *international jornal of environmental research and public health* November28, 2019;16(4770).
37. ManarDemein Mohammed<sup>1</sup> SABE-D, RefaatRaouf Sadek<sup>3</sup>,AwatefAbdelrazek Mohammed<sup>4</sup> Knowledge, Attitude and Practice about the Safe Use of Pesticides among Farmers at a Village in MiniaCity, Egypt *IOSR Journal of Nursing and Health Science (IOSR-JNHS)* e. May-June .2018; 7 (3):68-78.
38. Kalayou H, Amare A. Assessment of pesticide use, practice and environmental effects on the small holder farmers in the North Shoa zone of Amhara national regional state of Ethiopia. *Research Journal of Agricultural and Environmental Sciences*. 2015;2(2):16-24.
39. Chalie Mequanint BG, Yonas Mindaye, Dagnachew Eyachew Amare, Tadesse Guadu and Henok Dagne\* Practice towards pesticide handling, storage and its associated factors among farmers working in irrigations in Gondar town, Ethiopia, 2019. *BMC Research Notes*. 2019;12.
40. Emine Selcen Darçın MD, Murat Alkan and Gürdoğan Doğrul. Occupational Risk Factors for Acute Pesticide Poisoning among Farmers in Asia. *IntechOpen*. 2017.
41. Mustapha F.A. Jallow \* DGA, Mohammed S. Albaho, Vimala Y. Devi and Binson M. Thomas Pesticide Knowledge and Safety Practices among Farm Workers in Kuwait: Results of a Survey. *International Jornale of Environmental Research Public Health* 2017;14(340).

42. Jhalendra P. Rijal 1 I, Rajendra Regmi 2, Rajan Ghimire 3 ID , Krishna D. Puri 4 ID , Sudan Gyawaly 5 and Sujata Poudel Farmers' Knowledge on Pesticide Safety and Pest Management Practices: A Case Study of Vegetable Growers in Chitwan, Nepal. *Agriculture* 2018;8(16).
43. Lamichhane R, Lama N, Subedi S, Singh SB, Sah RB, Yadav BK. Use of pesticides and health risk among farmers in Sunsari district, Nepal. *J Nepal Health Res Counc.* 2019;17(1):66-70.
44. Mengistie BT, Mol APJ, Oosterveer P. Pesticide use practices among smallholder vegetable farmers in Ethiopian Central Rift Valley. *Environment, Development and Sustainability.* 2015;19(1):301-24.
45. Ayuk B. Tambe<sup>1</sup>, Baleba M. R. Mbanga<sup>1</sup>, Dapi L. Nzefa<sup>3</sup> and Medoua G. Nama<sup>1</sup>. Pesticide usage and occupational hazards among farmers working in small-scale tomato farms in Cameroon *Journal of the Egyptian Public Health Association* 2019;94(20).
46. Minnikanti Venkata Satya Sai GDR, R. Ramya, Ann Mary Swaroop, Eswaran Maheswari, and Mudigubba Manoj Kumar. Knowledge and Perception of Farmers Regarding Pesticide Usage in a Rural Farming Village, Southern India. *Indian J Occup Environ Med.* 2019;23(1):32-6.
47. Juliana A. Pesticide-handling practices among smallholder Vegetable farmers in Oyo state, Nigeria. *Scientific Research Journal.* 2015; Volume III,( Issue IV, ).
48. Ratana A. factors affecting use of PPE and pesticide safety practice a systemic review. *environmental research.* 2020.
49. Gesesew HA, Woldemichael K, Massa D, Mwanri L. Farmers knowledge, attitudes, practices and health problems associated with pesticide use in rural irrigation villages, Southwest Ethiopia. *PloS one.* 2016;11(9).
50. Damalas CA, Koutroubas SD. Farmers' training on pesticide use is associated with elevated safety behavior. *Toxics.* 2017;5(3):19.
51. Sharifzadeh MS, Abdollahzadeh G, Damalas CA, Rezaei R. Farmers' criteria for pesticide selection and use in the pest control process. *Agriculture.* 2018;8(2):24.
52. Khanal G, Singh A. Patterns of pesticide use and associated factors among the commercial farmers of Chitwan, Nepal. *Environmental health insights.* 2016;10:EHI. S40973.
53. Aynewa Y. estimate genetic variebility of malt barley. *IJAMR.* 2015(2393-8870).
54. <safety pesticide books.pdf>.
55. Jacobs H-ARaR. PESTICIDE HEALTH RISKS FOR SOUTH AFRICAN EMERGING FARMERS. SURPLUS P EOPLE PROJECT. 2016.
56. Kim K-H, Kabir E, Jahan SA. Exposure to pesticides and the associated human health effects. *Science of the Total Environment.* 2017;575:525-35.
57. Ndayambaje B, Amuguni H, Coffin-Schmitt J, Sibó N, Ntawubizi M, VanWormer E. Pesticide Application Practices and Knowledge among Small-Scale Local Rice Growers and Communities in Rwanda: A Cross-Sectional Study. *International Journal of Environmental Research and Public Health.* 2019;16(23):4770.
58. Jacobs H-ARaR. <PESTICIDE HEALTH RISKS FOR SOUTH AFRICAN EMERGING FARMERS>. SURPLUS P EOPLE PROJECT.
59. Flint ML. Pests of the garden and small farm: A grower's guide to using less pesticide: UCANR Publications; 2018.
60. Mohammed M, EL-Din SAB, Sadek R, Mohammed A. Knowledge, Attitude and Practice about the Safe Use of Pesticides among Farmers at a Village in MiniaCity, Egypt.
61. Mubushar M, Aldosari FO, Baig MB, Alotaibi BM, Khan AQ. Assessment of farmers on their knowledge regarding pesticide usage and biosafety. *Saudi journal of biological sciences.* 2019;26(7):1903-10.

62. Adesuyi AA, Longinus NK, Olatunde AM, Chinedu NV. Pesticides related knowledge, attitude and safety practices among small-scale vegetable farmers in lagoon wetlands, Lagos, Nigeria. *Journal of Agriculture and Environment for International Development (JAEID)*. 2018;112(1):81-99.
63. Yarpuz-Bozdogan N. The importance of personal protective equipment in pesticide applications in agriculture. *Current Opinion in Environmental Science & Health*. 2018;4:1-4.
64. Rijal JP, Regmi R, Ghimire R, Puri KD, Gyawaly S, Poudel S. Farmers' knowledge on pesticide safety and pest management practices: a case study of vegetable growers in Chitwan, Nepal. *Agriculture*. 2018;8(1):16.
65. Craig E, Lowe K, Akerman G, Dawson J, May B, Reaves E, et al. Reducing the need for animal testing while increasing efficiency in a pesticide regulatory setting: Lessons from the EPA Office of Pesticide Programs' Hazard and Science Policy Council. *Regulatory Toxicology and Pharmacology*. 2019;108:104481.
66. Soko JJ. Agricultural Pesticide Use in Malawi. *Journal of Health and Pollution*. 2018;8(20):181201.
67. Mengistie BT, Mol AP, Oosterveer P. Pesticide use practices among smallholder vegetable farmers in Ethiopian Central Rift Valley. *Environment, Development and Sustainability*. 2017;19(1):301-24.
68. Damalas CA, Koutroubas SD, Abdollahzadeh G. Drivers of personal safety in agriculture: a case study with pesticide operators. *Agriculture*. 2019;9(2):34.
69. Organization WH. Global situation of pesticide management in agriculture and public health: Report of a 2018 WHO–FAO survey: Food & Agriculture Org.; 2019.
70. etal sA. monitoring pesticied residue in surface and ground water in hangary survey in 1990-2015. *J chem*. 2015(2015:15).
71. Human U. Guidelines for the disposal of empty plastic pesticide containers: chemicals & fertiliser. *Oilseeds Focus*. 2018;4(4):35-.
72. Jallow MF, Awadh DG, Albaho MS, Devi VY, Thomas BM. Pesticide knowledge and safety practices among farm workers in Kuwait: Results of a survey. *International journal of environmental research and public health*. 2017;14(4):340.
73. Kaushik G, Chel A, Gadekar A. Methods of pesticide residues reduction in grains. *Pesticide residue in foods*: Springer; 2017. p. 119-33.
74. marhair@uw.edu. fast factes on health riskof pesticides in food. 2013.
75. who. <pesticid residu in food>. FAO of the uited nation. 2018(0259-2517).
76. Knipling E, Westlake W. Insecticide use in livestock production. *Residue reviews*: Springer; 1966. p. 1-32.

## Appendix

Questionnaires for farmers to assess on safe pesticide handling practice in productive areas of Gagusa Shikudad Woreda

Good morning/ afternoon/Evening. I am from Bahir Dar University College of medicine and health science school of public health, department of general public health.

I am currently conducting a research on farmers on “safe pesticide handling practice in selected areas of Gagusa Shikudad Woreda”. The main purpose of this questionnaire is to assess pesticides handling practice of farmers. Your response is believed to be quite sure and is required for research purposes only.

No need of writing names of respondents.

Do you agree to participate in this survey? 1.  Yes 2.  No If yes, continue

If you have any doubt please call on 09 12 00 29 07 (Getaneh Gashu)



S/No	Questions	Possible Answer	Skip to
101	Age of the farmer	-----	
102	Sex of the farmer	1. Male      2. female	
103	Educational status of farmer	1. unable to write and read    2. Read and write 3. Grade 1 to 8                      4. Grade 9 to12 5. Certificate & above	
104	Size of farm land in hectare	-----hectares	
<b>Part II KNOLEDG RELATED QUASTIONS</b>			
201	Have you ever heard about safe pesticide handling practice?	1.Yes    2.No	If no skip to que.203
202	If yes for qu. 201 where do you get the information?	1.Agricultural office workers    2 .Friends 3. Pesticide seller    4. Pesticide labeling    5.other -- -	
203	how do you know the intended pesticide while you buy	1. By asking seller    2 by reading the labelling 3. I cannot be sure    4. Others.....	
204	Have you ever got training how to spray	1. Yes    2. No	
205	Do you know as the pesticide sellers are licensed or not before buying?	1. Yes 2. 2. No	
206	Do you think pesticides could affect human health	1. Yes      2. No	If no skip to que.301
207	If yes how could they affect?	1.When enter to the body by moth while feeding 2. By entering to the body with respiration 3. eye irritation due to entrance to eye 4. Other---	
<b>Part III SAFE PESTICIDE HANDLING PRACTIC</b>			
301	Which pesticide do you use commonly?	1 Herbicides    2.Insecticides    3. Fungicides 4.Rodenticides    5.Other -----	
302	Where do you get pesticides?	1. Governmental organization 2. Privet venders      3. others -----	
303	How do you buy the required amount of pesticide based on your need?	1.buy together and share later with friends 2.sellers could give us the needed amount by reducing 3. buy alone and use the remaining for other time 4. Buy alone and sell the remaining for others 5. Other-----	

304	Do you read the labeling of pesticide container before handling?	1. Yes 2. No	If no skip to que.306
305	If yes when do you read?	1. When mixing 2. While spraying 3 when buying 4. Other -----	
306	If not read the labeling why?	1.Unable to read 2..Due to labeled by other language 3. Not easily understand 4. No labeling on container 5.Not giving attention-----	
307	Where do you store pesticide	1. Living room 2.store room with other materials 3 kitchen 4. other -----	
308	What container do you use to store pesticide?	1. Plastics/ highlands 2 Its own container . 3. Food utensils 4. other --	
309	Where do you mix pesticide?	1. In the house 2. Near to water bodies 3.At spraying area 4.Other -----	
310	How do you mix pesticide with water?	1. Shaking in sprayer 2. Shattering by using spray lance 3. Shattering by using wooden stick 4. Shattering with free hand	
312	Do you wear personal protective equipment while mixing pesticide	1. Yes 2. No	If no skip to que.313
312	If yes how often do you use? Hat Goggle Face mask Respirator Coverall Glove Protective boots	1.Always 2.sometimes 3 never 1.Always 2.sometimes 3 never 1.Always 2.sometimes 3 never 1.Always 2.sometimes 3 never 1.Always 2.sometimes 3 never 1.Always 2.sometimes 3 never 1.Always 2.sometimes 3 never	
313	Do you consider wind direction while mixing	1.Yes 2.No	If no skip to que.315
314	If yes in what situation do you stand	1. Wind blows away from me with pesticide 2. Wind blows towards me with pesticide	
315	Who apply pesticide spray on your farm land	1. Father 2. Other person with payment 3.Other person with payment and I assist him while spray 4.Other ----	

316	Do you wear personal protective equipment while you assist while other person spray?	1. Yes 2. No	
317	Do you wear personal protective equipment while you spray?	1. Yes 2. No	If no skip to que.320
318	If yes how often do you use the following? Hat Goggle Face mask Respirator Coverall Glove Protective boots	1.Always 2.sometimes 3 never 1.Always 2.sometimes 3 never 1.Always 2.sometimes 3 never 1.Always 2.sometimes 3 never 1.Always 2.sometimes 3 never 1.Always 2.sometimes 3 never 1.Always 2.sometimes 3 never	
319	How often do you wash PPE immediately after spraying	1.Always 2.sometimes 3 never	
320	How often do you wash your body immediately after spraying	1.Always 2.sometimes 3 never	
321	How do you dispose empty pesticide container?	1. Dispose anywhere 2. Insert in to latrine 3. Use for other time 4.Wash and use for domestic purpose 5.Other-----	
322	What do you use to store crops?	1.Gota 2.chemicaly soaked Kuntal 3.chemical free Kuntal 4.Other -----	
323	Do you apply pesticide to protect crop from weevil while storing?	1. Yes 2. No	If no skip to que.329
324	If yes what pesticides do you use	1. Powder (Malathion) 2. liquid form (Diatinon) 3 granular (Celphose) 4.Ethiopoxure(anti malaria spray form) 5. other -----	
325	Where do you mix pesticide with crop while storing?	1. Inside Gota 2. On floor of living room 3. inside the house on plastic sheet 4. inside kuntal 5. other -----	

326	How long do you wait for consumption of stored crops after pesticide application	-----days	
327	When do you sell the stored crop after adding pesticide	1 at any time 2 after one week 3 after two weeks 4 after one month 5 other -----	
328	What is your way to reduce pesticide residue from crops before consumption	1. Washing with water    3. Soaking with water 2. Heating    4.Peeling    5.Nothing to do	
329	Have you ever experience sickness immediately after pesticide application?	1. Yes 2. No	If no stop here
330	If yes which illness do you experience?	1. Headache    2. Dizziness    3.Skin irritation 4.Vomiting    5. Itchy eyes    6 .Shortness of breath 7. Other -----	
331	What measure did you take immediately as illness occurs due to pesticide poisoning?	1.Go to health institution 2.Taking home remedies 3. Take rest without medication 4. Ignore whatever happen 5.Other -----	

ቀበሌ -----

የመጠይቅ ኮድ -----

በንጉሳ ሽኩዳድ ወረዳ ስር ለ ጥናት በተመረጡ ቀበሌዎች ለሚኖሩ አርሶ አደሮች በ ፀረ ተባይ/አረም መድኃኒት አያያዝ ሁኔታ ለማጥናት የሚቀርብ መጠይቅ ።

እንደምን አደራችሁ/ዋላችሁ ! ስሜ ----- እባላለሁ። የባህርዳረ ዩኒቨርሲቲ ህክምናና ጤና ሳይንስ ኮለልጅ ጥናቱን ገምግሞና አፅድቆ እንዲሠራ በፈቀደው መሠረት የአቶ ጌታነህ ጋሹን የጥናት መረጃ ከሚሰበሰቡት አንዱ/ዲ ነኝ ። የጥናቱ አላማም በዚህ ቀበሌ የሚኖሩ አርሶ አደሮች የፀረ ተባይ/አረም መድኃኒት አያያዝ ሁኔታ ላይ ጥናት ለማካሄድ ሲሆን ጥናቱ የመመረቂያ ጥናታዊ ጽሑፍ በመሆኑ የግለሰቦችን መረጃ ምስጢር በሚገባ የሚጠብቅ ነው ። የተጠያቂዎች ስምም እንዲታወቅ አይፈለግም ። የእርስዎ መልስ ለጥናቱ እጅግ ጠቃሚ እንደመሆኑ መጠን ታማኝ የሆነ መልስ እንደሚሰጡን እንተማመናለን ።

ስለዚህ በዚህ ጥናት ተሳታፊ ለመሆን ፈቃደኛ ነዎት ? አዎ ----- አይደለም -----  
መረጃ ለመስጠት ፈቃደኛ ከሆኑ መጀመር ይቻላል።

መረጃ በሚሰበሰቡበት(መጠይቁን ለሚሞሉ) ወቅት መጠየቅ ለምትፈልጉት ጉዳይ ፡-

ጌታነህ ጋሹ ስልክ ቁጥር 09 12 00 29 07



303	የምትፈልጉትን መጠን ያህል የምትገዙት እንዴት ነው?	1. በጋራ ገዝተን በኋላ መካፈል 2. የምንፈልገውን ቀንሰው ይሸጡልናል 3. ሙሉውን ገዝተን የተረፈውን ለሌላ ጊዜ እንጠቀምበታለን 4. ሙሉውን ገዝተን የተረፈውን ለሌሎች እንሸጥላቸዋለን 5. ሌላ
304	የፀረ-ተባይ መድኃኒት ሥራ ላይ ከማዋልዎ በፊት የአጠቃቀም መግለጫውን የነብቡታል?	1. አዎ 2. የለም
305	የ 304ኛ ጥያቄ መልስዎ አዎ ከሆነ የሚያነብቡት መቼ ነው?	1 ከመጠየብዎቻችን በፊት 2. በእርጭት ጊዜ 3. ስንገዛው 4. ሌላ
306	ለጥያቄ ቁጥር 304 መልስዎ የለም ከሆነ የሚያነብቡት ለምንድን ነው?	1. ማንበብ ስለማንችል 2. ትእዛዙ በማናውቀው ቋንቋ በመጻፍ 3. ጽሑፍ/ምልክቱ በቀላሉ የሚረዱት ስላልሆነ 4. እቃው ላይ የተለጠፈ ጽሑፍ ስለሌለው 5. ትኩረት ስለማንሰጠው
307	ፀረ-ተባይ መድኃኒቶችን የሚያስቀምጡት የት ነው?	1. መኖሪያቤት (ሳሎን)                      2. ዕቃ ቤት 3. ከ-ሽና/ማብሰያ/ ቤት                      4. ሌላ ካለ ይጠቀስ -----
308	ፀረ-ተባይ መድኃኒቶችን የሚያስቀምጡት በምን ዕቃ ነው?	1. በፕላስቲክ/ ሃይላንድ ዕቃ                      2. የራሱ በሆነ ዕቃ 3 የምግብ ዕቃዎች                                      4. ሌላ
309	ፀረ-ተባይ መድኃኒቶችን በውሃ የሚበጠብጡት ቦታ የት ነው?	1. መኖሪያ ቤት ውስጥ                      2. ውኃ ካለበት አካባቢ 3. ከሚረጭበት ቦታ                                      4. ሌላ ካለ ይገለጽ-----
310	ፀረ-ተባይ መድኃኒቶችን ከውኃ ጋር ሲያዋህዱ ምን ይጠቀማሉ?	1. በመርጫው ውስጥ ውሃ ጨምሮ መነቅነቅ 2. በመርጫው ዘንግ ማማሰል. 3. በእንጨት ማማሰል.                      4. በባዶ እጅ ማማሰል
311	ፀረ-ተባይ መድኃኒቶችን በምትበጠብጡበት ጊዜ ለሰውነት መከላከያ አልባሳት/ መሣሪያ ይለብሳሉ?	1. አዎ 2. የለም
312	መልስዎ አዎ ከሆነ የሚከተሉትን መቼ ይጠቀማሉ- ኮፍያ /ባርኔጣ መከላከያ መነጽር የፊት መሸፈኛ መተንፈሻ መሳሪያ ቱታ ጓንት ቦት ጫማ	1. ሁልጊዜ                      2. አልፎአልፎ                      3. ተጠቅሜአለውቅም 1. ሁልጊዜ                      2. አልፎአልፎ                      3. ተጠቅሜአለውቅም 1. ሁልጊዜ                      2. አልፎአልፎ                      3. ተጠቅሜአለውቅም 1. ሁልጊዜ                      2. አልፎአልፎ                      3. ተጠቅሜአለውቅም 1. ሁልጊዜ                      2. አልፎአልፎ                      3. ተጠቅሜአለውቅም 1. ሁልጊዜ                      2. አልፎአልፎ                      3. ተጠቅሜአለውቅም 1. ሁልጊዜ                      2. አልፎአልፎ                      3. ተጠቅሜአለውቅም
313	ፀረ-ተባይ መድኃኒት ሲበጠብጡ የንፋስ አቅጣጫን ግንዛቤ ውስጥ ያስገባሉ ?	1. አዎ 2. የለም
314	መልስዎ አዎ ከሆነ የእርስዎ አቋቋም ከንፋስ አቅጣጫ ሁኔታ ምን ይመስላል ?	1. ንፋሱ ወደ እኔ እንዲነፍስ ሆኖ 2. ንፋሱ ወደ እኔ እንዳይነፍስ ሆኖ
315	ፀረ-ተባይ መድኃኒት ከሰብሉ ላይ የሚረጭ ማን ነው?	1. የቤቱ አባወራ 2. በክፍያ የሚረጭ ሰው 3. በክፍያ የሚረጭ ሰው ሆኖ ቦታውን ከእሱ ጋር አየተጓዘን የምናሳየው 4 ሌላ -----

316	የ 315 ኛው ጥያቄ መልስዎ ምርጫ 3 ከሆነ እርስዎ የሰውነት መከላከያ አልባላት ይጠቀማሉ?	1. አዎ 2. የለም
317	እርስዎ በሚረጩበት ጊዜ ለሰውነት መከላከያ አልባላት(መሣሪያ) ይለብላሉ ?	1. አዎ 2. የለም
318	መልስዎ አዎ ከሆነ የሚከተሉትን መቼ ይጠቀማሉ- ኮፍያ /ባርኔጣ መከላከያመነጽር የፊት-መሽፈኛ መተንፈሻመሳሪያ ቱታ ጓንት መከላከያቦት-ጫማ	1.ሁልጊዜ      2. አልፎአልፎ      3 ተጠቅሜአላውቅም 1.ሁልጊዜ      2. አልፎአልፎ      3 ተጠቅሜአላውቅም 1.ሁልጊዜ      2. አልፎአልፎ      3 ተጠቅሜአላውቅም 1.ሁልጊዜ      2. አልፎአልፎ      3 ተጠቅሜአላውቅም 1.ሁልጊዜ      2. አልፎአልፎ      3 ተጠቅሜአላውቅም 1.ሁልጊዜ      2. አልፎአልፎ      3 ተጠቅሜአላውቅም 1.ሁልጊዜ      2. አልፎአልፎ      3 ተጠቅሜአላውቅም
319	የተጠቀሙበትን የመከላከያ አልባላት ወዲያውኑ የማጠብ ሁኔታ	1.ሁልጊዜ      2.አልፎ አልፎ      3 ተጠቅሜ አላውቅም
320	ከርጭት በኋላ ሰውነትዎን የመታጠብ ሁኔታ?	1 ሁልጊዜ      2.አልፎ አልፎ      3 ተጠቅሜ አላውቅም
321	ረጭተው አንደጨረሱ ባዶውን የፀረ-ተባይ መድኃኒት ዕቃ የሚያስወግዱት አንዴት ነው?	1. በማንኛውም ቦታ መጣል 2. ሽንት ቤት መክተት 3. ለሌላ ጊዜ ለመጠቀም ቤት ይቀመጣል 4. አጥቦ ለቤት ውስጥ አገልግሎት ማዋል      5 ሌላ -----
322	እህል የሚያስቀምጡት በምንድን ነው?	1 በጎታ      2. ኬሚካል በተነከረ ኩንታል 3.ኬሚካል ባልተነከረ ኩንታል      4 ሌላ ካለ ይገለፅ
323	የነቀዝ መድኃኒት ይጠቀማሉ?	1 አዎ      2 የለም
324	መልስዎ አዎ ከሆነ ከሚከተሉት ውስጥ የትኛውን ተጠቀሙ(ከ አንድ በላይ መልስ ይቻላል)?	1. ዱቄት (ማላታይን)      2. ፈላሽ (ዲያቲኖን) 3. ቆቆር (ሴልፎዝ)      4. የወባ ትንኝ ኬሚካል 5 ሌላ-----
325	የነቀዝ መድኃኒቱን ከእህሉ ጋር የሚቀላቅሉት የት ነው?	1.ከጎታ ውስጥ      2 ከመኖሪያ ቤት ወለል 3 ቤት ውስጥ በሽራ      4. በኩንታል ከተከተተ እህል 5 ሌላ -----
326	እህሉን ከነቀዝ መድኃኒት ጋር ካቀላቀሉ በኋላ ከስንት ቀን በኋላ ለምግብነት ያውሉታል ?	----- ቀን
327	ከእህሉ ላይ የነቀዝ መድኃኒት ካደረጉ በኋላ ለገበያ የሚያውሉት በስንት ቀን ውስጥ ነው ?	1.በማንኛውም ጊዜ      2. ከአንድ ሳምንት በኋላ 3.ከሁለት ሳምንት በኋላ      4. ከ አንድ ወር በኋላ 5 ሌላ -----
	መድኃኒት ያለበትን እህል ከመመገብዎ በፊት መድኃኒቱን ለመቀነስ ምን ያደርጋሉ?	1.በውሃ ማጠብ      2. በውኃ መዘፍዘፍ      3.ማብሰል 4.መሽክሽክ      5. ምንም አናደርግም
329	የፀረተባይ መድኃኒት ከረጩ በኋላ በዕለቱ የጤና መታወክ አጋጥሞዎት ያውቃል?	1.አዎ 2.የለም
330	መልስዎ አዎ ከሆነ ምን የሀመም ስሜት/ምልክት ነበረብዎት?	1.ራስዎታት      2. ራስ ማዘር      3. የቆዳ ማሳከክ 4.ማስታወክ      5. የዓይን መሳከክ      6. የመተንፈስ ችግር 7.ሌላ ካለ ይጠቀስ -----



331	በፀረ ተባይ መድኃኒት ምክንያት የጤና መታወክ ሲያጋጥም ምን እርምጃ ወሰዱ?	<ol style="list-style-type: none"> <li>1. ወደ ጤና ተቋም ሄድኩ</li> <li>2. ቤት የተዘጋጁ ማስታገሻዎችን ተጠቀምኩ</li> <li>3. ዕረፍት ብቻ አደረግሁ</li> <li>4. ያደረግሁት ነገር የለም</li> <li>5. ሌላካል ይጠቀስ-----</li> </ol>
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## Annex I Declaration forms

### Annex IV.A: Candidate's Declaration Form

This is to certify that the thesis entitled “safe pesticide utilization and associated factors among farmers in Guagusa Shikudad District, northwest Ethiopia”, submitted in partial fulfillment of the requirements for the degree of Master of public health in GMPH in Department of health service management and health economics, Bahir Dar University, is a record of original work carried out by me and has never been submitted to this or any other institution to get any other degree or certificates. The assistance and help I received during the course of this investigation have been duly acknowledged.

**Name of the candidate:- Getaneh Gashu**

Signature .....

Date.....

**Place of submission:** - Bahir Dar University, college of medicine and health sciences, school of public health.

**Annex IV.B: Advisor’s Approval Form**

**Bahir Dar University**  
**College of Medicine and Health Sciences**  
**School of Public Health**

**Department of health service management and health economics**

**Approval of Thesis for Defense**

I hereby certify that I have supervised, read, and evaluated this thesis titled “safe pesticide utilization and associated factors among farmers in Guagusa Shikudad District, northwest Ethiopia” by ----- prepared under my guidance. I recommend the thesis be submitted for oral defense.

Achenef Motbainor

\_\_\_\_\_

\_\_\_\_\_

**Advisor’s name**

Signature

Date

Tebkew Shibabaw

\_\_\_\_\_

\_\_\_\_\_

**Co-Advisor’s name**

Signature

Date

-----

\_\_\_\_\_

\_\_\_\_\_

**Department Head**

Signature

Date

**Annex IV.C: Examiners' Approval Form**

**Bahir Dar University**

**College Of Medicine and Health Sciences**

**School of Public Health**

**Department of General Public Health**

**Approval of Thesis for Defense Result**

As members of the board of examiners, we examined this thesis entitled “safe pesticide utilization and associated factors among farmers in Guagusa Shikudad District, northwest Ethiopia” by ..... We hereby certify that the thesis is accepted for fulfilling the requirements for the award of the degree of “master”.

**Board of Examiners**

External examiner name

Signature

Date

\_\_\_\_\_

\_\_\_\_\_

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\_\_\_\_\_

\_\_\_\_\_

Internal examiner name

Signature

Date

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Chair person’s name

Signature

Date

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