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TITLE: MISUSE OF SOME AGROCHEMICALS BY THE LOCAL FARMERS: THE CASE OF ADEA BERGA DISTRICT, WEST SHOWA ZONE, ETHIOPIA

A THESIS SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES ADDIS ABABA UNIVERSITY IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE DEGREE OF MASTER OF SCIENCE IN GENERAL BIOLOGY.

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Declaration

I, was the under signed student, declared that the thesis on the title "**Misuse of some agrochemicals by the local farmers: The case of Adea Berga District, West Showa Zone, Oromia Regional state, Ethiopia"**, is my original work and that all source of materials that have been used for thesis that referred to or quoted has been dully acknowledged.

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This thesis has been submitted for examination with my approval as the university advisor.

Advisor: Name----------

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ABSTRACT

Agrochemicals are chemicals substances widely used in horticulture, agriculture and public health system both at industrial and domestic level. The study was conducted in Adea Berga districts to assess and analyzing the impact of misusing agrochemicals by the local farmers. Statements of the problem, research question and literature review also assessed to gate full information about the agrochemical misuse. Cross sectional study, descriptive methods designed, 183(one hundred eighty-three) Sample size selected by random sample method and quantitative data analyzed by SPSS software. Survey tools were prepared and distributed to respondents and collected to be analyzed. All most all farmers use all kinds of agrochemicals to gte good products from their farm land, for healing the wounds of some domestic animals like horses about 95.1 %(percents), sheep's 2.2% (percent) and as well as for human about 2.7% (percent's),they use empty container for drinking alcoholic and non alcoholic beverage and about 42.6%(percents), feeding purposes about32.8% (percents), for drinking water about 21.9% (percents) and about 2.7% (percents) for other purposes which cause a significant health problem.

So that the researcher finds the following major findings concerning misuses of some of agrochemicals among the society, using agrochemicals as wound healing and using un determined dose on the farm land, spraying herbicide without using personal protective material which causes a significant healthy problem, risks non target organisms ranging from beneficial soil microorganisms to insects and other animals that create pest resistance, crop losses, Inhibitors of Protein bio synthesis ATP (adenosine triphosphate) formation and reproductive system of flora are major health implications of agrochemical use in the communities as well as permitting children with immature organ in the processes of pesticide spray which is dangerous practice. These misuses may leads to either acute or chronic illnesses to the society. As the result the researcher concludes that agrochemicals should be strictly handled according to the regulations that contribute the reduction of the adverse effects on human health. Adoption of few simple measures such as designing and executive farm extension program for creation of awareness, green environment, the use of biological solution like Biofertilizer and Biopesticide for pest control, minimize the adverse effect of agrochemicals and using space science technology to produce agricultural drones for spraying pesticide on agricultural farm land.

LIST OF ACRONYMS, ABBREVIATIONS ANDKEY WORDS

$	*Dolar sign*
ATP	*Adenosine tri phosphate*
EU	*European Union*
FAO	*Food Agricultural Organization*
GNP	Gross National Product
LD	*lethal dose*
NAPs	*National Action Plans*
OECD	*Organisation for Economic Co-operation and Development*
PAN	*Pesticide action network*
PBs	*protective behaviors*
PPBM	*personal protective behavior and materials*
PPE	*Personal Protective Equipments*
USD	*United state dollar*
USEPA	*United States Environmental Protection Agency*
WHO	*World health organization*

Key words:

*Agrochemical, Pesticide. Fertilizer**,** fungicide**,** algaecide, bactericide,*

Bioaccumulation,

Eutrophication, lethal dose,

Occupational and Para-occupational exposure scenarios

Cholinesterase inhibition

Copper-containing pesticides

Biopesticide

Biofertilizer

Chapter 1: Background of the study

1.1. Introduction

Ethiopia is the second populous nation in Africa with 85% of its population depends on the agriculture that currently contributes 47% (percents) of the GNP (Ethiopian economy, 2015).

The worldwide production and use of chemicals pesticide dates back to the 20th century, increases in the trend from 1940 to 2015 (FAOSTAT, 2018), but applications really took off the mid-1940 and its consumption intensively increase worldwide from 20% in the1960 to 48% in 2005 (FAO, 2020), 2.36 billion kg of pesticides used in 2007 by producing a business worth of $ 40 billion USD this is a fifty fold rise in the amounts of pesticides used since 1950 (EPA, 2011). Pesticides as agricultural inputs introduced in Bangladesh in the 1957 (Islam, 2000) and, in Africa by colonial masters, (Wandiga, 2001). Agrochemicals are chemical substances used to boost agricultural production, control pests and diseases caused by microbes in order to enhance agricultural production and productivity (Sekhotha, 2016) improve shelf life of the product and reduce work force needed for weeding (Cooper and Dobson, 2007) Pesticides use in most of the developing countries reported to be unscientific and unregulated, causing serious damages to the ecosystem and human health (Rola , 1993-1994). Most of African farmers have limited economic incentives and financial resources to afford sophisticated farm machinery; they use manual simple farm tools that further expose them to chemical poisoning with grievous health problem (Ntow, 2006).Agrochemicals residues seep into the surrounding land and pollute the environment which leads to bioaccumulation and health problems (Bhandari ,2014)).Studies in developing countries show that pesticides sprayer mainly done by males than females and female farmer have limited access to pesticide handling as well as trainings (Naidoo, 2010). Occupational pesticide exposure occur directly during mixing pesticides and indirectly while performing re- entry tasks in pesticide treated crops or by take home exposure. Pesticide exposure occurs through the skin, via the respiratory system, or via the mouth and May result in health problems like ocular, dermal, cardiovascular and respiratory effects (Damalas, 2001). This study has initiated to evaluate the updated information about the misuse of some agrochemicals by the local farmers.

1.2. Statement of the study

Pesticides use in most of the developing countries reported to be unscientific and unregulated causing serious damages to the ecosystem and human health (Rola , 1993 - 1994).

It has been, reported that the majority of farmers in Ethiopia do not properly wear protective measures like clothing (Ntow, 2006). A survey was conducted in the1999 indicated that following the aerial spraying of agrochemicals, cows, calves, goats, fish, honey bees, dragon flies, lady beetles , birds and many other useful insects and animals had been seriously affected (Sultana and Nobukazu, 2001). Circumstances of poisoning vary from 27% during spraying, 20% by ingestion (drinking, food contaminated by hands used to manipulated pesticides), 13% in home,7% in the kitchen, and 3% during fishing (Pouokam,2017).

The overuse and unsafe use have now affected the environment on many ways of farmer's life time. Agrochemicals seep into the surrounding land pollutes the environment that leads to bioaccumulation, increase the risk of asthma in humans, may kill bacteria and other organisms beneficial to the soil, and also increase nitrate content in the soil. They also alter pH levels and water physicochemical properties to promote the growth of algae that may lead to Eutrophication as well as water pollution with ultimate death of aquatic organisms. Some farmers also use agrochemicals for healing the wounds of animals like horses, which leads to some adverse health problems (http://enviromental hazard of pesticide). Therefore, the main focus of the present study was to assess the effect of misuse, the knowledge and handling practices of commonly used agrochemicals by the smallholder farmers in the study area.

1.3. Significance of the study

The results of this study will have paramount importance in designing effective protective measures and farm extension program for smallholder farmers during application of agrochemicals. Similarly, the result of this study will also provide important awareness creation among the local society about the unsafe use of agrochemicals and their residues to the environment.

1.4. Scope of the study

This study is limited to some kebele's in Adea Berga district to address the issue of using agricultural chemicals for an unintended use.

1.5. Objectives of the study

1.5.1. General objectives of the study

The general objective of this study was to assess farmers' experiences in misuse of agrochemicals and their posed health impacts

1.5.2. Specific objectives of the study

The specific objectives of the current study were:

- To assess unsafe handling practices and misuse of agrochemicals by house holder farmers
- To identify the awareness level, social, economic characteristics of respondents about the negative effects of using pesticides on their health and other negative impact on the environment

1.6. Research Questions

The study attempts to answer the following questions:

- How do farmers handle agrochemicals and make necessary precautions?
- What are the negative effects of misusing of agrochemicals?
- What are the challenges of using pesticides?

Chapter 2:

2. Literature Review

2.1. Historical background of Agrochemicals

Ethiopia is the second populous nation in Africa with 85% of its population (currently estimated to be at 96.6 million individuals) living in rural areas, depends on the agricultural sector for necessities and as a source of employment. The agricultural sector currently contributes 47% of the Gross National Product (Ethiopian economy, 2015). Agriculture is one of the most important sectors that have experienced a treme ndous significant development worldwide (Larsen, 2017). The practice of agriculture first began about 10000 years ago in the fertile crescent of Mesopotamia in the part of Iraq, Turkey, Syria and Jordan where edible seeds gathered by the population (Hartman , 2004).

It is clear that farmed crops would suffer from pests and diseases causing a large loss in the yield with the ever present possibility of famine for the population. Even today with advances in agricultural sciences losses due to pests and diseases range from 10 – 90% , with an average of 35 to 40% for all potential food and fibred crops (Marcel and Dekker, 2002).

Agrochemicals are chemicals substances like fertilizer, herbicide, fungicide and insecticides that widely sold and used in horticulture, agriculture and public health system both at industry and domestic level to boost agricultural production (Luczka, 2020), used as soil conditioners, acidifiers, and nutrients and used to control pest and diseases caused by microorganisms in order to enhance agricultural productivity and safety. It also improved shelf life of the product and reduced workforce needed for weeding, which frees labor for other tasks (Cooper and Dobson, 2007).

2.1.1. Worldwide Agrochemicals manufacture and use

There was thus a great incentive to find ways of overcoming the problem caused by pests and diseases. The first record use of insecticides is about 4500 years ago by Sumerians who used Sulphur compounds to control insects and mites whilst about

3200 years ago the Chinese were using Mercury and Arsenical compounds for controlling body lice (September 19th centure , 2008). Every year, China uses approximately 1806 million kg of pesticides. India is the 4th largest global producer of agrochemicals after US, Japan and china. The history of pesticide use can be divided into three period of time. During the first period before the 1870s, pests were controlled by using various natural compounds. The first recorded use of insecticides was about 4500 years ago by Sumerians (Smith and Secoy , 1976).

The use of chemicals pesticide for pest control dates back to the turn of the 20th century, but applications took off in the mid1940s after the advent of the insecticide. Since, the 1940 manufacturing, consumption and use of pesticide intensively increase in agriculture across the globe to control a variety of pests and diseases affecting crops from 20% in 1960 to 48% in 2005(FAO, 2015). According to the latest estimates, approximately 2.36 billion kilograms of pesticides used worldwide in 2007, producing a business worth of $40 billion USD – this is a fiftyfold rise in the amounts of pesticides used internationally since 1950(FAO, 2015). According to Food and Agriculture Organization Corporate Statistical Database (FAOSTAT, 2018) world pesticide production shows a steeply increasing trend from 1940 to 2015 (Figure 2.1). For example, total pesticide production has increased from one million metric tons in 1965 to nearly two million metric tons in (Pimentel, 2009).

Approximately 75% of global pesticide consumption occurred in developed countries (Akter , 2009). The consumption of pesticides has been increasing dramatically over the last 3-4 years at a 6% rate and is likely to reach $64 billion by 2017. In terms of its volume, the global market for pesticides projected to reach 3.2 million tons by 2019 compared to 2.5 million tons in 2015. In the EU alone, more than 200,000 tons of pesticides (active ingredients) used annually (Pesticide action network (PAN-Germany, 2012)

Most of the pesticides are used worldwide to protect fruit and vegetable crops, but in developed countries, pesticides are mostly used for maize (PAN-Germany and PAN EU, 2012 (Pimentel, 2009).Projects indicate that Brazil`s agricultural production and associated demand continually increasing for pesticides use for cultivating crops like soybean, sugar, corn, citrus (Sarkar, 2021). EU pronouns some banned chemical

pesticide used by the farmer as DDT, delta HCH, ethylene dichloride and the like (Tijani AA, 2018).

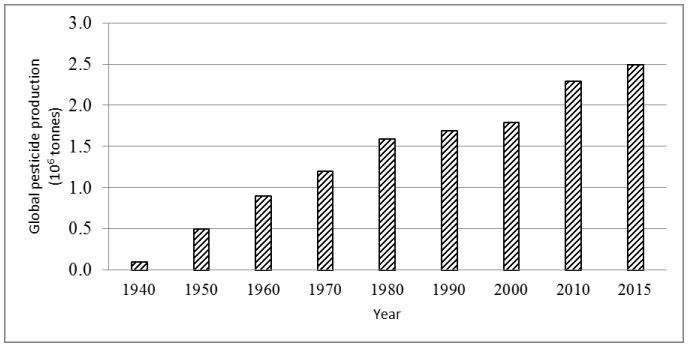

Figure 2.1. Global agro pesticide productions 1940-2015. Source: http://faostat3.fao.org/download/R/RP/E (FAOSTAT, 2018)

2.1.2. Agrochemical interest in importing and use by developing countries

Interests importing and using pesticides emerged with the passage of time and continu ous agricultural developmental process.The FAO statistical database estimated that Africa have imported pesticides from advanced countries like Europe and China (FAOSTAT, 2018).Top 10 countries by import value are Nigeria, South Africa, Ghana, Ivory Coast, Egypt, Kenya, Cameroon, Tanzania, Ethiopia, and Guinea. The amount of import value for these top 10 countries constitutes 85.9% of the total i mport value to Africa from China (Erwin,2015).Pesticide as agricultural input introduced in Bangladesh in 1957 (Islam, 2000)and in Africa by colonial masters (Wandiga., 2001).

By the mid-1990s, developing countries consumed approximately 25% of all pesticides; 13% of this consumption occurred in Asia, 8% in Latin America, and 4% in Africa (Schaerers, 1996).Patterns of pesticide consumption have been shifting as well in developing countries: their global share of pesticide use has doubled in the past three decades, going from 20% to 40% (PANNA, 2006).As there is a large need in developing countries for an increase in agricultural production, the use of cheap, broadly effective pesticides often considered a simple strategy for obtaining better crop yields at relatively low direct costs (Ngowi, 2003).

2.1.3. Agrochemical interest of importing and use in Ethiopia

In Ethiopia, pesticides mainly imported for agricultural purposes, and lesser amounts of pesticides imported for health care (vector control) and industrial purposes. Chemical pesticide use in Ethiopia has been historically low, but due to recent developments in intensification and expansion of modern agricultural activities including commercial horticultural farms such as small-scale irrigated farms, large-scale open farms and cut-flower greenhouses, there has been almost a threefold increase within a decade (1440 to 4586 tons from 2001 to 2013) (Negatu , 2016).

2.2. Types of Agrochemical used in African countries like Ethiopia

Pesticide are classified into three categories (insecticide, herbicide, fungicide) based on the type of pest they act on against insect, weed and fungus that parasites agricultural crops (Journal of Health, 2018). Agrochemicals are chemicals substances widely sold and used in horticulture, agriculture, livestock development, public health system and crop system both at industrial and domestic level to control any pes t, vectors of plants and animals ranging from insects (insecticides), rodents (rodenticid es) and weeds (herbicides) to microorganisms (fungicides, algaecides, or bactericides) (FAO, 2014)). They used to boost agricultural production, improved shelf life of the product and the reduced workforce needed for weeding, which frees labor for other tasks (Cooper and Dobson, 2007).

The choice of pesticides depends on farmers' perception of its efficacy on pests, type and intensity of pests, crops growth stage and availability of pests, crops growth, and the availability of pesticide (Sani, 2000).Pesticides named according to their intended use. For instance; insecticides used to against insects, herbicides against plants and fungicides against fungi. Some insect predators, and certain microorganisms such as bacteria *(Bacillus thuringiensis),* fungi *(Verticilliumlecanii)* and viruses (pine sawfly NPV) also used to kill or control pests.

2.3. Challenges of agrochemical application in developing countries

Agrochemical use in most of developing countries is unregulated, unscientific and unsafe (Rola, 1993). Most African farmers have limited economic incentives and financial resources to afford sophisticated farm machinery to apply agrochemicals hence; they resort to the use of manual simple farm tools such as knapsack sprayers, buckets, brushes, and brooms in the application of agrochemicals (Mekonnen, 2002). They apply pesticides without the appropriate Personal Protective Equipment (PPE) such as nose mask, overall coats, goggles, gloves, Wellington boots, etc, which further exposes them to chemical poisoning with grievous health and environmental consequences (Ntow, 2006). Agrochemicals seep into the surrounding land and water bodies, entering the food chain, which leads to bioaccumulation, asthma, eutrophication and other health problems.

Studies in developing countries show that pesticides sprayer mainly more done by males than females, and female farmers have limited access to pesticide training (Naidoo, 2010). Some farmers admitted their children to spray pesticide without PPM which contributes to their significantly risk of well known deleterious health and development effects of exposure to pesticides.

2.3.1. Occupational exposure and Para-occupational scenarios

Most African farmers have limited understanding, economic incentives and financial resources to afford sophisticated farm machinery for applying agrochemicals; hence, they resort to the use of manual/simple farm tools such as knapsack sprayers, buckets, brushes, and brooms in the application of agrochemicals. It has been reported that majority of the farmers in Ethiopia do not properly wear protective measures like clothing (Ntow, 2006).

Studies in developing countries shows that pesticides spray mainly done by male than females, female farmer have limited access to pesticide training. Peoples living around pesticide chemical spray and worker most frequently linked with pesticide exposure. Occupational and Para- occupational exposures to agricultural pesticides in Africa remain as key concerns that unfortunately poorly addressed (Cauley,2013). Occupational exposure occurred in work places and concerned workers, while para-

occupational exposure refers to exposure of people who may not formally work on farms but live near the sprayed areas (Blewett, 2011).

Some Ethiopian farmer use pesticide residues inappropriately for healing the wounds of animals like donkey, they dump up the residues of pesticide into the surrounding soil, water and use empty container without cleaning gently for drinking and eating purposes which enter food chain, leads to bioaccumulation, eutrophication, water pollution, nutrient imbalance, adverse health problem, asthma, kill bacteria beneficial to soil (Issahaku,2020). Many of these misuses have reported in the field farms because of the absence of a clear instructions, illiteracy of farmers, lack of knowledge on risks from bad uses, uses of pesticides on crop for which the product was not homologated and difficulties to properly prepare the solution to be used, and poor respect of dosage(Bon, 2014) .

Exposure to pesticides occurs while preparing the spray solutions, loading in the spray tank, and applying the pesticide (Dahaba , 2017).Occupational pesticide exposure can occur directly during mixing and pesticide application and indirectly while performing re-entry tasks in pesticide-treated crops or by take home exposure. Pesticide exposure can occur through the skin (dermal uptake), via the respiratory system (inhalation), or via the mouth (ingestion) and may result in health problems like ocular, dermal, cardiovascular, gastro intestinal, carcinogenic, endocrine disruption, developmental, neurological, and respiratory effects (Damalas, 2013).

2.4. Agrochemical exposure and poisoning

The population of the developing countries like Bangladeshis completely protected against exposure to agrochemicals (pesticides) and the potentially serious health effects. Joko(2020)Despite their popularity and extensive use, there is serious concern about health risks arising from the exposure of farmers when mixing and applying pesticides or working in treated fields. From residues of pesticides on food and in drinking water, the health risks for the general population have been raised ((Pimentel, 2005); (Soars and Porto, 2009). In Bangladesh like other developing countries, farmers face great risks of exposure due to the use of toxic chemicals that are banned or restricted in other countries, incorrect application techniques, poorly maintained or totally inappropriate spraying equipment, inadequate storage practices((Asogwa and Dongo, 2009). In addition, several studies have shown that inadequate

product labeling and users' lack of information have led to the widespread overuse and misuse of dangerous pesticides (Bombardi, 2017). In Ethiopia vector control has consequently been intensified in all over the country with Indoor Residual Spray as a method of choice. The adverse health effects of such indoor insecticide sprays that still include DDT.

2.4.1. Pesticide level of poisoning and toxicity classification

Several instances of chronic toxicity or deaths reported among the exposed farm population due to occupational, accidental or intentional poisoning. These risks could be high particularly for those occupationally exposed (Barraza, 2020).

Circumstances of poisoning vary: 27% during spraying, 20% by ingestion (drinking, food contaminated by hands used to manipulate pesticides), 13% occurred at home, 7 % in the kitchen, and 3% during fishing (Pouokam, 2017). Occupational exposure concerned up to 30% of poisoning cases. Common occupational risk factors include absence of personal protective equipment, spraying in a direction opposite to wind, aerial sprayed, pesticides pouring on the skin, pesticides entering in the eyes, noise, and mouth, with respect of the indicated dosage (Dahaba, 2017)

Among the typical symptoms of acute (short-term) poisoning in humans are fatigue, headaches and body aches, skin irritation, eye irritation, irritation of the nose and throat, feelings of weakness, dizziness, nausea, vomiting, excessive sweating, impaired vision, tremors, panic attacks and cramps (Bonvoisin, 2020). Chronic (long-term) poisoning leads to severe health problems, such as cancer, damage to the reproductive system, the liver, the brain, and other parts of the body (WHO, 2009). Pesticides toxicity classifications by the (WHO) vary according to pesticides lethal dose 50 (LD50). LD50 varies from slightly toxic (LD50 > 5000 mg/kg) to extremely toxic (LD50 < 50 mg/kg).The (WHO, 2009)) classifies pesticides in five groups based on their hazard level, ranging from extremely hazardous (class I a), highly hazardous (class I b), moderately hazardous (class II), slightly hazardous (class III) to unlikely to present acute hazards (class U) (Faba and Duffard, 1997).

Table 2.1.Health and environmental hazards of most commonly used pesticides reported by case study farmers in four African countries: Benin, Senegal, Ghana and Ethiopia.

chemical group	WHO Class and acute hazards	Chronic and reproductive effects	Environmental hazards
Endosulfan (organochlorin	Class II Acutely toxic	Endocrine disruptor	Very toxic to fish ar phototoxic to some plants.
Dimethoate (organophosphate)	Class II Acutely toxic Cholinesterase inhibitor	Endocrine disruptor Possible human carcinogen	Toxic to bees and phytotoxic to some plants. water contaminant
Cypermethrin (synthetic pyrethroid)	Class II Mild eye and skin irritant. Possible skin sensitizer	Endocrine disruptor Possible human carcinogen	Highly toxic to fish. Toxic to bees and aquatic i nvertebrates.
Chlorpyrifos (organophosphate)	Class II Acutely toxic Cholinesterase inhibitor	Suspected endocrine Disrupt immune system. Possible birthdefect	Highly toxic to fish and bees. High water pollution risk. Phototoxic to some plants.
Fenitrothion (organophosphate)	Class II Acutely toxic Cholinesterase inhibitor	Endocrine disruptor	Toxic to bees. EU Dangerous Substances List II.
Malathion(organophosphate)	Class III Acutely toxic Cholinesterase inhibitor	Endocrine disruptor. Suggestive evidence of carcinogenicity	Toxic to bees and moderately toxic to fish. EU Dangerous Substances List II.
Glyphosate(phosphonic acid)	ClassIII Slight acute to xicity. Mild eye and skin ir ritant	Suspected endocrine Disruptor	Harmful to fish and aquatic life. Toxic to some soil microbes
Profenofos(organophosphate)	Class II Acutely toxic Cholinesterase inhibitor. Moder ateeye &mild sk in irritant		Toxic to fish and bees. Potential ground water contaminant.
Deltamethrin (synthetic pyrethroid)	Class II Acutely toxic Mild eye irrita nt	Endocrine disruptor Suggestive evidence of carcinogenicity	Toxic to fish and bees.

Source : Adapted from: httt://:www: pdf

2.5. Farmer's perceptions and experience of harmful effects of pesticides

Despite the beneficial effects of pesticides, their adverse effects on environmental quality and human health well documented worldwide and prove to be a major concern on the local, national, regional and global scales (Ntow, 2006). In Africa, PAN-Africa and Pan-UK documented 16 suicide cases in Benin, Senegal, Ghana and Ethiopia in the years 2002-2006 (PAN-UK, 2006 : SCOWN, 2020).

Therefore, changing patterns in the global distribution of pesticide production and use has implications for human health and the environment (Zhang, 2011). This holds especially true in developing countries where good agricultural practices often poorly implemented. Currently, approximately 500 pesticides with mass applications are in use. Of these, organ chlorine pesticides are highly pollutant to the environment. Pesticides commonly take the form of liquids, wet table powders, emulsifiable concentrates, dusts, and when they sprayed; they move through the air and eventually end up in the environment. Only 1% of sprayed pesticides actually reach the target pest, while the remaining 99% should be considered a direct human health threat or a pollutant to the environment (bodies of water, soil, air, and non-target organisms) via drift, volatilization, leaching and run off (Damalas and Eleftherohorinos, 2011). Pesticides used in various types of pests control; remain a big source of air, water and soil pollution, which may negatively affect human health and the living organisms in the environment.

Furthermore, pesticides held responsible for contributing to biodiversity loss and the deterioration of natural habitats. Residues of pesticides contaminate soil and water, persist in crops, enter the food chain, and finally ingested by humans through food and water (Van Den Brink, 2013).Depending on circumstances, exposure may occur through breathing, eating, or drinking or by contact with the skin or eyes. More than 91% of Nigerian farmers reported to had suffered from pesticide related health symptoms during or after applications. Symptoms were nausea, headache, vomiting, eye irritation, and skin problems (Cheke, 2009). (FAO, 2020), about 20 % of the approximately 800 000 people who die from suicide every year do so by ingesting pesticides. A recent study by PAN International assumes that currently, among the1.3 billion farm workers worldwide, approximately 41 million suffer from pesticide poisoning each year with an average poisoning rate of 32% (PAN-Germany, 2012).

In Africa, PAN-Africa and Pan-UK documented 16 suicide cases in Benin, Senegal, Ghana and Ethiopia in the years 2002-2006 (PAN-UK, 2006).

2.6. Mechanism and effect of misuse of agrochemicals in Ethiopia

Eco toxicological studies of the natural environment are necessary. All the pesticides have different mechanism by which they affect the organisms and human. These pesticides remain in the environment for a long time and slowly accumulated. Runoff and erosion are the ways by which pesticides enter the surface waters. In the aquatic animals, the pesticides enter through gills or skin, ingestion, contaminated food. Terrestrial wildlife uptake pesticides by eating contaminated food or water. The pesticides going on accumulating and enter the food chain and affect the food chain of the aquatic animals (Vergucht, 2006).

2.6.1. Effects of agrochemicals on non-target fauna and flora:

Cholinesterase inhibitors (organo phosphorus and carbamates), pyrethroids, and neonicotinoid insecticides are neurotoxic substances. These affect the nervous system of arthropods and various animals. These agrochemicals target the similarities in the neuronal physiology among animals make insecticides toxic not just for the insect target species, but also to other aquatic and terrestrial arthropods and, to a variable extent, to vertebrates. The carbon and nitrogen metabolism is also affected. The pollination efficacy also affected due to reduction in floral visits and a change in community of floral visitors (Vergucht, 2006).

2.6.2. The effects of Herbicides, Fungicides and Insecticides

Herbicides affect the diversity of flora. The young plants are more affected during spray of herbicides. The reproductive system of the plants affected when exposed to maximum doses of herbicides. The spray of agrochemicals drift affects the balance of species from the second year of exposure. This also disturbs the composition of plant species. Herbicides affect various sites in the plants and each herbicide have different mode of action, which is as follows; ***Growth regulators:***The example of growth regulator is 2, 4-dichlorophenoxiacetic acid. The mechanism of 2, 4-D is based on auxin-like capacity. The receptor for auxin will recognize analogues such as 2, 4-D .***Seedling growth inhibitors:*** The examples of seed growth inhibitors are thiocarbamat

es and acid amides. These seed growth inhibitors affect the plant growth and cell division (Huart, 2015). ***Photosynthesis inhibitors:*** The photosynthesis inhibitors examples include herbicides (e.g. triazines, and copper-containing pesticides). These rupture the biomembranes and block the photosynthesis. The highly reactive molecules rupture the biomembranes, and then destroy the cell membranes. The atrazine and copper-containing pesticides blocks electron transport chain in photo system II. This inhibition results in buildup of carbon dioxide (CO_2) within the plant cell. In addition, the magnesium ion (Mg^{2+}) in the chlorophyll is replaced by other ions. ***Inhibitors of amino acid biosynthesis:*** These herbicides inhibit biosynthesis of amino acids. For example, glyphosate (phosphonomethyl) glycine, inhibits biosynthesis of tyrosine, tryptophan, and phenylalanine amino acids (Flores, 1995). Many herbicides inhibit acetohydroxyacid synthase, the first compound that inhibit biosynthesis of valine, leucine, and isoleucine, or 4-hydroxyphenylpyruvate dioxygenase, a key enzyme in tyrosine catabolism and carotenoid synthesis. In addition, there are compounds, which inhibit glutamine synthase that incorporates ammonia (NH_3) onto glutamate.

Fungicides and **insecticides** have shown adverse effect on non-target flora. The spray of fungicides affects the photosynthesis of plants. The **insecticides** also affect the germination and plant growth. ***Cholinesterase inhibition***: Carbamate and organophosp hate insecticides are used to kill insects. These inhibit acetyl choline esterase and kill the insects. ***Chitin synthesis inhibitors:*** These inhibit the chitin synthesis insects and result in early death of the insects. ***Insect growth regulators:*** The insect growth regulators affect the endocrine system of the insects.

Nonspecific growth regulators: The mode of action of nonspecific growth regulators is not known. ***Electron transport inhibition:*** Organochlorine insecticides inhibit the electron transport. Due to this, the energy source ATP generation is also inhibited.

Herbicides chemical designed to kill some plants and herbs species including desirable species and non-target plants if they applied directly, cause sub lethal effects. Phenoxy herbicides, including 2,4-D, can injure nearby trees and shrubs if they drift onto leaves (Flint, 1994) . Exposure to herbicide glyphosate can severely reduce seed quality (Locke,1995). It can also increase the susceptibility of certain plants to disease. This poses a special threat to endangered plant species (Higgins, 1988).

2.6.3. Effects of agrochemicals on vertebrates and invertebrates:

According to there are very few reports on effect of pesticides on reptiles and amphibians. Amphibians and reptiles more affected by agrochemical compared to other vertebrates. The function of thyroid rodents, birds, amphibians, and fish affected by insecticides, herbicides, fungicides, and their immune system also affected.
Insecticides act similar to acetylcholine. They bring paralysis, and death of the insects Neonicotinoids are the most toxic which affect the reproduction and immune system of bees, butterflies and moths and its residues reduces the Larval stage of flies in the soil(Flint, 1994) .

2.6.4. Inhibitors of Protein biosynthesis and ATP formation:

In these, Dithianon are the protein inhibitors. The dithianon change the sulfhydryl group in the proteins and inhibit the germination and germ tube growth. Azoxystrobin prevents electron transfer at the quinone "outside "the site of the cytochrome *bc1* complex, which known as ubiquinol oxidizing, or Qo site, this prevents ATP formation (Flint, 1994).

2.6.5. Levels of agrochemicals in foods

Globally, the use of pesticides in food production is common with many farmer using commercial pesticides for pest control to increase yield and improve quality. The WHO reports that 20% of pesticide use in the world is concentrated in developing countries (PAN G, 2012). Pests and diseases attack fruits and vegetables from cultivation through to storage. Pesticide are used to preserve their quality, productivity and prevent diseases but inappropriate use of pesticide use poses health hazards to consumers (Wang, 2010)Contamination of the lips and mouth or accidental swallowing of agrochemicals is often caused by poor hygiene or bad practice. Failure to wash properly before eating is a common cause, as is smoking during work. Attempting to clean a blocked sprayer nozzle by putting it between the lips and blowing through it is another bad practice. In some countries pesticides and veterinary products are decanted from large and properly labeled containers into unlabelled bottles and sold. These could subsequently be mistaken for soft drinks and consumed. Such practices should be banned. Even very small quantities of a toxic substance

could cause death if ingested in this way. Inhaled toxic substances could subsequently be ingested by swallowing contaminated sputum(Food and Agriculture Organization of the United Nations, Rome).\

2.6.6. Levels of pesticide residues in some highly consumed foods

In most African countries, pesticide residues are not of concerns in agricultural products sold at local markets, on the contrary to export products, which raises more attention. Residues on produce resulting from the inappropriate use of pesticides are however one of the most important food safety concerns (FAO, 2014).

2.6.7. Human health hazard

The links between pesticides and human health were suspected as early as the 1960s and 1970s US epidemiologists observed an unusual rise Hodgkin's Lymphoma in areas of high pesticide use (Gupta, 2012). A number of more recent studies and reviews bring to light some critical health implications of pesticide exposure.

Acute illnesses; The typical symptoms of acute pesticide poisoning in humans are fat igue, headaches and body aches, skin discomfort, skin rashes, poor concentration, fee lings of weakness, circulatory problems, dizziness, nausea, vomiting, excessive sweat ing, impaired vision, tremors, panic attacks, cramps,etc and in severe cases coma and death and cause ***chronic illnesses*** like sarcomas, multiple myelomas, cancer of the pro state, pancreas, lungs, ovaries, breasts, testicles, liver, kidneys, and intestines as well a s brain tumors (Bödeker and Dümmler, 1993), non Hodgkin lymphomas and leukem ia (Alavanja, 2004),Neurological health effects (Gilbert, 2012), Aneuploidy,sex-null - the lack of a sex chromosome: X orY((Emery and Carrell, 2006). Diagnosis of acute pesticide poisoning generally occurs when one or more of these symptoms, which appear in a short time after contact with pesticides, are detected.

2.7. Why farmers Misuse Agrochemicals

This section discusses the key factors that motivate or compel farmers to use agroche micals starting with environmental challenges, Activities of NGOs, Government policies, Lack of labor or high cost of labor, Competition among farmers/modern farming. **Environmental challenges** are one of major factor that compels farmers to use synthetic agrochemicals is worsening environmental conditions link to climate

change. Farmers are responding and increasing their use of agrochemicals despite serious repercussions. In one of the community workshops, farmers expressed concerns with the use of agrochemicals but attributed their use of agrochemicals to the worsening environmental conditions. **Activities of NGOs:** The study found that some farmers in the remote communities introduced to synthetic agrochemicals by N GOs working in their communities. The result confirms earlier studies, which found d eliberate promotion of agrochemicals in Africa. **Government policies** play a major role in directing farmers' activities, aim at helping farmers to address environment ch allenges, provide subsidies to support farmers, and ensure food security, among other impacts. **Lack of labor or high cost of labor:** The study discovered that labor scarcity and the high cost of labor influences farmers' decisions to use synthetic agrochemicals. The finding confirms who found that yam farmers used herbicides to avoid prohibitive labor cost. **Competition among farmers/modern farming:** The study found that competition among smallholder farmers influences their decision to use agrichemicals. For instance, unlike Western countries where there are premium prices for organic foods and farmers given incentives by the government for sustainably producing food such incentives are lacking or not common in developing countries.

2.8. Mitigating measures in use of agrochemicals:

The use of pesticides can have adverse effect on the ecosystem. The tests are performed as per standard guidelines as per the United States Environmental Protection Agency (USEPA) to assess the risk of exposure to pesticides. However, these may not capture the complex interacting effects of repeated exposure of communities to complex mixtures of pesticides. The exposure of dose of agrochemicals should be such that harmful pests, nematodes, weeds, etc. are killed. The European (EU) framework of agri-environmental unit develops schemes, which make minimum use of agrochemicals and thus help to control the population of pests. The use of fipronil and neonicotinoid should be stopped to minimize the environmental and human health risk. The Organisation for Economic Co-operation and Development (OECD) make use of regulatory, technical aspects and best practices. There should be sustainable approach to reduce the use of agrochemicals (for e.g. Integrated Pest Management) (Flint, 1994). All the countries must adopt National Action Plans (NAPs) to set their own policies, legislations, rules, and

objectives to reduce the use of agrochemicals. Therefore, progress needs to be done on sustainable approach.

Strategies of protecting inappropriate use of agrochemicals

FIRST AID A. Eyes – Immediately wash eyes with running water for 15 minutes. The eyelids should be held gently open during the washing process. If irritation develops, call a doctor. B. Skin – Wash exposed areas with plenty of soap and water. Call a doctor if irritation develops. C. Inhalation – If discomfort occurs, remove individual to fresh air. If breathing difficulty occurs, get medical assistance immediately. D. Ingestion – Do not induce vomiting. Wash out the mouth with plenty of water, being careful not to swallow the washings. Treat symptomatically and call a doctor.

2.9. Policies and Regulation on the misuse of agrochemicals

Despite this, pesticide- use policies and regulations are in their infancy pesticide misuse is prevalent in many developing countries. However, Ethiopia has endorsed many proclamations in order to minimize and control occupational and environmental risks in general and pesticides in particular (Pesticide registration and control proclamation number 674/2010 and Environmental pollution control proclamation number 300/2002). Previously conducted pesticide-related Knowledge, Attitude and Practice (KAP) studies in Ethiopia have indicated that farm workers had limited knowledge on pesticide hazards, inadequate awareness about safe pesticide management, and poor hygienic in addition, sanitation practices

CHAPTER 3: Material and Methods

3.1. Description of the study area and sample collection

3.1.1. Description of the Study Areas:

The study was conducted in AdeaBerga district of West Shoa zone. AdeaBergadistrict is located in West Showa zone of Oromia Regional State. The district is bordered with Walmera in the Southeast; Ejerie in the Southwest, Meta Robi in west and Mugger River in the northeast. The map of the study area is given below in a Fig 3.1.

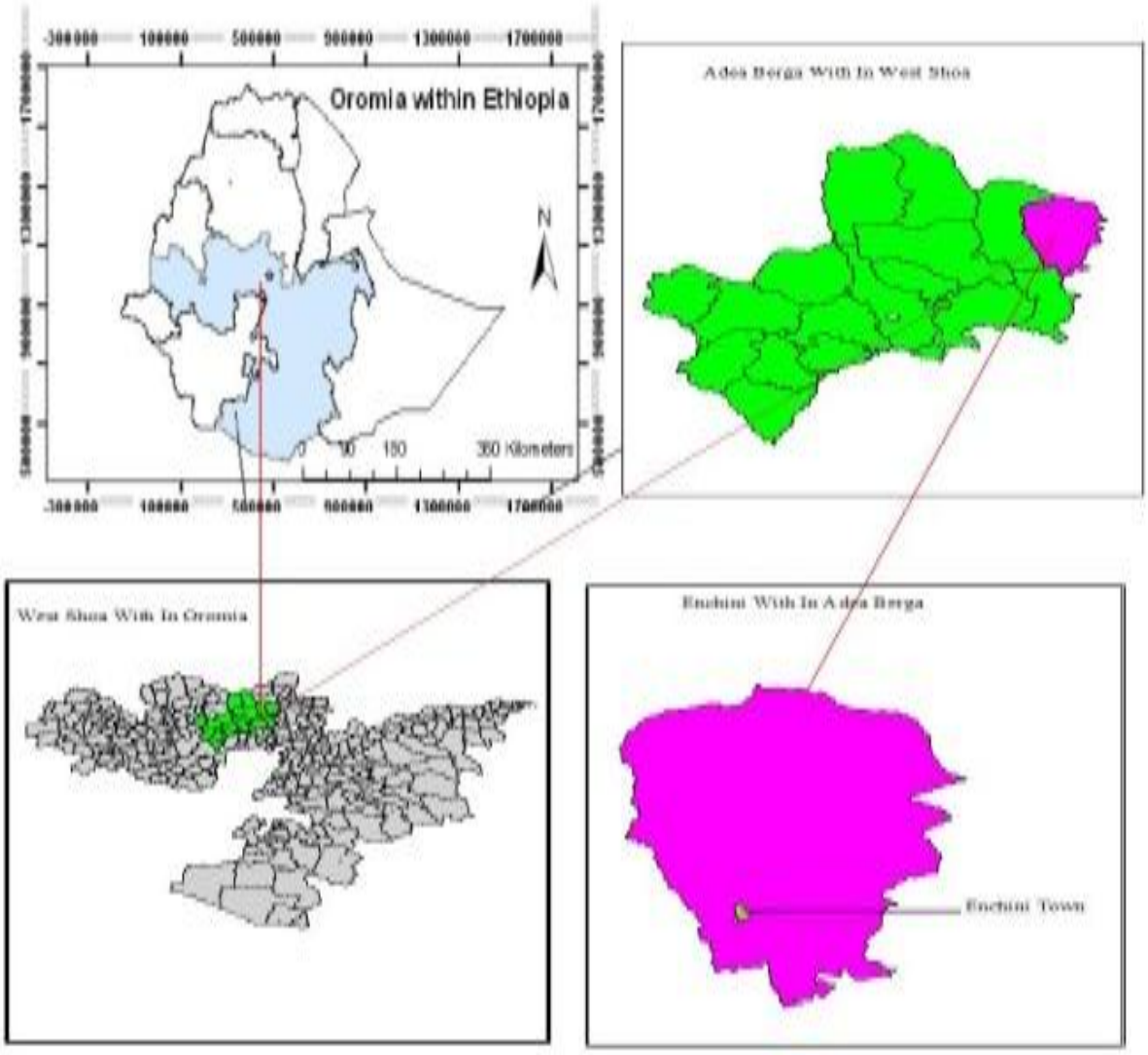

Figure **3.1.The map of AdeaBerga in west Showa from AdeaBerga Agricultural office**

Agro-ecological condition: The district has three agro-climatic zones that include mid land (woinadega 34%), high land (dega; 29%) and lowland (Kola, 37%). Topographically the study areas mainly characterized with leveled fields that make an ideal place for Agricultural activities. The elevation of the district varies from 1500m above sea level to 3580m. The climatic condition of the district is characterized by mid temperature with annual temperature ranges between 16 and 29^{o}C with an average of 22.5°C. The mean annual rainfall of the district ranges from 812 mm to 1099mm ((Agriculture office, 2010). The area occupied with high potential of groundwater and smaller rivers like Berga Abay river basin, and Mugger River, which is essential for eucalyptus~~,~~ trees which grow more by the local people.

Physical and Natural Resources-The land use of the district varies largely~~,~~ where around 44.69% of the land is under cultivation, 18.08 % is pasture land, 1.38% forest land and 35.85% is under other forms such as construction, investment and residence. The major crops are barely, wheat, maize, sorghum, teff, pea, bean and different vegetables, and most households are benefiting from crop production. Recently, the districts characterized by industrial areas where three cement manufacturing industry like Mugar Cement factory, Bedrock Enchini Cement factory and Dangote Cement Factory (Ethiopia) PLC and Brilliant Gypsum Manufacturing PLC are functioning (Adea Berga Economic development, 2010).

Socioeconomic Condition of AdeaBergaWoreda~~:~~ There are two major ethnic groups in the Woreda; these are Oromo and Amhara with Oromo ethnic group being dominant group in terms of population number. According to the population and housing census of 2007, the population of the district was 120,177(males 60,148 and females 60,029) and Agriculture, Crop/livestock mixed production system are the major economic activity of the district (CSA,, 2007).

3.2. Research Design and Methodology

A cross-sectional study and descriptive research design were used to identify, address the problem, gather various kinds of data from farmers using data gathering tools such as questionnaire, interview ((Beins and Khan, 2004).

3.2.1. Methods of Sample and Data Collection

The researcher collected samples by using and two-survey tools i.e., interview, and questionnaires used to collect relevant information about the misuse of agrochemicals from respondents. The respondents were stratified into four groups namely farmers, a gricultural expert, pesticide suppliers and kebele manager.Primary data were collected from farmers using questionnaires and interview about the misuse of agrochemicals. Oral questions were prepared for illiterate farmers, while educated respondents were self-administered (Graziano & Raulin, 2004)

3.3. Population of the study subjects

The populations of study were residents of Adea Berga district in two kebeles. The respondents were stratified into four groups, namely; educated and non-educated farmers, agricultural expert, pesticide suppliers and kebeles` managers. Self-administered questionnaires distributed to educated respondents, whereas oral question prepared and read by the researcher for illiterate farmers. Finally, their responses recorded on each questionnaire**.**

3. 3.1. Sampling and sample size determination Techniques:

From the total of 22 kebele`s; 2 kebele's (Maru Chobot and Sire Barga) will be selected purposively due to the instabilities of peace and security of other kebele's. The researcher believed that the sample sizes of two kebele's are representative of all kebele's of the district.

From 680 total numbers of populations of the district the researcher used half of (50%) of the total number of the population to determine the sample size for which questionnaires distributed. The researcher used 50% of 680 means 340 populations and 183 sample sizes calculated based on Yamane`s formula bellow.

The total number of population 340 house holder farmer drawn from two kebele's of the district.From these, 300 male and 40 female respondents (152 male and 20 female

farmer from Maru Chobot and 142 male and 18 female household farmers from Sire Berga) and three (2 male 1 female) Agricultural experts, 3(2 male 1 female) Farm uni

on herbicide suppliers and two kebele's manager were selected by simple random sa mpling techniques (table of random number) (Kazdin, 1992).

The researcher selects even numbered householder farmer residents lists from the two kebele's of managers 'name lists of household farmers by sampling technique to distribute questionnaire for them. The sample size for this research calculated based on Yamane's formula (Yamane, 1967).**N =N÷1+Ne^2, Were, n= the sample size, N=t he size of population, e= the error of 5 percentage points.**

The size of population N=340, e= 5, n=? n= N/1+N e^2 the sample size for this research would be: n= 340/1+340(0.05)^2= 34 0/1+ 340X 0.0025=340/1+0.85=340/1.85=**183.78**. Percentage of 100= 300x 100/340=88.3% male and % 100= 40 x 100/340=11.7% female respondents selected in order to collect relevant information about the misuse of Agrochemicals at Adea Berga Woreda.

Finally, 183.78 (88.3%) males and 183.78(11.7%) females in the sampled kebele's were selected in order to collect relevant information about the misuse of Agrochemicals at Adea Berga Woreda.

Table 3.1 Summary of population, sample size and sampling techniques

No	Types of respondents	Gender	Population size	Sample Size		Sample technique	Justification
				Size	%		
1	F a r m e r	M	294	169		Random sampling Table of random numl Or lottery method	Even numbered lists of Maru Cobot Sire barga
		F	3 8	3 4			
		T	332	181			
2	Agricultural expert	M	2	1		Random sampling	Agricultural expert
		F	1	1			
		T	3	2.9			
3	Pesticide supplier	M	2	1		Random sampling	Herbicide supplier
		F	1	1			
		T	3	2.9			
4	Kebele's manager	M	2	1.99		Random sampling	Maru Cobot and Sire barga
		F	-				
			2	1.99			
	T o t a l	M	300	171	8 9		
		F	4 0	3 6	1 1		
		T	340	183	100%		

3.6. Data gathering Instruments

The data were gathered using questionnaires and interview. Questionnaires either distributed to or orally read for the selected participants but interview was held with selected individuals to get in-depth information on agricultural practices, and marketing in each of the study site (Josep and Jegede, 1999).

3.6.1. Questionnaires

A questionnaire based on cross-sectional study design was employed to look at the perception and awareness of the respondents about misuse of agrochemicals. It would be the favored tool to obtain quantitative data; collect data in a structured and manageable form, opinions from many respondents that easily and quickly analyzed once completed and better to reduced ambiguity and biased conclusion and interpretation. The researcher used combined structured, close and open ended questionnaires to collect data from farmers and agricultural experts. The questionnaires contained certain items from background information of the respondents to problems of misusing agrochemicals. Both 23 close and 33 open-ended Self-administered questionnaires including oral questionnaires were prepared in English and Afan Oromo languages, then distributed, and collected from respondents. The researcher requested non-educated respondents orally and recorded their responses (Kazdin, 1992).

3.6.2. Interview

Researcher used an interview questions that would be prepared to make communication easier, active and flexible with respondents, in which new questions might be raised during the interview. It helped to counter check the information obtained from the questionnaires. The interview was conducted in English or translated to Afan Oromo language, when necessary. Two Kebele's managers, agricultural expert and pesticide suppliers were interviewed separately for an hour. Interview notes were taken, summarized and organized.

Pilot Studies

Pilot test was conducted by involving some additional 10 respondents. Based on the pilot test, some comments were included to improve the clarity of some statements, grammatical structures, and interpretation of the findings. Then, the revised questionnaires administered to the study subjects orally.

3.7. Methods of Data Analysis

Quantitative data were collected via data collection instruments to make it manageable for interpretation and analysis. The quantitative data obtained through questionnaires edited, categorized and tabulated to be analyzed using appropriate descriptive statics. The percentage and frequency value types of statistical techniques used to analyze the data secured through close and open ended questionnaires. The scores of each item were organized, statistically compiled and entered into SPSS to obtain the frequency, percentage mean values and standard deviation of each item. The result of closed and open-ended questions were summarized, organized, analyzed and interpretated (Josep and Jegede, 1999)**.**

CHAPTER FOUR

4. Results and Discussion

The first part of this section provides the personal characteristics of the respondents. The second part dealt with the analysis and interpretation of the data acquired through questionnaire and the third part dealt with analysis of interview.

4.1. Demographic Characteristics of the Respondents

This sub- section treats the profile of the respondents with regard to their demographic characteristics of the population like sex, age, occupation, level of education. The discussions of proportions and the results of each demographic characteristic and statistical analyze were given below in the table 4.1,to 4.3.1 with each explanation of the statistical data under each table

Table 4.1. The respondent's demographic characteristics

Item		Category	Descriptive Frequency				Descriptive Statistics		
			ncy	Percent	Valid Percent	ative Percent	Mean	SD	
1	Sex	Male	152	83.1	83.1	83.1	1.17	.376	
		Female	31	16.9	16.9	100.0			
		Total	183	100.0	100.0				
2	Age	25-50	97	53.0	53.0	53.0	1.51	.582	
		51-75	78	42.6	42.6	95.6			
		Above 76	8	4.4	4.4	100.0			
		Total	183	100.0	100.0				
3	Religio n	Orthodox	79	43.2	43.2	43.2	1.66	.635	
		Protestant	88	48.1	48.1	91.3			
		Other	16	8.7	8.7	100.0			
		Total	183	100.0	100.0				
4	Ethinici ty	Oromo	143	78.14	78.14	78.14	1.28	.568	
		Am	29	15.85	15.85	93.99			
		Other	11	6.01	6.01	100.0			
		Total	183	100.0	100.0				
5	Marital status	Married	120	65.57	65.57	65.57	1.76	1.128	
		Separated	10	5.46	5.46	71.03			
		Divorced	30	16.39	16.39	87.42			
		Widowed	23	12.57	12.57	100.0			
		Total	183	100.0	100.0				
6	Family size	<=5	96	52.46	52.46	52.46	1.58	.688	
		6-10	67	36.61	36.61	89.07			
		>=11	20	10.93	10.93	100.0			
		Total	183	100.0	100.0				

Item		Category	Descriptive Frequency				Descriptive Statistics		
			ncy	Percent	Valid Percent	ative Percent	Mean	SD	
7	Educational level	Illiterate	100	57.2	57.2	57.2	1.91	669	
		Certificate	50	31.5	31.5	88.7			
		Other	33	22.7	22.7	100.0			
		Total	183	100.0	100.0				
8	Farm land	<1 hectare	9	4.92	4.92	4.92	3.17	.889	
		1-5hectare	32	17.49	17.49	22.41			
		5-10hectar	61	33.33	33.33	55.74			
		>10hectar	81	44.26	44.26	100.0			
		Total	183	100.0	100.0				
9	Farming practice	Crop	5	2.73	2.7	2.7	2.92	.355	
		Animal	4	2.19	2.2	4.9			
		Mixed&trad	174	95.08	95.1	100.0			
		Total	183	100.0	100.0				
10	Income	<=10K	50	27.32	27.32	27.32	2.16	.947	
		11-20K	72	39.34	39.34	66.66			
		21-30K	42	22.95	22.95	89.61			
		>30K	19	10.38	10.38	100.0			
		Total	183	100.0	100.0				
11	Main incoe	Agricultur	160	87.4	87.4	87.4	1.13	.332	
		Agri&Oth	23	12.6	12.6	100.0			
		Total	183	100.0	100.0				
12	Experianein farming	<=10	72	39.3	39.3	39.3	2.03	.997	
		11-20	50	27.3	27.3	66.7			
		21-30	45	24.6	24.6	91.3			
		>30	16	8.7	8.7	100.0			
		Total	183	100.0	100.0				

Demographic Characteristics: ***Table*** 4.1 shows the summary statistical results of some of the vari ables describing the characteristics of the respondents. Table 4.1 of item 1, Over 83.1% of the study subjects were male's and16.9% of them were female household farmers with mean of1.17 and

standard deviation of 0.376. The highest proportion of the respondent's age ranged between 25-50 years, which accounted about 53%,it also indicates the highest working man power between this age group in the area of study, while the rest were in age group of 51 to 75 and above 75 years which accounted 42.6% and 4.4 respectively with the mean and standard deviation of 1.51 years and 0.582 years, respectively in the study sites (Table 4.1 of item 2). With regards to religion of the respondents, a large number (48.1%) of them were protestant followers, orthodox (43.2%) and 8.7% were other religion followers with mean of 1.66 and standard deviation of 0. 635 (Table4.1 of item 3).A significant number of respondents (78.14%) were Oromo ethnic groups but the rest (15.85%) were Amhara and other ethnic groups (6.01%) with mean of 1.28 and standard deviation of 0.568(Table 4.1. of item 4).More than half (65.57%) of the respondents were married, divorced (16.39%), widowed (12.57%) and separated5.46%; with about mean of 1.76 and standard deviation of 1.128 (Table 4.1of item 5). Over 52% of respondents had five or less than five family members, 36.6% of the respondents had between 6 to 10 family members and 10.93% of respondents had greater than ten family members with mean of 1.58 and standard deviation of 0.688 (Table 4.1 of item 6). As shown in the table 4.1 of item 7, the respondents in the study area had different educational status with (22%) of the respondents were able to read and write, whereas about 31.03% received diploma and degree, but the remaining (57.2%) of the respondents never attended school with mean of 1.91 and standard deviation of 0.669. Thus, the study area is dominated by farmers with a relatively low level of education about 27.32 % and nearly half about 54.64 % able to read and write but they were lucking an awareness about the side effect of misusing agrochemicals, the rest about 18.04 did not recognized it even though they were trained by NGO sometimes which creates an information gap. Poor education background could partly affect farmers were primary school leavers who might not be able to read or understand pesticide labeling and instructions written in English. About 44% of respondents had more than 10 hectares of farmland, 33.33% of the respondents had 5 to 10 hectare and the rest had less than 5 hectares with mean of 3.17 and standard deviation of0.889 (Table 4.1 of item 8). Almost all (95%) respondents practiced mixed farming but the rest involved in either crops production or animals rearing with mean of2.92 and standard deviation of 0.355(Table 4.1 of item 9). According to table 4.1 of response 10, above 39.34% of the respondents harvested 11 to 20 quintal per farmland, 27% of the respondents got less than or equal to 10 quintal and 22.95% of the respondent's gets 21-30Kuntal per farm land with mean of 2.16 and standard deviation of0.947. Greater than 87% of the respondents depended on agriculture and the rest of respondents utilized other income sources with mean of1.13 and standard deviation of 0.332(Table 4.1 of item 11). The study subjects had varied experience (Table 4.1 of item 12), Many of the respondents (39.3%) had less than or equal to 10

years, 27.3% of the respondents had 11 to 20 years and 24.6% of them21 to 30 years of experience with mean of 2.03 and standard deviation of 0.997.

The researcher also discussed the demographic characteristics as follows:

The present study showed that most of the demographic variables did not show any influence on the personal protective behavior and materials (PPBM) of farmers. The respondents sex, religion, family size does not affect the personal view about the use of PBs whereas,
the age, educational level, farming practice; experience and the income influenced differently in different kebele's.

Illiterate farmers were more reluctant to PBs or (PPEs) compared to other literate, some illiterate farmer allow their children with immature internal organs and immune system to spray pesticide without the use of any PPBM which is dangerous practice; contributes to significantly risk health and development effects of exposure to pesticides. The respondents also use leftover fertilizer for healing their wound and their domestic animals cause significant health problem like paralysis, skin cancer and other. Poor education background could partly affects farmers were primary, elder school leavers or illitrate who might not be able to read or understand pesticide labeling and instructions written in English. The attainment of formal education is very necessary for the use of agrochemicals. Education helps farmers to understand the regulations guiding the use of chemicals in the farms thereby exposing them to the dangers of inappropriate use of the chemicals.

Similarly,(Akter et al., 2018)also reported that age, income, education received and types of involvement in agriculture have strongly influenced on PBs of sampled areas farmer. Farmer faces many of short and long-term health problems as age and year of experience increases in farming with misuse of agrochemical again and again throughout their life, the same problems also happened to farmer with low income since they were unable afford modern machinery for spraying herbicide on their farm land.

WHO (2003, 2009) among the typical symptoms of acute (short-term) poisoning in humans are fatigue, headaches and body aches, skin, eye, nose and throat irritation, feelings of weakness, diz ziness, nausea, vomiting, excessive sweating, impaired vision, tremors, panic attacks cramp. Chr onic (long term) poisoning leads to severe health problems, such as cancer, damage to the reproductive system, liver, brain, and other parts of the body. However, (Damalas and Hashemi, 2010)showed that young farmers in Greece had more positive attitudes towards pesticide PBs tha n older farmers. Also, low income farmers in South West were more prone to PBs (PPEs) than ot

her higher income groups of farmers.Study showed that the PBs of farmers were mainly affected by different perception and attitude factors such as level of knowledge, perceptions of the consequ ences of their behavior, and actions of the government and pesticide retailers. Similarly, (Fan , 2015) found that the PBs of farmers pesticide were mostly affected by age, education, level of knowledge, perceptions of the consequences of their behavior, and actions of the government and retailers. The results of correlation coefficient and chi-square below also shows the relationship of the level of education, income, age and farming experience with the PBs of farmers. Researchers like (Alam, 1996) also reported the risk of pesticides on the environment and public health in the developing countries. The illiteracy among farmers and agricultural workers is quite low as indicated by many studies. The agricultural workers in many third world countries are illiterate and cannot read a pesticide instruction labels, lack trainings on the application methods of safe use of pesticides, do not wear any protective clothing, and are ignorant on safe storage and appropriate disposal of residual (Shatanawi, 2007).

Correlations

			Educational level	Income	Experiance in farming	Age
Spearman's rho	Edulevel	Correlation	1.000	.916	.817	.697
	Income	Correlation	.916	1.000	.924	.800
	Experiance in farming	Correlation Coefficient	.817	.924	1.000	.858
	Age	Correlation	.697	.800	.858	1.000

The above result shows as the relationship between age, education, income and experience in farming

4.2. Information about agrochemical use in AdeaBergaWoreda

Table 4.2.1. The knowledge and use of agrochemical

No	Item	Category	DescriptiveFrequency				DescriptiveStatic	
			Frequency	Percent	Percent	Percentive	G Mean	SD
1	Do you know agrochemical?	Yes	173	94.5	94.5	94.5	1.05	.228
		No	10	5.5	5.5	100.0		
		Total	183	100.0	100.0			
2	Do you use agro chemicals in your agriculture?	No	5	2.7	2.7	2.7	2.43	.548
		Sometimes	91	49.7	49.7	52.5		
		Always	87	47.5	47.5	100.0		
		Total	183	100.0	100.0			
3	Where did you get agrochemical for your agricultural purposes?	From Gov.	91	49.73	49.7	49.7	1.5027	.5013
		Private super market	92	50.27	50.3	100.0		
		Total	183	100.0	100.0			

Since, 1940s manufacturing, consumption and use of pesticides intensively increase in agriculture across the globe to control a variety of pests and diseases affecting crops. For instance, the proportion and consumption of pesticides have increased rapidly from 20% in 1960 to 48% in 2005 (Zhang, 2011);(FAO , 2014 ; 2015). Similarly, as shown in the table 4.2.1 of item 1 and 2 above; 94.5% of household farmer replied as they know agrochemicals, 5.5% of respondents were

not know as well as not used it based on the soil fertility and adaptation of soil, 49.7% of respondents use agrochemicals sometimes and 47% of respondents use agrochemicals always for their farmland to get good crop productivity with mean and SD of 1.05 and 0.228 respectively. Table 4.2.1of item 3 tell as Adea Berga household farmers can obtain or bought agrochemical from both private super markets about 50.3% and Government institution about 49.7% with mean and SD of 1.50 and 0.501respectively.

This pie chart also tells as the same things.

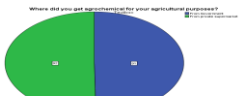

Figure 4.2.1. The pie chart showing the source of agrochemicals

This present study has observed that pesticides were readily available in agrochemical retail shops and there were also pesticide vendors who practiced measuring out quantities of the pesticides from larger containers and sale to farmers at different measurements. However, the other possible cause of indiscriminate use of pesticide could be shortage of extension staff that co uld accordingly advice the farmers on other alternative methods for pest controls. For example,int egratedpest management (IPM) and organic agricultural strategies could be the alternatives to excess use of pesticides (Wilson and Tisdell , 2001).From this study and earlier one, the researcher concluded that the use of agrochemical like pesticide started since 1940 and used up to the present day.

Table; 4.2.2. The types of agrochemicals and organization that provides agrochemical

No	Item	Category	*Descriptive Frequ*			Descriptive St		
			uenc y	Perc ent	Vali d	Cum ulati	Mean	SD
4	Which types of agrochemical do you use in agriculture?	Herbicide	54	29.5	29.5	29.5	2.44	1.48
		Fertilizer	78	42.6	42.6	72.1		
		Insecticide	6	3.3	3.3	75.4		
		Fungicide	6	3.3	3.3	78.7		
		All	39	21.3	21.3	100.0		
		Total	183	100.0	100.0			
5	Which types of agroche micals did you use for healing some wounds of cattle, horse, donkey, and others?	Herbicide	60	32.8	32.8	32.8	1.83	.755
		Fertilizer	104	56.8	56.8	89.6		
		Insecticide	9	4.9	4.9	94.5		
		Fungicide	10	5.5	5.5	100.0		
		Total	183	100.0	100.0			
6	Do you use fertilizers like DAP, urea as wound healing chemical for--	Human	5	2.7	2.7	2.7	1.99	.222
		Horse	174	95.1	95.1	97.8		
		Sheep	4	2.2	2.2	100.		
		Total	183	100.0	100.0			
7	Do you use insecticide as wound healing chemical for---	Human	6	3.3	3.3	3.3	1.98	.222
		Mule &Hors	172	94.0	94.0	97.3		
		Cow &Ox	5	2.7	2.7	100.0		
		Total	183	100.0	100.0			
8	Do you use herbicide f or eradicating weeds fr om your farmland?	Sometime	78	42.6	42.6	42.6	1.59	.526
		Always	102	55.7	55.7	98.4		
		No	3	1.6	1.6	100.0		
		Total	183	100.0	100.0			

The types of pesticides commonly used by farmers in Adea Berga District were herbicides, Insecticides, Rodenticides and Fungicides. 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. Most probably herbicides and insecticides were used to control pests from agriculture fields whereas most farmers used fertilizer for increasing productivity .Table 4.2.2of item 4 indicates

that 42.6% of respondents use fertilizer, 29.5% of respondents use herbicide and 21.3% of respondents used all types of agrochemicals with mean and SD of 2.44 and 1.48. These imply that farmers use all kinds of agrochemicals to gate good products from their farmland. This bar chart t ells as the same ideas. Similar to researcher Bremner (1993) farmers use diferent kinds of agrochemicals to gate good products from their farmland.

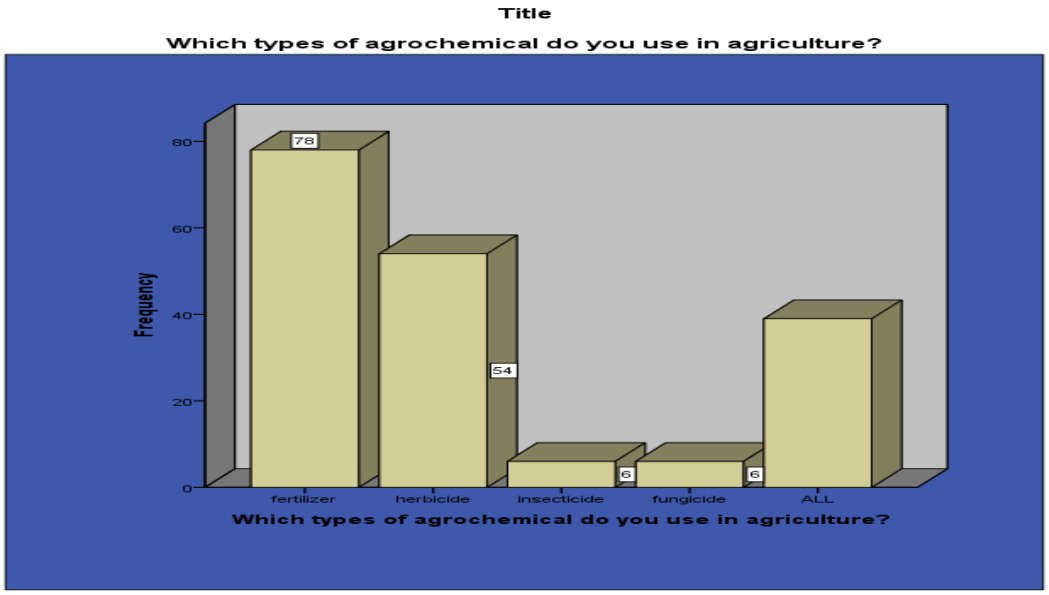

Figure 4.2.2. The bar chart showing the frequency and types of agrochemical used in agriculture

From the above table 4:2:2 of item 5 about 56.8% of respondents used fertilizers, 32.7% of respon dents used herbicides for healing wounds of animals like cattle, horse, and donkey with mean and SD of 1.83 and 0.755. The pie chart below expresses the same things. This might have health implications for those farmers that do not follow proper use practices productivity (Barraza, 2020).

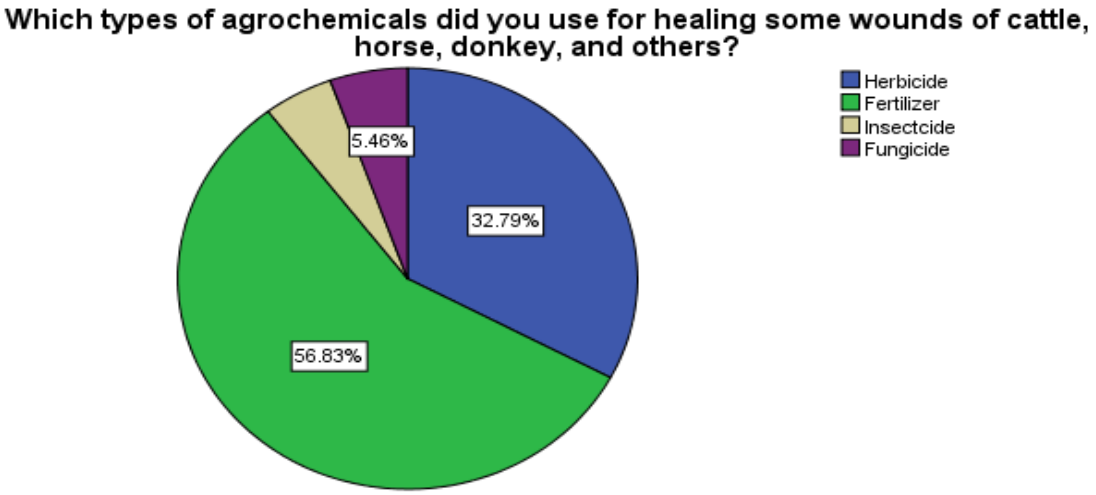

Figure 4.2.3. The pie chart showing the type of agrochemicals used for wound healing purpose

Table 4.2.2 of item 6, Shows as that about 95.1%, 2.7% and 2.2% of the respondents used left over fertilizers for healing the wounds of horses, human and sheep's with mean and SD of 1.99 and 0.222 respectively. As shown in the table 4:2:2 of item 7: 94.0%, 3.3% and 2.7% of the respondents used insecticide for healing the wound of mule and horses, human, Cow and Oxen with mean and SD of 1.98 and 0.222 respectively.

The use of fertilizer and herbicide for healing the wounds of some animals may result paralysis, cancer, eye, skin burning and poisoning. The misuse of agrochemical may cause acute pesticide poisoning death and chronic illnesses (Bödeker and Dümmler, 1993), non-Hodgkin lymphomas And leukemia (Alavanja, 2004) in humans.

A recent study by PAN International assumes that currently, among the 1.3 billion farm workers worldwide, approximately 41 million suffer from pesticide poisoning each year with an average poisoning rate of 32% (PAN-Germany, 2012).The above table 4.2.2 of item 8 tells as 55.7% of the respondents always used herbicides and 42.6% of respondents sometimes used herbicides for eradicating weeds from the farmland with mean and SD of 1.59 and 0.526.However, according to (Van Den Brink, 2013) the misuse of pesticides contribute biodiversity loss and the deterioration of natural habitats. Residues of pesticides contaminate soil and water, persist in crops, enter the food chain which leads to bioaccumulation, and finally ingested by humans through food and water. Overdose and much exposure of crops to agrochemicals cause scorches, yellowing, necrosis of the foliage, and distortions of the leaves. In this instance, a higher rate of application has the potency to affect output level. Residues of agrochemicals sometimes remain in edible parts of crops which have a health impact on the consumer (Sheahana and Tasie, 2017)

From this, the researcher could conclude that farmers must use agrochemical with careful precaution and protectively. The researcher generalizes the unsafe use of agrochemical may not result in poisoning only it causes several healthy problems like immune system, nervous system, reproduction, paralysis, skin irritation, skin burning any other problems, rather than increasing products and healing wounds of some domestic animals. The easy access to the agrochemicals in the local market, limited knowledge of pesticide environmental effects, possibly unrealized agrochemical expenses and the associated public health effects may be among the factors for indiscriminate uses of agrochemicals.

Table 4.2.3 .Training about the use of agrochemical

No	Item	Category	Frequency	Percent	Valid Percent	Cumulative Percent	Mean	SD
9	Is there any training concerning the use of agrochemicals?	Sometime	172	94.0	94.0	94.0	1.07	.297
		Always	9	4.9	4.9	98.9		
		Not needed	2	1.1	1.1	100.0		
		Total	183	100.0	100.0			
10	The training of agrochemical use	Agri Bureau	77	42.1	42.1	42.1	2.1374	.98487
		Health Bure	3	1.6	1.6	43.7		
		NGOs	103	56.3	56.3	100.0		
		Total	183	100.0	100.0			

(Staudinger, 2011) also showed that over 50% of Tanzanian farmers often mixed pesticides with their bare hands because of their low level of knowledge and higher rate of illiteracy.

Table 4.2.3 of item 9 shows as that 94% of the respondents sometimes trained about the use of agrochemical, about 4.9% always trained and 1.1% there is no need of training with mean and SD of 1.07 and 0.297 respectively. As indicated in the table 4.2.3 of item 10:56.3% of the respondent s trained by NGOS and 42.1% of the respondents trained by the agricultural bureau with mean and SD of 2.13 and 0.984. Most of the training given by NGOS, which creates an infor mation gap since NGO, not address all the kebele's and it had expire time and area limitation.

These show as shortage of training about the use of agrochemicals, which leads to misuse of agrochemicals. Many misuses have also been resulted in field farms because of the Absence of clear instructions, Illiteracy of farmers, Lack of knowledge on risks from bad uses, Uses of pesticides on crops, for which the product was not homologated, Difficulties to properly prepare the solution to be used and poor respect of dosage, Lack of obligation about the use and training, Some farmers are not willing of training and not responsible to change what they train in to practice. Here the researcher concludes that there must be another organization sets up; the likes of executive farm extension program in addition to NGO and Agricultural bureau that train and advice the farmer without an information gap, expire date and limitation throughout the Woreda as well as throughout the country.

Table 4.2.4.**Thestorage of pesticide and usage of empty container**

No	Item	Category	Frequency	Percent	Valid Percent	Cumulative Percent	Mean	SD
11	The storage of pesticide chemical	Put around the home	5	2.7	2.7	6.0	2.96	0.496
		Kept in home with other commodity	165	90.2	90.2	96.2		
		Not determined	4	2.2	2.2	98.4		
		Other	3	1.6	1.6	100.0		
		Total	183	100.0	100.0			
12	Do you use containers of pesticides when the contents exhausted?	Yes	176	96.2	96.2	96.2	1.04	.192
		Not	7	3.8	3.8	100.0		
		Total	183	100.0	100.0			
13	If your answer to question above is yes, for what purposes did you use	For drinking water beverage	78	42.6	42.6	42.6	1.85	.857
		Food serving object	60	32.8	32.8	75.4		
		Watering serving of domestic animal	40	21.9	21.9	97.3		
		Other	5	2.7	2.7	100.0		
		Total	183	100.0	100.0			

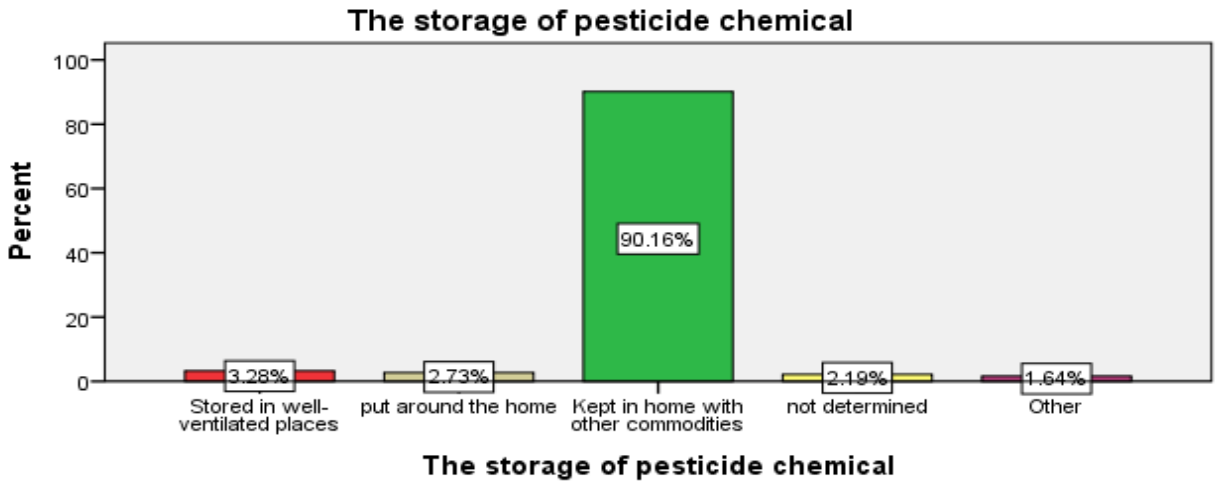

Figure 4.2.3. T bar chart showing the storage of chemical pesticide

As indicated in table 4.2.4 of item 11 most (90%) of respondents store pesticides in the home with the commodities, which may result contamination of commodities with mean SD of 2.06 and 0.496**.** Table 4:2:4 of item 12 told as96% respondents collect and sold empty containers to the local shop either for sec of getting money and for other services and most (42.6%) of the respondents use empty container for drinking beverage, water 21.9%, eating food 32% or feeding service which results contamination of food and water with mean and SD of 1.04 and o.192. (FAO, WHO, 2020), about 20 % of the approximately 800 000 people who die from suicide every year do so by ingesting pesticides. Many studies reported that herbicide misuse occurred during herbicide spray, however from the above responses table 4.2.2 to 4.2.4the researcher concludes that agrochemicals misuse occurred during one of the following applications. These were explained below1. Herbicide spray and not recognizing the dose to be sprayed, 2.Incorrectly storage of chemical pesticide, 3.Using empty container for different purposes and 4. Using left over agrochemicals' as wound healing

4.3. Interview questionnaires' prepared for collecting information about the pesticide s application methods

Table 4.3.1.The training, abilities and awareness of misusing agrochemicals

No	Item	Category	Frequency	Percent	Percent	Cumulative Percent	Mean	SD
A	Is there any training and awareness about the use of agrochemicals fromagricultural organization	Yes	60	32.8	32.8	32.8	1.80	.644
		Sometimes	100	54.6	54.6	87.4		
		No	23	12.6	12.6	100.0		
		Total	183	100.0	100.0			
B	What kind of illness do you observed from the misuse of agrochemical in your local area	Body, fatigue & aches	83	45.4	45.4	45.4	1.55	.499
		Skin, eye, nose & throat irritatio	100	54.6	54.6	100.0		
		Total	183	100.0	100.0			
C	Do you informed and diagnose some of the negative healthy impact of misusing agrochemical	Not	60	32.8	32.8	32.8	1.91	.746
		Sometime	80	43.7	43.7	76.5		
		Always	43	23.5	23.5	100.0		
		Total	183	100.0	100.0			
D	Are you effective and know different pesticide application methods	Yes	60	32.8	32.8	32.8	1.98	.883
		Poor	80	43.7	43.7	76.5		
		Good	30	16.4	16.4	92.9		
		Fair	13	7.1	7.1	100.0		
		Total	183	100.0	100.0			
E	Di you take shower immediately after mixing or spraying pesticides	Yes	60	32.8	32.8	32.8		
		Not	99	54.1	54.1	86.9		
		Sometime	24	13.1	13.1	100.0		
		Total	183	100.0	100.0			

Figure 4.3.1. The bar chart showing the awareness and training level

As shown from the response to table 4.3.1 of item A, 54.6 % of the respondents trained and aware sometimes, 32.6% of the respondents trained well and 12.6% of respondents were not trained well on how to use and read the labeling with mean and SD of1.55 and 0.499. This response shows as still there is shortage of awareness creation among the society which expose them chemical poisoning even though some training. The study confirmed the findings of (Fianko, 2011) that there is considerable evidence that farmers have overused agrochemicals especially pesticides. It is also consistent with (Omari, 2014) findings that farmers have a low level of awareness of the hazards associated with the use of agrochemicals.The assertions by many farmers in Ghana do not have adequate knowledge and information on the health hazards associated with handling and use of pesticides. Most farmers follow the instructions available on the packaging labels with information of pesticides application methods and precautions necessary to do so, while relatively few of them read the labels to determine the components of the pesticide, and anti poison caution. However, Poor education background could partly affects farmers were primary school leavers who might not be able to read or understand pesticide labeling and instructions on use since were written in English. In developing countries, farmers face great risks of exposure due to the use of toxic chemicals that are banned or restricted in other countries, incorrect application techniques, poorly maintained or totally inappropriate spraying equipment, inadequate storage practices (Asogwa and Dongo, 2009)

As shown in the table above of item B, 45.4% 0f the respondents feels body fatigue and aches, 54.6% of the respondents feels skin, eye, nose & throat irritation and as well as they feels weakness, dizziness, nausea, vomiting. The respondents experienced multiple health effects, with the duration of ailment also being quite significant. The typical symptoms of acute pesticide poisoning in humans are fatigue, headaches and body aches, skin discomfort, skin rashes, poor co ncentration, feelings of weakness, circulatory problems, dizziness, nausea, vomiting, excessive sw eating, impaired vision, tremors, panic attacks, cramps,etc and in severe cases coma and death and cause chronic illnesses like sarcomas, multiple myelomas, cancer of the prostate, pancreas, lungs , ovaries, breasts, testicles, liver, kidneys, and intestines as well as brain tumors, non-Hodgkin lymphomas and leukemia (Alavanja et, al, 2004). From this table, 33.3% of the respond ents were effective in the identification and diagnosis of pesticides and 66.7 % were not effective in identification of pesticide. As shown in the table 4.3.1 of item C, 32.8% of the respondents had not informed and unable to diagnose the negative health impacts of misusing agrochemicals whereas about 43.7% of the respondents had informed and able to diagnose sometimes. Diagnosis of acute pesticide poisoning generally occurs when one or more of these symptoms, which appear in a short time after contact with pesticides, are detected whereas difficult for chronic one (Bödeker and Dümmler, 1993). As indicated in the above table 43.7% of respondents apply pesticides poorly whereas 32.8% of the respondents know the applica tion methods of pesticide on their farmland, 16.4% of the respondents spray pesticide good and7% 0f the respondents spray pesticide fairly. Some farmers admitted their children to spray pesticide without PPM which contributes to their significantly risk of well known deleterious health and development effects of exposure to pesticides. The respondents also use leftover fertilizer for healing their wound and their domestic animals that cause significant health problem like paralysis, skin cancer.

Table 4:3:1of item E told as, 32.8% of the respondents had taken shower after spraying pesticide; whereas 54% of the respondents did not take shower after spraying pesticide and13% of the resp ondents had taken shower sometime after spraying herbicide. Previously conducted pesticide-related Knowledge, Attitude and Practice (KAP) studies in Ethiopia have indicated that farm workers had limited knowledge on pesticide hazards, inadequate awareness about safe pesticide management, and poor hygienic and sanitation practices.

CHAPTER FIVE

5. Summary, Conclusion and Recommendations

5.1. Summary

The researcher summarizes the above ideas according to respondents' response.

Demographics general information:Table: 4.1.1 shows the general profile of the 183 farmers requested in the study. Out of the 30 questionnaires distributed to 183-household farmer, 3 agricultural experts, 3 agrochemical supplier, 2 kebele's manager and 170 farmers; 178 were retrieved, for a response rate of 97%. The present study showed that most of the demographic variables did not show any influence on the personal protective behavior and materials (PPBM) of farmers except the age, educational level, farming practice; experience and the income influenced differently in different kebele's.The respondents in the study area had different sex, educational status; farming practice and income with the highest proportion of the respondent's age were ranged 25-50 years, which accounts about 53%. Nearly half of the respondents (57%) were unable to read and write they were leaving primary and elder school leaver, never been in school. Illiterate farmers were more reluctant to PBs or (PPEs) compared to other literate, some il literate farmer allow their children with immature internal organs and immune system to spray pe sticide without use of any PPBM which is dangerous practice; contributes to significantly risk health and development effects of exposure to pesticides. About 44.26% of respondents had more than 10 hectare of farmland. Almost all 95% respondents practice mixed farming, earn about 11 to 20 kuntal or 200,000,000 birr (two hundred thousands) per their farmland yearly, and depend on agriculture.

General information about agrochemicals

Table 4.2.1 to 4.2.4 tells information about agrochemical use and misses use. 94.5% of household farmer replied as they know agrochemicals, 49.7% of respondents use agrochemicals sometimes and 47% of respondents use always for their farmland to get good crop productivity. All most all farmers use all kinds of agrochemicals like fertilizer, herbicide, insecticide, fungicides to get good products from their farmland. However, Most of the farmers lack awareness on how to apply and not capable of taking decisions on pest management, application and store agrochemicals wrongly . They use them for healing the wounds of some domestic animals (see table 4:2:4) and as well as for human, they use empty container for drinking beverage, alcohol and feeding purposes. These unsafe and over uses of agrochemical causes a significant problem, since the residues of agrochemical contaminates and pollutes the atmosphere.

All of the respondents stated that they were working or had been working for an agricultural production that uses agrochemical like pesticides. Furthermore, the majority of the respondents reported that the lack of consciousness and education towards pesticide hazard in the region was a concerning issue. Many misuses have also been resulted in field farms because of

1. Absence of clear instructions, 2. Illiteracy of farmers, 3.Lack of knowledge on risks from bad uses, 4. Uses of pesticides on crops, for which the product was not homologated,

5. Difficulties to properly prepare the solution to be used and poor respect of dosage, 6. Lack of obligation about the use and training, 7. Some farmers are not willing of training and not responsible to change what they train in to practice.

Methods of application of agrochemical

Table 4.3.1 shows the abilities of spraying pesticide or the application of pesticide. 54 % of the respondents trained and aware sometimes 32% of the respondents trained well and 12% of respondents were not trained. Most of the respondents were not able to identify the symptom of illness and diagnose wounds caused as the result of misusing agrochemicals and using / wearing inappropriate protective material and most of the respondents apply agrochemicals poorly. Many studies reported that herbicide misuse occurred during herbicide spray, however from the above responses, the researcher concludes that agrochemicals misuse occurred during one of the following applications. These were explained below. 1. Herbicide sprays without recognizing the dose to be sprayed on the suggested farmland2. Incorrectly storage of chemical pesticide 3.Using empty container for different purposes4. Using left over agrochemicals' as wound healing.

Findings: Since, 1940s manufacturing, consumption and use of pesticides intensively increase in agriculture across the globe to control a variety of pests and diseases affecting crops. For instance, the proportion and consumption of pesticides have increased rapidly from 20% in 1960 to 48% in 2005.The environmental challenges; government policy and competition among farmers were maj or factors influencing farmers' to use agrochemicals. The farmers are moving away from indigenous farming systems which rely on low input farming to the use of synthetic agrochemical. This shift in practice from Indigenous farming methods to the use of agrochemical and the farmer spends many time and money to buy agrochemical like fertilizer from government or private super market and some farmer use it unsafely without any training.

Farmers are responding and increasing their use of agrochemicals despite serious repercussions. One major factor that compels farmers to use synthetic agrochemicals is worsening environmental conditions link to climate change, air pollution and health. The misuse of agrochemical like pesticide and other cerates several health problems like nausea, headache, vomiting, eye irritation, and skin problems (Cheke RA, 2009). (FAO, WHO, 2020), About 20 % of the approximately 800

000 people who die from suicide every year do so by ingesting pesticides. A recent study by PAN International assumes that currently, among the1.3 billion farm workers worldwide, approximately 41 million suffer from pesticide poisoning each year with an average poisoning rate of 32% (PAN-Germany, 2012).

So that the researcher find the following misuses among the society

1. Using agrochemicals as wound healing
2. Using empty containers of agrochemical for different purposes
3. Using un determined dose on the farm land
4. Spraying herbicide without using personal protective materials
5. Some farmer allowed their children with immature organ in the process of pesticide spray
6. Some farmer use leftover fertilizer for healing the wound of some domestic animals including human being.
7. Pesticide sprayer spray pesticide without determining the direction of wind

This misuse of agrochemicals causes a significant problem, since the residues of agrochemical contaminates and pollutes the atmosphere.

The residue of agrochemicals found in soil, surface and ground water creates

1. Severe healthy problem, air pollution and environmental problem
2. Poses significant risks to the environment
3. Risks to non-target organisms ranging from beneficial soil microorganisms to insects, plants, fishes, birds, humans and other animals, kill the beneficial organisms easily; create pest resistance and crop losses.
4. Inhibitors of Protein biosynthesis and ATP formation
5. Agrochemical misuse spray on the farmland could affect the diversity of flora and microorganism and affects the reproductive system of flora.

The farmers spray chemicals without appropriate PPE like protective gear: overall coats, nose masks, Wellington boots, and gloves, further exposing them to risk. Furthermore, some farmer's allowed their children with immature internal organs and immune systems to spray pesticide without wearing any protective clothing which is dangerous practice. This practice results in heightened risk of well known deleterious health and development effects of exposure to pesticides. The respondents also use leftover fertilizer for healing their wound and their domestic animals that cause significant health problem like paralysis, skin cancer and other.

The study found two major health implications as reported by farmers: ***chemical poisoning*** and ***lower self-reported health***. **Chemical poisoning;** The majority of farmers in the area of study become ill from chemical exposures and they face common symptoms of chemical poisoning are body weakness and headache/dizziness, sexual weakness (ie, impotence) among the men, chronic cough, and depression as a

symptoms of chemical poisoning. Similar findings have been reported in Uganda (Godfrey, Patrick and Judith, 2018).

Low self-reported health; even though farmers feeling poor health, children or families fall sick regularly, loss of strength claiming they cannot work as effectively as before due to their chemical ingestion; they consume the Indigenous food crops and they never visited a hospital.

5.2. Conclusions

This study examined agrochemical use practices and the related health challenges of smallholder farmers in Adea Berga district. The study sample was drawn from two kebele's out of Adea Berga kebele's. These kebele's were purposively selected to capture variation in agrochemical use among smallholder farmers in the kebele's.

Agrochemicals use often considered as quick, easy, and necessary for controlling weeds, insect pests and increase yield in agricultural landscapes. However, Most of the farmers lack of awareness on how to apply and not capable of taking decisions on pest management and application. The study also revealed that farmers do not strictly observe safety precautions associated with the use of agrochemicals due to their limited knowledge of active ingredients of agrochemicals and the subsequent normalization of most agrochemicals. Often they apply agrochemicals when there is no real need or they store wrongly and use wrong chemicals at wrong doses, methods and times and also they use them for healing the wounds of some domestic animals and as well as for human they also use empty container for drinking beverage, alcohol and feeding purposes . These unsafe and over uses of agrochemical causes a significant problem, since the residues of agrochemical contaminates and pollutes the atmosphere. The residue of agrochemicals found in soil, surface and ground water creates severe healthy problem, poses significant risks to the environment and risks non-target organisms ranging from beneficial soil microorganisms to insects, plants, fishes, birds, humans and other animals, kill the beneficial organisms easily, create pest resistance and crop losses.

Agrochemicals should be strictly handled according to the regulations that contribute to reduction of the adverse effects on human health and environment. Adoption of a few simple measures such as designing executive farm extension program for creation of awareness, training, using good quality sprayers, not smoking during spraying, wearing headgear and changing clothes immediately after spraying may reduce the acute symptoms.

For green environment and reducing chronic effect biological solution can play effective role. Biofertilizer and Biopesticide also become alternative solution for pest control and using several natural products and biological agents give us hope to minimize the adverse effect of

agrochemicals and also using space science technology to produce agricultural drones for spraying pesticide on agricultural farm land.

5.3. Recommendations:

The researcher recommends the need for

- ✓ Designing, launching and implementation of outreach executive farm extension programs in addition to agricultural bureau and NGO for awareness creation on the proper and safe methods of using and handling of agrochemicals.
- ✓ Creating awareness about the use of Biofertilizer, Biopesticide and using several natural products and biological agents give us hope to minimize the adverse effect of agrochemicals than chemical fertilizers and pesticides. The use of space science technology for producing agricultural drones to spray pesticide on the farm land.
- ✓ Advising the farmers as they do not use chemicals that eradicates soil microorganism necessary for the soil fertility rather than using pesticide like so called valance (it eradicates weeds only).
- ✓ Precautions of using agrochemicals and better communication with farmers should be needed. Farmers should be enlightened on the positive and negative side effect of using agrochemical. Farmer should be well informed about the negative and positive effect of using agrochemical. The fact that almost half of the respondents answered that they did not know enough about the adverse effects of pesticides on their health (despite their training that they received) could be an indication that the current educational initiatives by the pesticide vendors lack this kind of information. More emphasis should be given on the sources, expire date, method of application, Brochures and field visits as means of sources of information have received more attention in the extension programs . The majority of the respondents reported that the lack of consciousness and education towards pesticide hazards in the area was a concerning issue.

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Appendix- 1 questionnaires

College of Natural and Computational Science Department of Zoological Science General Biology Msc Program: Proposal for the thesis 2015/2023

Title: The misuse of some agrochemicals by the local farmers at West Showa, AdeaBerga District

Questionnaire to be filled by the farmer and other concerning body

The main purpose of this questionnaire is to collect valid and reliable data on the misuse of some of agrochemicals. Thus, your genuine responses will help the researcher to provide reliable and valuable suggestions and recommendations. Your response will be useful for the success of this study. Thus, you are kindly request to provide your genuine opinions and suggestions. I would like to express my appreciation in advance of your time and consideration.

General Directions:

No need of writing your name. Mark "√"tick/choose or write possible options in the box or space of your alternative answer(s). Please give your short and precise responses to the closed and open-ended items/ questions.

Part one: Demographic characteristics of the study population

1. The Name of the farm area: _____
2. **Sex**: _____ **Age**: ____ Religion_____ Ethnicity____ Family size_____
3. **Marital status**: Single___ Married__ Separated__ Divorced __Widow____
4. **Educational Level**: Illiterate ____Certificate level__ If other please specify ___
5. **Farm land holding size**: < 1ha__ 1-5ha____ 5-10ha__ >10 ha_____
6. **Occupation types**: Crop production___Animal product__ Trading and mixed farm practice _
7. Yearly total income_____ Main income source _____Experience in agriculture____ years

Part 2: Information about agrochemical use in AdeaBergaWoreda.

1. Do you know agrochemicals? A) Yes B)No, If your answer yes did you use agrochemicals in your agriculture? A) No B) Sometimes C) Always
2. Where did you get agrochemical for your agricultural purposes? A) From farm union.
   B) From private super market C) None
3. If your option for question number 3 is A: how many percent it can supply for you? A, 20% B, 50% C, 75% E, 100%

4. Why did you use agrochemical in agricultural practices? For___ A. increasing agricultural product B. controlling pests, weeds, insects and others C. healing animal wounds and treating diseases D. all of the above uses
5. Which types of agrochemical do you use in agriculture? A) Herbicide B) Fertilizers C) Insecticide D) Fungicide E) other agrochemicals like _____.
6. Which types of agrochemicals did you use for healing some wounds of cattle, horse, donkey, and others? A) Herbicide B) Fertilizers C) Fungicide D)please specify if any__.
7. Do you use fertilizers like DAP, urea as wound healing chemical for_ A) Human B) Donkeys/ Horses / Cows / Oxen C) Sheep and goats D) chicken/dogs/cats
8. Do you use herbicide as wound healing chemical for __A) Human B) Donkeys C) Horses D) Cows and Oxen E) Sheep and goats F) chicken/dogs/cats _____
9. Do you use herbicide for eradicating weeds from your farmland? A) Sometimes B) Always
10. Is there any training concerning the use of agrochemicals?A)Sometime B)Always C)not need ed
11. If your answer to question11 above is yes, which organization/institution gives the training? A) Agricultural bureau b) Health bureau C) NGOs D) Others (please specify)_____
12. Do you wear personal protective materials while spraying pesticide? Yes / No, If your answer is yes, please choose some of personal protective materials you use while spraying pesticide. A)Knapsack sprayers, B) Buckets, C) Brushes, D) brooms E)All F)Please write if any other __
13. Where do you store pesticides before use? A) Stored in well-ventilated places. B) put around the home C) Kept in home with other commodities D) not determined E) Please specify_____
14. Where did you dispose empty pesticide containers after use? A) Left in the field and water after use B)Collect and sold to shops. C) No locations for storing after use. D) Buried in soil E) Please specify
15. Do you use containers of pesticides when the contents exhausted? Yes/No,If your answer to question 17 is yes, for what purposes did you use? A) for drinking water/beverage B) food serving object C) watering serving for domestic animals D) please specify--

Part 3: Interview questionnaires' prepared for collecting Information about the pesticides application methods and participation

1. Is there any training and awarenous about the use of agrochemical**s** from agricultural organiz ation? A/yes B/Sometime C/no D/ If your answer Yes, are you effective for identification and diagnosis of pesticide? A.yes B. Not
2. Is there participation of stakeholders in the process of marketing pesticide? A/Yes B/No C/If yes, who are the participants? _____ D/ If the answer for question No 1 is No why? _____
3. If the answer of question No 2 is yes, describe your level of participation of each participant as A, high, B, medium C, low**.**
4. What kind of illness do you observed from the misuse of agrochemical in your local area ___Burnig
5. Did you diagnose some of illness caused due to the misuse of agrochemicals in your organization? A/ no B/ sometime C) Always
6. Do you inform some of the negative healthy impact of misusing agrochemicals? A)Not B) Sometime C) Always.
7. Did you informed on pesticide law proclamation. A)Very good B)good C)fair D) poor
8. Are you know different pesticide application methods A)Very good B)good C)fair D) poor
9. Did you take shower immediately after mixing or spraying pesticides is needed A) Very good B)good C)fair D) poor
10. Did you read any direction written on the container of agrochemical useA. Not B. Always C.Sometime

GAAFFII AFAANII AFAAN OROMOOTIIN

KabajamtootaqonnaanbulaaAannaaAda`aaBargaGandda_____ ,kaayyoongaafiikanaawaa`eefayyadaminsaafmiidhaakemikaalotaqonnaafoolanillaalchisee raga sasaabachuufqorannoogaggeessuufqofadha. Kanaafuu; Yaadaafkoomiikeessandaangaatokkomaleekennuudandeessu.Ragaanisinkennitanisgalmaanga hinsaqorannookoofbaayy`eebarbaachisa .

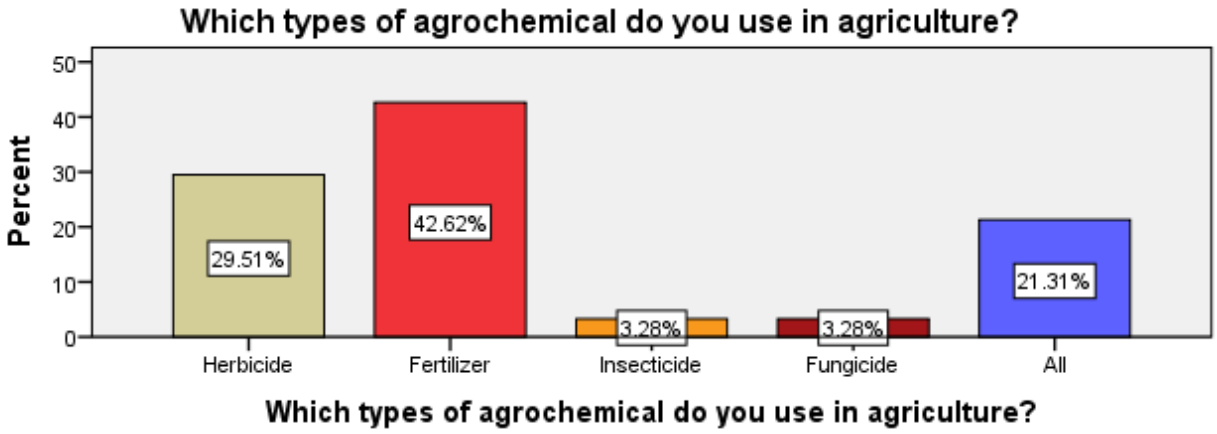
1. Maqaanaannoo/ganda/ qonnaanbulaa_____
2. Saala___ Umurii____ lammumaa _____amantii _____Baainamaatiiqabdan___
3. Sadarkkaabarnnotaa: kanhinbarane_____ kanaddaankute _____ kanbarate_____
4. Ballinnilafaqonnaakeessaniihagamii? _____
5. **Gosaqonnaa:** biqiiloota omishuu__ binneldoota horsiisuu _ lachanuu__lachuufdaldaaluu___
6. Muxxannooqonnaa: waggaameeqaqotanii? _____

7. Ooriyuu keessaniif kemikaalota fayyadamtu? A/EeyyeenB/Lakki C/altokkotokkoD/ Yerroohundaa
8. Kemikaalotaqonnaa kana maaliiffayyadamtu? A. Bu`aaqonnaakeenyaaguddifachuuf B. Aramaa fi ilbiisotato`achuufballessuuf C. Maddaabineeldootaafayyissuuf D. hundaaf
9. kemikaalootabgosaakkamiitifayyadamtu?A. Farraaramaa B) Farrailbiisotaa C) Farrafangasii D) Xaa`oo E) Hunda F) KemikalotaKanbiraayookanfayyadamtanta`ehimaa __
10. Bu`aaqonnaagaariiargachuufkemikaalotaisinfayyadamtanhimaa? _____
11. Madaa bineeldaa keessani qoorssuuf fayyissuuf kemikaaloota fayyadamtanhimaa ? ____
12. Fayyidaafmiidhaakemikaalotaalafaqonnaakeessanittibiiftankan biro natihimaa? _____ Fayyidaa _____ miidhaa _____
13. Yeroo ooriyuukeessanit kemikaalota qonnaa biiftan ofeeganoo gootanii fi meeshaalee fayyad amtan himaa_
14. Waa`emiidhaa f fayyidaakemikaalotaqonnaailaalchiseeleenjjii fi gorsatokkotokkojiraay ? ___, leenjii fi gorsaeessaaargatu? ____, gorsaa fi leenjiiargatansirnaanittifayyadamtu? ___maaliif? ___,
15. Barreefamakuusaakemikaalotairratibarrefameejirunidubistuuyi? A) eeyeen ; maalhubachuufdubbiste _____ B) Lakki; maaliifhindubbisne_____
16. Meeshaaleeyookankussaakemikaalotaqonnaafayyadamtaniikeessafixxaneessakeewwatu _____ mofayyadabiraafittisfayyadamtu? _____

Appendix – 2 the list of questions directly related to the study with results given in table and graph below

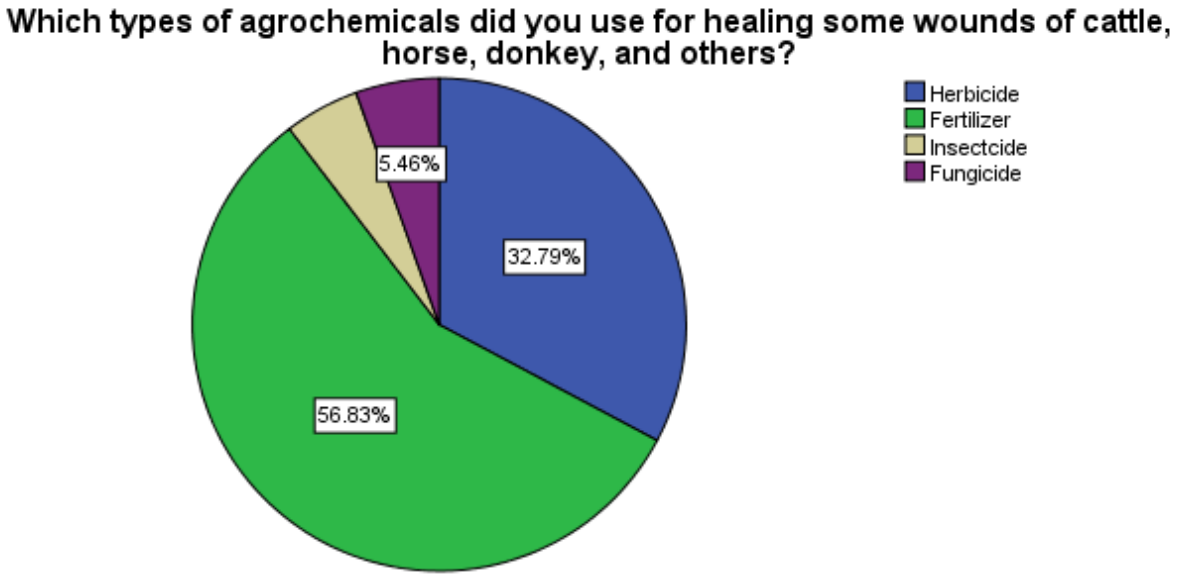
Which types of agrochemical do you use in agriculture?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Herbicide	54	29.5	29.5	29.5
	Fertilizer	78	42.6	42.6	72.1
	Insecticide	6	3.3	3.3	75.4
	Fungicide	6	3.3	3.3	78.7
	All	39	21.3	21.3	100.0
	Total	183	100.0	100.0	



Which types of agrochemicals did you use for healing some wounds of cattle, horse, donkey, and others?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Herbicide	60	32.8	32.8	32.8
	Fertilizer	104	56.8	56.8	89.6
	Insectcide	9	4.9	4.9	94.5
	Fungicide	10	5.5	5.5	100.0
	Total	183	100.0	100.0	



Do you use fertilizers like DAP, urea as wound healing chemical for?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Human	5	2.7	2.7	2.7
	Horse	174	95.1	95.1	97.8
	Sheep	4	2.2	2.2	100.0
	Total	183	100.0	100.0	

Do you use insecticide as wound healing chemical for:

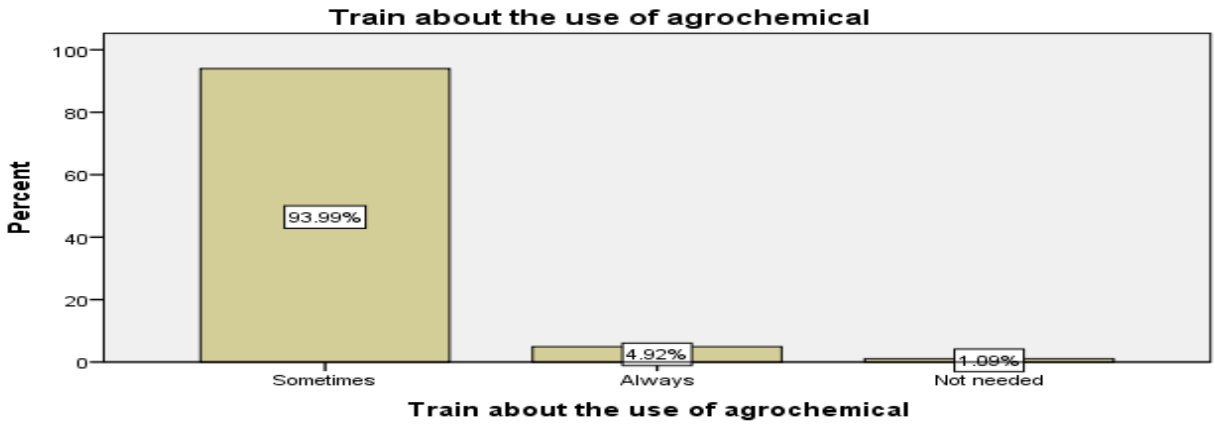
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Human	6	3.3	3.3	3.3
	Mule&Horse	172	94.0	94.0	97.3
	Cow&Oxe	5	2.7	2.7	100.0
	Total	183	100.0	100.0	

Do you use herbicide for eradicating weeds from your farmland?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Sometimes	78	42.6	42.6	42.6
	Always	102	55.7	55.7	98.4
	No	3	1.6	1.6	100.0
	Total	183	100.0	100.0	

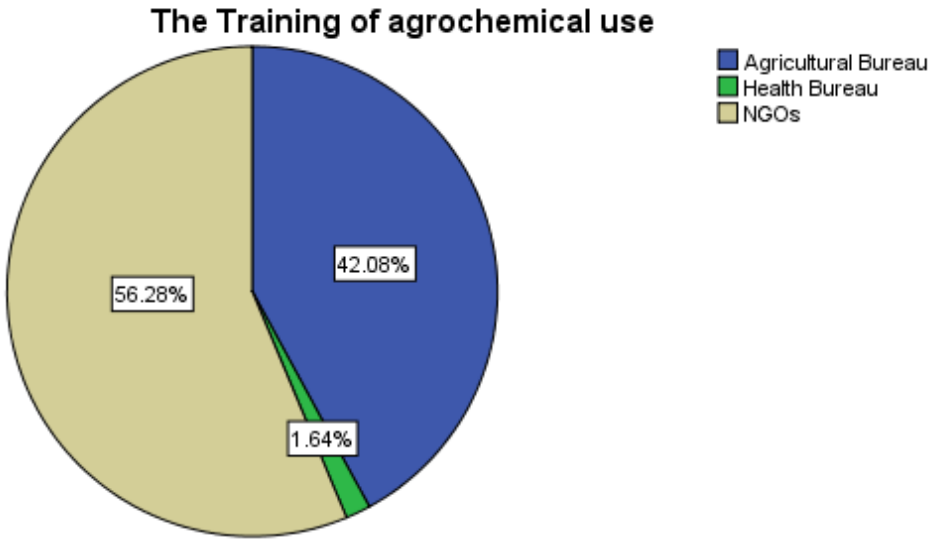
Train about the use of agrochemical

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Sometimes	172	94.0	94.0	94.0
	Always	9	4.9	4.9	98.9
	Not needed	2	1.1	1.1	100.0
	Total	183	100.0	100.0	



The Training of agrochemical use

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agricultural Bureau	77	42.1	42.1	42.1
	Health Bureau	3	1.6	1.6	43.7
	NGOs	103	56.3	56.3	100.0
	Total	183	100.0	100.0	



Do you wear personal protective materials while spraying pesticide?

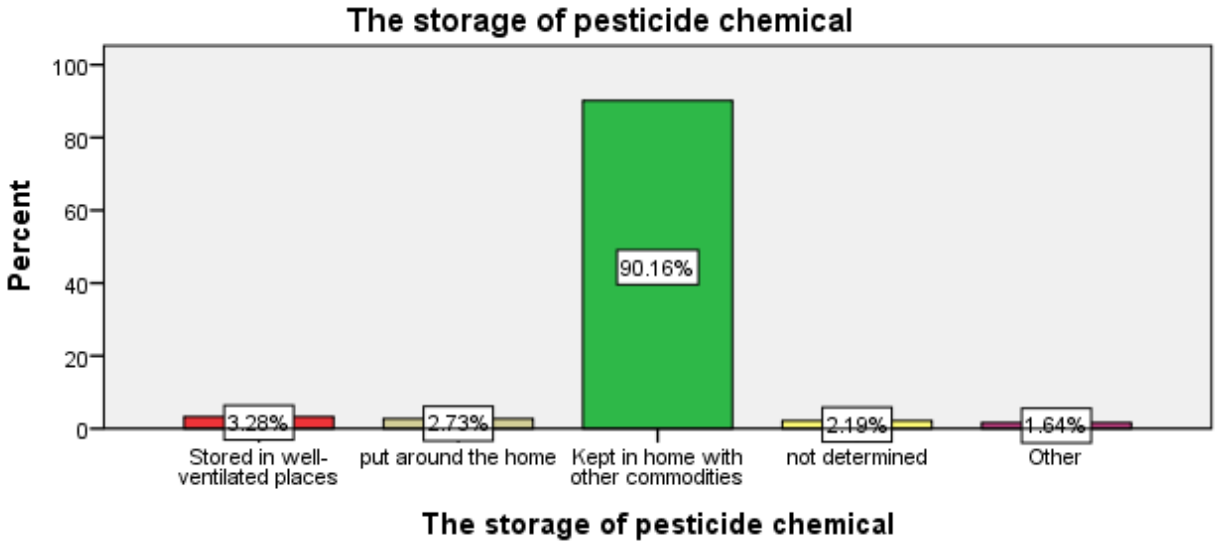
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	163	89.1	89.1	89.1
	No	20	10.9	10.9	100.0
	Total	183	100.0	100.0	

If your answer is yes, please choose some of personal protective materials you use while spraying pesticide.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Knapsack sprayers	4	2.2	2.2	2.2
	Buckets	3	1.6	1.6	3.8
	Brushes	2	1.1	1.1	4.9
	Brooms	4	2.2	2.2	7.1
	All	170	92.9	92.9	100.0
	Total	183	100.0	100.0	

The storage of pesticide chemical

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Stored in well-ventilated places	6	3.3	3.3	3.3
	put around the home	5	2.7	2.7	6.0
	Kept in home with other commodities	165	90.2	90.2	96.2
	not determined	4	2.2	2.2	98.4
	Other	3	1.6	1.6	100.0
	Total	183	100.0	100.0	



Do you use containers of pesticides when the contents exhausted?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	176	96.2	96.2	96.2
	No	7	3.8	3.8	100.0
	Total	183	100.0	100.0	

If your answer to question 13 is yes, for what purposes did you use?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	For drinking water/beverage	78	42.6	42.6	42.6
	food serving object	60	32.8	32.8	75.4
	watering serving for domestic animals	40	21.9	21.9	97.3
	Other	5	2.7	2.7	100.0
	Total	183	100.0	100.0	

Appendix – 3 the list of pictures taken during the collection of data

VID_20230813_064744.mp4