KNOWLEDGE, ATTITUDE AND PRACTICE OF INDOOR USE OF PESTICIDE IN HOUSEHOLDS OF HAWASSA CITY AND ITS POSSIBLE HEALTH IMPACTS, SIDAMA NATIONAL REGIONAL STATE, ETHIOPIA

M.Sc THESIS

AGEGNEHU ALEMU

HAWASSA UNIVERSITY, HAWASSA, ETHIOPIA

OCTOBER, 2023

KNOWLEDGE, ATTITUDE AND PRACTICE OF INDOOR USE OF PESTICIDE IN HOUSEHOLDS OF HAWASSA CITY AND ITS POSSIBLE HEALTH IMPACTS, SIDAMA NATIONAL REGIONAL STATE, ETHIOPIA

AGEGNEHU ALEMU

A THESIS SUBMITTED TO THE

DEPARTMENT OF BIOLOGY

HAWASSA COLLEGE OF NATURAL AND COMPUTATIONA SCIENCE, SCHOOL OF

GRADUATE STUDIES

HAWASSA UNIVERSITY

HAWASSA ETHIOPIA

IN PARTIAL FULLFILMENTS OF THE

REQUIREMENT FOR

THE DEGREE OF

MASTERS OF SCINCE IN ECOTOXICOLOGY AND ENVIRONMENTAL HEALTH

ADVISOR: SHIFERAW AYELE (PhD)

NOVEMBER, 2023

HAWASSA, ETHIOPIA

SCHOOL OF GRADUATE STUDIES

HAWASSA UNIVERSITY

ADVISORS' APPROVAL SHEET

==========

This is to certify that the thesis entitled "***Knowledge, attitude and practice of indoor use of pesticide in households of Hawassa city and its possible health impacts, Sidama national regional state, Ethiopia*** " submitted in partial fulfillment of the requirements for the degree of Master's with specialization in Ecotoxicology and Environmental Health, the Graduate Program of the Department/School of Biology, and has been carried out by **Agegnehu Alemu IDNºGPEcEHR/0001/14**, under my/our supervision. Therefore I/we recommend that the student has fulfilled the requirements and hence hereby can submit the thesis to the department.

Shiferaw Ayele (Ph.D) _____ _____

Major Advisor Signature Date

SCHOOL OF GRADUATE STUDIES

HAWASSA UNIVERSITY

EXAMINERS' APPROVAL SHEET

==========

We, the undersigned, members of the Board of Examiners of the final open defense by have read and evaluated his/her thesis entitled "***Knowledge, attitude and practice of indoor use of pesticide in households of Hawassa city and its possible health impacts, Sidama national regional state, Ethiopia***", and examined the candidate. This is, therefore, to certify that the thesis has been accepted in partial fulfillment of the requirements for the degree of Masters.

_____.	_____.	_____.
Name of the chair person	Signature	Date
---	---	---
Name of Internal Examiner	Signature	Date
---	---	---
Name of Major Advisor	Signature	Date
---	---	---
Name of External Examiner	Signature	Date
---	---	---
SGS Approval	Signature	Date

Final approval and acceptance of the thesis is contingent up on the submission of the final copy of the thesis to the School of Graduate Studies (SGS) through the Department Graduate Committee (DGC) of the candidate's department.

Stamp of the SGS

Date:_____

Remark

ACKNOWLEGDEMENTS

First and for most, I would like to thank the **Almighty God** for the providence and faithful guidance; without whom nothing would have come to this end. He protected me and for this I will always honor my **God** and all praise and glory to him, for granting me the ability and strength to accomplish this research paper all the way through.

I would like to extend my deepest gratitude and greatest respect to my thesis Major Advisor, Shiferaw Ayele (PhD), for his tremendous academic support, valuable suggestions, and constructive guidance in writing this thesis with wisdom and patience; without his genuine advice this research would not have been possible. I appreciate his invaluable guidance and advice from the conception of my thesis to its realization in a statement.

My great sincere thanks and my deepest appreciation goes to my brother Kifile Alemu for his unreserved encouragements during the whole period of the research work. I am thankful to Sidama regional state, Mayor Office of Lekku city administration and principals of Lekku high school for their positive attitude and allowing me to follow my regular class and for financial and material during my study. I thank All Lekku high school teachers and students for their unreserved support during the study period. I would like to thank my lovely Uncle Ato Bezabih and all his families for providing me material and moral support.

Last but not least, my great sincere thanks and my deepest appreciation goes to all my relatives and friends Tariku Burka, Mesfin Degefu, Adane Kabato, Tsega Mesafint and Daniel Dangiso for their unreserved encouragements during the whole period of the research work.

DECLARATION

I hereby declare that this MSc thesis is my original work and has not been presented for a degree in any other University, and all sources of material used for this thesis have been duly acknowledged.

Name: Agegnehu Alemu

Signature: _____

Date: _____

DEDICATION

This thesis work is dedicated to my beloved father Alemu Gebrewold and my mother Almaz Mitiku who deserves to see my academic success.

TABLE OF CONTENTS

Contents **Page**

LIST OF TABLES

Table **Page**

LIST OF FIGURES

Figures **Page**

LIST OF ABBREVIATIONS /ACRONYMS

CSA	Central Statistical Agency
DDT	Dichloro Diphenol Trichloroethane
FAO	Food and Agricultural Organization
FGD	Focus Group Discussion
HH	Households
HCAFEDD	Hawassa City Administration Finance and Economy Development Department
KAP	Knowledge, Attitude and Practice
KIIs	Key Informant Interviews
PPEs	Personal Protection Equipment's
SPSS	Statistical Package for Social Science
WHO	World Health Organization

ABSTRACT

Pesticides are widely used in homes to prevent or control pests, diseases, and other animal pathogens to improve the public health quality. However, improper use of pesticide has consequences of human health effects. In country, the impacts of pesticides are likely to be aggravated by the limited knowledge among users on toxicological and chemical properties of these substances. This study was designed to assess knowledge, attitude and practice of indoor use of pesticide in households of Hawassa city and its possible health impacts, Sidama national regional state, Ethiopia. To achieve this objective, essential information was gathered from six sample kebeles based on mixed research design. Both quantitative and qualitative data were collected concurrently. In this survey 217 households were selected from six sample kebeles then distributed according to the numbers of households in each Kebele. This study finding indicates the most common pests' troubled households in the homes were cockroach, house fly, bed bugs, mice, mosquitoes and lice 45.4%, 23.4%, 13.7%, 7.8%, 5.9% and 3.9% respectively. *In order to control pests* 75.6% and 24.4% of *households used traditional methods and synthetic pesticides respectively. The result of the analysis indicated that the 75.6%) of respondents were said that they used synthetic pesticides at different levels, 63.4%) of the household respondents said that they used roach killer pesticides at different levels, 32.2%) of the respondents reported that untrained fathers were sprays pesticide, 49.3%) of the household participants indicated that they disposed empty pesticide containers on the open area, 65.9%) of the respondents indicated that pesticides enter in to the body via skin. This result also indicated that households mostly exposed to pesticides during spraying. They were not properly disposed and they re-used pesticide containers for various purposes in their home. As survey finding indicated that improper use of pesticides in home is the consequences of human health impacts in the study area. In general, the majority of households have low level of awareness in the study area concerning their practice related to pesticide use. Therefore, there should be an integrated effort from governmental and non-governmental organizations that focus on the awareness rising of households on proper pesticide use and safety measure practice management related issues.*

Key Words: Households, Pest, pesticide use, Synthetic pesticide, Traditional pest protection methods

1. INTRODUCTION

1.1 Background of the Study

Pesticide is a chemical used to control or destroy pests that damage crop plants and disturbs human health. Pesticide use is a common performance to control pests and disease in crop cultivation. A pesticide is any chemical or biological agent that kills or reduces the action of plant or animal pests. They are known to be one of the useful and beneficial agents for preventing losses of crops as well as diseases in humans (Marquis, 2013). The urban public housing dwellings are prone to have severe pest infestation mainly due to the presence of abundant food sources (both indoor and outdoor), persistent moisture problem, household cluttering, and cracks and crevices in the walls, windows, and doors (Horton *et al.,* 2011).

Cockroaches, lice, bed bugs and rodents are present in the homes of many residents in the developing cities. Besides causing annoyance and stress, they are sources of allergens that can trigger asthma symptoms in sensitized individuals, and they may increase the risk of allergic sensitization (Gruchalla *et al.,* 2005; Chew *et al.,* 2008).

The use of pesticides in most developing countries is becoming an increasingly serious environmental problem due to factors such as water contamination, ecosystem disruption and habitat contamination. Pesticides can be very harmful especially to the people coming into contact with them as part of their daily lives (Chew *et al.,* 2008).

Pesticides are poisonous chemicals by design, they are biocides designed to kill, reduce insects, weeds, fungi, rodents or other organisms that can threaten public health and economy. Pesticides are known by a various names depending on their target, a few of these insecticide, fungicide, and herbicide. Pesticides are used to kill insects, fungus, bacteria and other organisms that are affect crops and also vectors that transmit disease of public health and veterinary importance. It also eliminates or controls herbs (weeds) and animals causing harm or interference with the production, processing and storage of food and agricultural commodities (Stevenson *et al.,* 2000).

Pesticides applied in urban homes include insecticides and rodenticides, and their chemical formulations frequently involve active and inactive ingredients that are acute toxicants, known or suspected carcinogens (Environmental Protection Agency 2005), or developmental or reproductive toxicants [Environmental Protection Agency (EPA) 2004]. Their application may result in human exposure via inhalation, ingestion, or skin absorption from initial

applications and their residual presence. Pest control that depends on chemical only approaches is limited by its failure to address conditions that sustain pest populations the ability of pests to move within and between residences, the presence of food and water sources typically found in kitchens and bathrooms, and the ability of pests to find and create shelter. Integrated pest management (IPM) is an approach that primarily involves improving sanitary and structural conditions to deny pests food, water, harborage, and movement, and includes the judicious use of pesticides after an evaluation of need and the hazard to human occupants. Pesticide use reduction, improved pest management, and reduced pest and allergen burdens in housing populated by largely black and Hispanic families with disproportionately high prevalence of asthma (Stevenson *et al.*, 2000).

When household using pesticides in their home it is necessary to read the instructions on the container for use and waste disposal very carefully. In other words, the instructions on the container are the best mechanism not only to use properly the pesticides, but also elimination of unnecessary application and proper pesticide storage (Amera, 2008).

Residents in their home may also be unaware of the health hazard. However, they known that extensive use of pesticide have adverse effect on health and gradually contaminate the environment (Calvert *et al.*, 2008). 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. 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). The incidence of pesticide poisonous is increasing according to the existing reports and it is estimated that about five million people die every year, cause long term damage to human, birth defects, damage the nervous system and potentially cause cancer and similar related international accidental and occupational exposure worldwide (Ali *et al.*,2002).

1.2. Statement of the Problem

In our country, there is lack of strong controlling mechanism on the importation of hazardous chemicals, absence of well-established institutions to provide occupants with knowledge of pesticide application and about safety issues, and explanation of non-licensed visitors increase the importance of establishing effective guidelines to minimize the negative impact of pesticide on the heath of occupants and environmental sustainability (Karuna *et al.*, 2012).

Most of our pesticide sprayers were mostly exposed to pesticide injury as well as they have more probability pesticide poising as result of limited information on pesticide application with in an individual (operators) safety and they were exposed to health problems like skin irritation, nausea, vomiting, headache, eye irritation (Kasahun, 2019). The impacts of pesticides in Ethiopia are likely to be aggravated by the limited knowledge among users on toxicological and chemical properties of these substances. And the fact that labels on pesticide containers were in a language which cannot be understood or missing (Tadesse Asferachew, 2008).

The pesticide problem appears in the study areas like nausea, headache, vomiting, skin irritation, and eye irritation due to poor application on pesticide utilization of occupants in home (personal observation). These are because of the lack of training, attitude, work experiences and misuse is the main factors that influence the pesticide application in the study area. Despite the popularity and beneficial use of pesticides, there are serious concerns about health risks arising from the exposure of occupants when mixing and applying pesticides in their home and from residues in food and in drinking water (Soares and Porto, 2009). Moreover, there is no similar research was conducted in the study area. Taking this in to consideration, this study was aimed to fill this gap by assessing knowledge, attitude and practice of indoor use of pesticides in households of Hawassa city and its possible health impacts, Sidama national regional state.

1.3. Objectives of the Study

1.3.1. General Objective of the Study

The general objective of the study was to assess knowledge, attitude and practice of indoor use of pesticide in households of Hawassa city and its possible health impacts, Sidama national regional state, Ethiopia.

1.3.2. Specific Objectives of the Study

1. To identify the type of pesticides used in the study area.
2. To assess knowledge, attitude and practice of the occupant's on pesticide use assess the occupants' traditional methods of pest prevention in the study area
3. To identify the human health adverse impacts associated with use of pesticides in home.

1.4. Research Questions

1. What is the type of pesticides used in the study area?
2. What is the knowledge; attitude and practice of the occupant's on pesticide use assess the occupants' traditional methods of pest prevention in the study area?
3. What is the human health adverse impact associated with use of pesticides in home?

1.5 Significance of the Study

The output of the study will contribute significantly to information and knowledge on the potential risks to the environment and human health arising from the household's use of pesticides in their home. The present study makes an important contribution to an improved understanding of the impacts of pesticides on the human health in study area such an understanding is necessary for training on the safe use of pesticides in their home. The study will generate specific information on the types and quantity of pesticides used in the home. The information is important to health and environmental officers to formulate the ways of using pesticides. The information will be used by other scholars as input for further research. This information will be useful to the government and other stakeholders in developing appropriate policies to enhance environmental and human safety in pesticides use for households.

1.6 Scope of the Study

The study was confined to occupants or households at six selected Kebeles (Guwe, Fara, Tula 01, Tesso, Wuquro and Dume kebeles) were selected by using systematic random sampling method from total 32 kebeles of Hawassa City administration. The study was concentrated on pesticides use in home in the study area. The study was carried out over a period of four months and may not have captured long term changes. The study area was selected systematically based on the researcher's previous and current knowledge for the city and the sample households was selected randomly.

1.7 Limitations of the Study

Some respondents were not voluntary to participate and give information. The respondents who involve in this study were afraid of to give information on the reuse of pesticide material. Households did not know the names of the pesticides they used, or gave inaccurate names in many cases, so not all pesticides could be identified. There is a limitation to get published articles and journals in this field of study in our country for literature review and to be used for comparison of the result obtained. Money and time were the key constraints on the thesis. The monetary overhead was particularly limiting because the researcher had to finance all research related expenses out of own pocket.

2. LITERATURE REVIEW

2.1 Meaning and Concept of Pesticides

The term is used very broadly to include all chemical products intended for use in the prevention or control of pests, diseases, and weeds in crops all chemical products used to protect harvested products against pests and diseases all chemical products used to eradicate malarial mosquitoes or to rid cattle of ticks. A pesticide is a substance intended to prevent, destroy, repel or control any animal pest or disease caused by microorganisms, as well as unwanted weeds (Ming, 2005). It is a generic term that covers a wide spectrum of biologically active compounds, including herbicides, fungicides and insecticides. Pesticides are harmful to animals and microorganisms through direct contact, feeding or other kinds of effective exposure during their stages of growth. Insecticides include: organochlorine, organophosphates, carbamates, synthetic pyrethroids, acylureas and fumigants. The majority of insecticides used today are synthetic organic chemicals, and most of them are nerve poisons which act by inhibiting the organism's enzymes or interacting with other target sites vital to the proper functioning of the insect's nervous system while other insecticides act by blocking essential process, such as respiration. Pesticides are used widely in agriculture and for many other purposes whereas their use and dispersion in the environment has mainly occurred (Ming, 2005).

2.2 Historical Background to Pesticides Use

The use of pesticides dates back to the times of Ancient Romans where people used to burn sculpture for controlling weeds. A Roman naturalist urged the use of arsenic as an insecticide (Margni *et al.,* 2002). Humans since the BC have utilized pesticides to protect their crops. The First known pesticides was elemental sulfur dusting used in ancient Mesopotamia. By the 15^{th} century, toxic chemicals such as arsenic, mercury and lead were being applied to crops to kill pest. A short history of pesticide use describes that the use of chemicals to control insects possibly dates back to the classical Greece and Rome. The Chinese were using chemical insecticides like arsenic and nicotine at least by the 16th century (Margni *et al.,* 2002). Globally, the use of pesticides in food production is common to many farmers using commercial pesticides for pest control to increase yield and improve quality; and the world health organization (WHO) reports that 20% of pesticide use in the world is concentrated in developing countries (PANG, 2012).

2.2.1 Pesticide Use in Ethiopia

Agricultural development policies in many developing countries have resulted in an increase in the use of inorganic fertilizers and chemical pesticides as a means to increase agricultural production (Ngowi, 2003).Pesticides are one of the vital inputs in agriculture to prevent loss of production, but if not properly handled and/or managed they could create major environmental and human health risks (Vergucht, 2006). 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 effects like ocular, dermal, cardiovascular, gastro intestinal, carcinogenic, endocrine disruption, developmental, neurological, and respiratory effects (Damalas *et al.,* 2011; Ntzani *et al.,* 2013).

Tough 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, Labor proclamation number 277/2003 and Environmental pollution control proclamation number 300/2002), previously conducted pesticide-related Knowledge, Atitude and Practice (KP) 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 (Mekonnen, 2002; Amera, 2008; Karunamoorthi *et al.,* 2011).

2.3 Classification of Pesticides

There are different types of pesticides and a classification is offered according to the target organism. Based on the target organism (Draggan and Miller, 2012) classified pesticides as follows:

Antimicrobials- Kill microorganisms (such as bacteria and viruses), Attractants- Attract pests, **Fungicides-** Kill fungi (including blights, mildews, molds, and rusts),

Herbicides- Kill weeds and other plants that grow where they are not wanted, Insecticides- Kill insects and other arthropods,

Molluscicides- Kill snails and slugs,

Nematicides- Kill nematodes (microscopic, worm-like organisms that feed on plant roots), **Rodenticides-** Control mice and other rodents,

Inorganic Pesticides- they include arsenic, copper and mercury compounds, highly toxic biocides that have the ability of remaining in the environment for extended periods of time. They are generally neurotoxins and even a single dose may cause permanent damage (Cunningham *et al.,* 2003).

Natural Organic Pesticides- mainly plant extracts. Some examples are nicotine and nicotinoid alkaloids from tobacco, rotenone from the roots of derris and cube plants and pyrethrum, a complex of chemicals extracted from Chrysanthemum cinerariaefolium (Cunningham *et al.,* 2003). Rotenone has been linked to nerve damage and Parkinson's disease (IPM, 2003).

Fumigants-it contains small molecules such as carbon tetrachloride, carbon disulfide, ethylene dichloride, and ethylene dibromides that gasify easily and penetrate rapidly into some materials. They are used to sterilize soil and prevent degradation of stored grain. These compounds are very dangerous for workers, and their use has been severely restricted or banned (Cunningham *et al.,* 2003).

2.4 Pesticide Registration and Safety

Pesticide registration is a scientifically based, legal, and also administrative process. Where a wide variety of effect associated with the use of a pesticide product and its potential effect on human health and the environment is assessed (Monaco *et al.,* 2002; EPA, 2009). The registration is an important step in the management of pesticides as it enables authorities primarily to determine which pesticide products are permitted to be used and for what purposes, and also to exercise control over quality, usage rates, claims, labeling, packaging and advertising of pesticides, thus ensuring that the best interest of end-users as well as the environment are well protected (WHO, 2010). The registration process for a pesticide usually requires the manufacturer (registrant) to conduct, analyze, and pay for many different scientific tests. These tests define the product chemistry, risks to humans and domestic animals, the environmental fate of the pesticide, and the impact on non-target organisms (FAO, 2002).

2.5 Importance of Pesticides

The term pesticide covers a wide range of compounds, including insecticides, herbicides, rodenticides, molluscides, nematodes, plant growth regulators etc. The problem associated with pesticides is mostly marked in rural areas that use different types of pesticides like

herbicides and insecticides. Pesticides can be biological or chemical based up on application method. Most pesticides work by poisoning pests. A systematic pesticide moves inside the plant by absorption (Elzinga, 2004).

Pesticides are used to control organisms that are harmful to human and livestock health. Pesticides kill mosquitoes that can transmit diseases like yellow fever and malaria. They can also kill bees, wasps or ants that can cause allergic reactions and causes high exposure to health risks. Herbicides can be used to clear road side, weeds and trees. They can also kill invasive weeds that may cause environmental damage. Herbicides are commonly applied in ponds and lakes to control algae and plants such as water grasses that can interfere with activities like swimming and fishing that cause water to look or unpleasant smell (Jansen, 2008).

Uncontrolled pests such as termites and mould can damage structures such as houses. Pesticides are used in grocery stores and food storage facilities to manage rodents and insects that infest food such as grain. Each use of a pesticide carries some associated risk (World Book 1994). Wide spread application of pesticides can eliminate food sources and certain types of animals, thereby causing the need to relocate the animals, to change their diet or starve them. Proper use of pesticides decreases the associated risk. Poisoning may also occur due to the use of DDT and other chlorinated hydrocarbons by entering the human food chain when animal tissues are affected (Elzinga, 2004).

Pesticides help to control a variety of organisms. Most disinfectants used in homes, hospitals and restaurants contain pesticides, some of which only last long enough to control the target pest while the others remain in the environment. According to the WHO and the United Nations (UN) environmental program estimates, each year three million workers in agriculture in developing world experience severe poisoning from pesticides, about 18,000 of who die (WHO, 2006). Farmers' occupational exposure to pesticides occurs in manufacturing process, such as mixing, loading, packaging and storing. Workers involved in pest control in agriculture and vector borne disease prevention programs are usually exposed to pesticides during mixing and spraying (Grube *et al.,* 2011).

Therefore, the effects of exposure to pesticides result in human health problem. The causal factors contributing to acute occupational pesticides poisoning include sloppy handling, lousing preparation and spraying of highly toxic pesticides or high concentrations of spraying every row, direct contact with sprayed crops, going forward into the wind during spraying,

lack of personal protection and poor personal hygiene (WHO, 2006).It is argued that exposure to pesticides is associated with long term health problems such as respiratory problems, memory disorders, dermatologic condition, cancer depression, neurological deficits and birth defects (Williamson *et al.*,2008). This is despite the fact that pesticides also preserve the beauty of recreational areas by controlling weeds and preventing structural damages associated with termite's infestations. Moreover, herbicides and insecticides are used to preserve the control vectors that cause diseases (Aktar *et al.*, 2009).

2.5.1 Importance of Pesticides for Agriculture

Agricultural population use pesticides to protect their crops from damages caused by pests. Pesticides are also used as plant growth regulator, defoliant, desiccant or agent of thinning fruit, preventing premature fall of fruit and substances applied to crops either before or after harvest to protect the commodity from deteriorations during storage and transport (Mulualem, 2005). As literature shows, worldwide, 40% of agricultural product is lost due to plant diseases, weeds, and pests collectively (Ross, 2005). That means that if there would have been no pesticides, crop losses would have been even more. Moreover, these crop-saving substances not only protect the crops from damage rendered by pests, but they also increase the yields of crops considerably.

2.5.2 Importance of Pesticides for Public Health

Pesticides are useful not only for control of pests from affecting crops, but also to prevent them from transmitting diseases to people and animals. People use pesticides where pests are a major problem to human health. Insects are probably the major pests that transmit serious diseases such as malaria and typhus. Therefore, pesticides are also used in homes and other buildings to control pests such as ants, flies, cockroaches and termites (Elzinga, 2004). He further argues that ticks, rodent and insect- borne diseases such yellow fever, typhoid fever and typhus have been kept in control by the effective use of pesticides.

2.5.3 Importance of Pesticides for Veterinary Health

Pesticides are used to control threats caused by external parasites to health of domestic animals. They are effective control against ticks, lice, blow flies, biting flies, itching mites, screw worms and other external parasites affecting veterinary health. They also protect animals from biting fly and strikes for a certain period of time. Pesticides differ according to their effects on various organisms, and, therefore, selective pesticides are absorbed by organisms in lower level of food chain. In Ethiopia, pesticides are widely used for a variety of

purposes. In addition for controlling agricultural fields from being affected by pests, pesticides are used in homes in the form of sprays, poisons and powders for controlling cockroaches, mosquitoes, rats, fleas, ticks and other harmful bugs (Margni *et al.*, 2002).

To wind up, pesticides use, as has been above discussed has both benefits and risks. The degree of benefits and risks depends on whether or not the pesticides are used properly and improperly. If pesticides are used and pesticides wastes are disposed properly the benefits could more than the risks. As research has revealed, for example, about one-third of the agriculture products are produced by using pesticides (Liu *et al.,* 2002). As a result, agricultural sector consumes significant amount of pesticides approximately 85% of the estimated 2.9 million tones are used each year globally (Raven *et al.,* 2008). It is estimated approximately 9000 species of insects and mites, 50,000 species of plant pathogens and 8000 species of weeds damage crops worldwide (Pimentel, 2009).

Pesticides' use especially is at a rapid rate in developing countries, where the livelihood of major of the people based on agriculture. None use of pesticides would shortage of food security there. The developing nations utilize about 20% of total pesticides applied worldwide. Despite the increasing application of tons of pesticides worldwide, however, more than 40% of all potential food production and another 20% of the harvested crop is lost to pests. This indicates that farmers of the developing countries need to use more pesticides to ensure food security. Ethiopia is a developing country, whose economy is largely dependent on agriculture. Hence, Ethiopia needs high yield varieties of crops to ensure food security, which requires increased use pesticides, with proper management indeed (Ngowi, 2007). At the same time, pesticides' use is also important for public health and the health of domestic animals. Vector-borne diseases are most effectively tackled by killing the vectors. Insecticides are often the only practical way to control the insects that spread deadly disease such as malaria, resulting in an estimated 500 deaths each day (Ross, 2005).

When a pesticide is released into the environment many things happen to it. Sometimes, the leaching of some herbicides into the root zone can result in better weed control and at times releasing pesticides into the environment can be harmful, as not the entire applied chemical reaches the target site (Cesna *et al.,* 2005). The behavior of pesticides in soils for example is governed by a variety of complex dynamic physical, chemical and biological processes, including sorption–desorption, volatilization, chemical and biological degradation, uptake by plants, run-off, and leaching. The relative importance of these processes varies with the

chemical nature of the pesticides and the properties of the soil (Arias-Estevez *et al.*, 2008). At the same time, most farmers, farm family members and farm workers have been careless or ignorant of the dangers of exposure to these toxic substances resulting in major health impairments (WHO, 2004).

Throughout the world, the highest levels of pesticide exposure are found in farm workers, pesticide applicators, and people who live adjacent to heavily treated agricultural land, exposure to pesticides can result in a number of acute and chronic illness symptoms which may include skin, eye, stomach and respiratory irritation and neurological problems occupational contamination or poisoning has been identified as the most serious problem associated with the use of agricultural pesticides (Monosson, 2007).

Coronado *et al.,* (2004) stated expose to pesticide has been one of the most important occupational hazards among farmers in developing countries. Farmers in Ogun state, Nigeria where 95% indicated they had experienced redness among other symptoms after using pesticides. Farmers in Ogun state, Nigeria where similar health complaints attributed to pesticide had 95 % of the farmers indicated that they normally experienced redness of eyes amongst other symptoms after using pesticides (Lawal *et al.,* 2005). Pesticides enter the atmosphere either by application drift, post-application vapor losses or wind erosion of pesticide treated soil. They and their photo degradation products may be transported long distances before the removal processes of atmospheric wet and dry deposition return them to the earth's surface (Cessna *et al.,* 2005). Pesticides can enter the human body through inhalation of aerosols, dust and vapor that contain pesticides; through oral exposure by consuming contaminated food and water; and through dermal exposure by direct contact of pesticides with skin (Sacramento, 2008).

Exposure to pesticides can range from mild skin irritation to birth defects, tumors, genetic changes, blood and nerve disorders, endocrine disruption, and even coma or death (Miller, 2004; Mathur *et al.,*2005).

2.6. Impacts of Pesticide on Human Health and Environment

2.6.1 Positive Impacts of Pesticide on Human Health

Before unpacking the ways in which pesticides can negatively influence human health, it is important to remember the many mechanisms through which they can be beneficial to health. Cooper and Dobson (2007) detail a litany of these benefits, which we summarize here. Most

directly, the use of pesticides reduces the incidence of harmful pests, which can severely limit yields, contribute to both pre- and post-harvest losses, or even directly impact human health as disease-carrying vectors. This increase in yields and food availability should translate into increased incomes, decreased malnutrition, and improved human health for farming households. In particular, herbicide use reduces the drudgery associated with hand-weeding, which may increase quality of life and decrease energy expenditure as well as physical hardship and risk of injury. On Sub-Saharan Africa specifically, Gianessi and Williams (2011) argue that herbicide use remains a significantly underutilized method of increasing yields and saving labor on farm. Farmers may also benefit from a widening array of crop varieties and times of the year when agriculture is viable with pesticide use. Indirectly, farmers benefit through revenue gains from more marketable agricultural surplus or the reduced need to buy food, both of which facilitate the purchase and consumption of nutrient-rich foods or better health-related practices (like visiting a doctor preemptively, procuring medicines, purchasing and using a mosquito net to prevent malaria, etc.). Similarly, if these pesticides are labor-saving technologies and relatively less expensive than the human time needed as a substitute, then farmers enjoy increased profits not only from increased revenues but also from reduced costs of other agricultural inputs, should all else remain constant (Cooper and Dobson, 2007).

2.6.2. Negative Impacts of Pesticide on Human Health

Pesticides can enter the human body through inhalation of aerosols, dust and vapor that contain pesticides; through oral exposure by consuming contaminated food and water; and through dermal exposure by direct contact of pesticides with skin. Pesticides are sprayed onto food, especially fruits and vegetables, they secrete into soils and groundwater which can end up in drinking water and pesticide spray can drift and pollute the air (Sacramento, 2008). The effects of pesticides on human health are more harmful based on the toxicity of the chemical and the length and magnitude of exposure (Lorenz, 2009). Farm workers and their families experience the greatest exposure to agricultural pesticides through direct contact with the chemicals. But every human contains a percentage of pesticides found in fat samples in their body. Children are most susceptible and sensitive to pesticides due to their small size and underdevelopment. The chemicals can bioaccumulation in the body over time. Exposure to pesticides can range from mild skin irritation to birth defects, tumors, genetic changes, blood and nerve disorders, endocrine disruption, and even coma or death (Miller, 2004).

2.6.3 Impact of Pesticides on the Environment

The major source of environmental contamination by pesticides is the deposits resulting from application of these chemicals to control agricultural pests. Effect on the environment could come from point-source pollution and non-point source pollution. The former is the contamination that comes from a specific and identifiable place; including pesticide spills, wash water from cleanup sites, leaks from storage sites, and improper disposal of pesticides and their containers. The latter is the contamination that comes from a wide area, including the drift of pesticides through the air, pesticide run off into waterways, pesticide movement into ground water (Toth and Buhler, 2009).

Environmentally-sensitive areas to the pesticides are; where ground water is near surface, near the habitats of endangered species and other wildlife; near honey bees and near food crops and ornamental plants ((Toth and Buhler, 2009). Sensitive plants and animals as well as the water quality of water bodies in field margins can be affected either directly or indirectly (Cessna *et al.,* 2005).The degradation of pesticide is influenced by many factors including application factors, pesticide properties weather conditions and microorganisms (Zhi-Yong Zhang *et al.,* 2006). A smaller content of organic matter in the soil increases the amount of pesticide that will leave the area of application, because organic matter binds to and helps break down pesticides (Lotter *et al.,* 2003).Jansen and Harmsen (2011) and Teklu *et al.,* (2016) the environmental impacts of pesticides are not well understood by farmers in Ethiopia.

Effect of pesticides on bees are closely watched because their importance. However, little is known about the impacts of pesticides on wild pollinators in the field. In recent study conducted in Italian agricultural area, authors monitored species richness of wild bees, bumblebees and butterflies were sampled after pesticides application. They detected decline of wild bees after repeated application of insecticide fenitrothion. Lower bumblebee and butterfly species richness was found in the more intensively farmed basin with higher pesticide loads. During nineties, herbicide Atrazine and Endosulfan were found most often on surface waters in the USA and Australia due to their wide spread use. Other pesticides detected included Pronofos, Dimethoate, Chlordane, Diuron, Prometryn and Fluometuron (Brittain *et al.,* 2010).

Pedlowski *et al.,* (2012) explained that pesticide can potentially contaminate ground water through leaching and run-off due to their physicochemical characteristics which facilitate

their mobility in the soil layers. Pesticides that are adsorbed to soil particles are more likely to remain in the root zone where they may be available for plant uptake and microbial or chemical degradation (Kerle *et al.,* 2007). The pesticides can also move downwards with water through the soil in leaching process. Leaching can be increases when the pesticide is water soluble, the soil is sandy, a rain-event occurs shortly after spraying, and if the pesticide is not strongly adsorbed to the soil (Anonymous, 2009). Inert ingredients and impurities such as dioxins in pesticides may also pose more serious adverse health effects on humans and wildlife (Monsson, 2007).

Impact of Malathion a broad spectrum insecticide, on aquatic ecosystem has been demonstrated. Malathion is the most commonly applied insecticide around the world and can be legally directly sprayed over aquatic habitats to control the mosquitoes. This study showed that relatively small concentration of Malathion caused direct and also indirect effect on aquatic food web. Changes in plankton and periphyton abundance and composition consequently affected growing of frog tadpoles and reduced predation rates on amphibians (Relyea & Hoverman, 2008). Additionally, many of the organisms that provide food for fish are extremely susceptible to pesticides, so the indirect effects of pesticides on the fish food supply may have an even greater effect on fish populations. Prethroid insecticides are extremely toxic to most aquatic organisms. It is evident that pesticides cause major losses in global fish production. Furthermore, recent laboratory studies of endosulfan and fenitrothion in the tilapia species from Lake Victoria in Tanzania indicated a high capacity of the species to absorb the two pesticides from water with rapid distribution in the organs each with a bioaccumulation factor of 33 and 346 L/kg fresh weight respectively (Henry, 2003).

2.7 Training on Pesticide Issue

In Ethiopia, the reason of the gap on pesticide safety measure would be due to the fact that training on the labels on pesticide containers may be which cannot be understood or missing. The recommendations include: washing hands before eating, smoking or using the restroom, wearing protective clothing to minimize skin contact with pesticide residue at work, showering and changing clothes immediately after work and washing work clothes separately. Therefore, the knowledge level of farmers on occupational health and safety hazards and their perceived risk as well as their attitudes and behaviors towards safety, specifically play a crucial role in the safe operation of farming activities for developing countries. This study analyzes pesticide use and safety measures, knowledge, attitude and practices among farmers and sprayers, because knowledge, attitude and practice was the

strongest in the area of farmers reported routinely washing and changing clothes after working in areas where pesticide had been applied.

2.7.1 Proper Pesticide Application

It is necessary to maintain carefully and continuous control over the use and handling of these chemicals during the transportation, mixing, loading, application and disposal. Also a care must be exercised in cleaning equipment, clothing and personal hygiene working with pesticide and check-up the preferable equipment which might be old to use and have maintence (Dellavalle *et al.,* 2012). Non-usage of PPE amongst farmers has been reported in studies conducted by Yassin *et al.*(2002), 45% reported that the failure of farmers to use PPE during pesticide preparation and application presents potential risk to pesticide exposure. Farinde (2012) and Antwi Agyakwa (2013) reported that only a small percentage of cocoa farmers actually wear PPE during pesticides application while majority did not longer use of PPE to be necessary.

2.7.2 Proper Pesticide Handling, Pesticide Have To Be Transported Pesticide, Stored and Disposed Properly

Some of the guide lines should be followed, pesticides must be a safely transported in the beds of trucks, Never be transported in the passenger compartment of vehicle; never be allowed to ride in the bed of pick up tracks carrying pesticide; never be transported in the compartment with food and clothing. Have the container in the shipment should be secured tightly and made up of paper card or similar materials should be protected from moisture during transport (FAO, 2002).

The way of storage often causes accident and more simply the failure of the treatment used. Farmer store pesticides in not recommended places like: bedroom, in general locked farm and outside of the house. Some rules which pertain to pesticide storage; pesticides always store: in their original; labeled container with label clearly visible in tightly sealed containers and check container periodically for leakage corrosion breaks; tears, in well ventilated place, Never in old bottles or food containers near food or seed; have agencies(programs) that store significant amount of pesticide should have designated pesticide store facility(FAO,2001)special requirements for pesticide storage: locking doors, adequate ventilator, adequate light, fire extinguishers ready available; presence of label and for stored materials (Ajayi *et al.,* 2007).

Ogunjimi and Farinde (2012a, 2012b) which stated that, high percentage of Cocoa farmers in Osumand Endo states, Nigeria, store pesticides in living home together with food stuff. With finding previous researchers Ngow *et al. (*2001) and Murphy *etal. (*2002) indicated that storage of pesticide in ungraded sites in common in many developing countries. Tinjiani (2006) which stated that 87.5% of Cocoa farmers in Ondo state, Nigeria, kept their pesticide in store room with very few 8.3 % store in their bed room. It would possess high risk of pesticide exposure to human's, environment, drinking water and food. For instance, the Northern Pres byteria Agricultural Services (NPAS) (2012) reported that fifty farmers in Upper East region of Ghana died in 2010 from suspected pesticide poisoning and most of these died was due to poor storage of pesticide. Always dispose pesticide containers in manner specified on the label, check the container will be recycled, and because of many companies now recycle pesticide containers. Any empty pesticide containers add the correct amount of rinse reaches all interior in the mixing tank (Arcuy *et al.,* 2007).

Repeated this rinsing procedures at least two more times for a total of three rinses and the container dry and replace the cover (Arcuy *et al.,* 2001). Farmers washed their hands after spraying indicates the awareness of harm effect of pesticide on humans. A particular study Curwin *et al.*(2003) indicating that washing hands in the flied was found to reduce the level of pesticide acephate by 96% on the hands of tobacco harvesters. Lawal *et al.* (2005) on Cocoa farmer in Ogun state, Nigeria, which reported all the farmers washed their hands after pesticide application.

2.7.3 Awareness and Practice on Safety

Poor knowledge and understanding of safe practices in pesticide use, erroneous beliefs about the necessity of personal protective equipment, use of pesticides in excessive concentrations than those needed, and poor maintenance facilities for application equipment can seriously impair farmers' abilities to protect themselves against potential risks. Amal *etal.* (2016), in their study found that half of the farming mothers had no information about pesticides, while the information from mass media, agricultural guide and neighbor constituted 23.3%, 16.7% and 10% respectively. Also Okonya and Kroschel(2015) in their study in Uganda reported that most farmers received information about pesticide from their neighbors and only minority from agricultural extension officers. While farmers may be aware of the necessity of using protective equipment when using pesticides, they usually prefer not to use such equipment which they consider as uncomfortable, cumbersome, or unnecessary (Hoek *et al.,* 1998).

2.8 Factors Contribute to Pesticide Exposure

Though no section of human population is completely immune to pesticide exposure yet much higher level of risk is associated in case of occupationally exposed groups including those involved in agricultural activities and pesticide manufacturing etc. (Maroni *et al.,* 2006). Exposure to chemical pesticides may result in a number of serious and chronic health problems such as birth defects, nerve damage, cancer, skin diseases and many other that might occur over a long period of time Environmental Protection Authority (EPA, 2012). However, health effects of pesticides are greatly dependent on factors such as their chemical nature and toxicity as well as dose and length of exposure. According to Environmental protection Authority the risk is directly proportional to toxicity as well as exposure (EPA, 2007).

Another major point of concern regarding pesticide application is their effects on human health. Human beings may be exposed to pesticides through three basic modes i.e. oral, dermal and nasal. Thus, they may enter in the body in a variety of forms such as the toxic residues in all forms of food crops, particularly fruits and vegetables, contaminated water and aquatic animals consumed as food, aerosols in air, direct contact through skin etc. (Sacramento, 2008).

2.8.1 Handling of Pesticides

User's knowledge of the potential hazards of pesticide handling is important for the prevention of exposure to pesticides. Levels of knowledge regarding routes of exposure to pesticides and specific health effects of pesticides may vary considerably among farmers (Elmore & Arcury, 2001). Pesticide use in most of the developing countries is reported to be unscientific and unregulated, causing serious damages to the ecosystem and human health. The trade-off between the health impacts and financial benefits of crop production has been reported by various researchers across the globe (Crissman *et al.,* 1994).

Despite this, pesticide- use policies and regulations are in their infancy in many developing countries and as a result, pesticide misuse is prevalent. Several instances of chronic toxicity or deaths have been reported among the exposed farm population due to occupational, accidental or intentional poisoning. Using/consuming of a pesticide is the major mode of committing suicides among the farmers in distress in the state of Kerala due to its easy access. A cross-sectional survey of 1102 farmers in Austrialia indicated that the Victorian grain farmers were frequent user of a variety of pesticides but the use of protective clothing

while handling pesticide was poor, while many industrial farmers did not use PPE at all. Personal protective equipment use across all pesticide class was poor, indicating the possibility of clinically significant pesticides exposure in many farmers. The result showed that non-use of PPE was frequently reported by up to 10-40%of farmers (McFarlane *et al.*, 2007).

2.8.2 Use of Protective Equipment

Poor knowledge and understanding of safe practices in pesticide use, erroneous beliefs about the necessity of personal protective equipment, use of pesticides in excessive concentrations than those needed, and poor maintenance facilities for application equipment can seriously impair farmers' abilities to protect themselves against potential risks. In particular, lack of personal protection equipment or failure to use it properly is a major problem during pesticide application. It is also essential that the available protective equipment is suitable for the purpose used and fits the user properly and comfortably. If it is unsuitable for the purpose used or does not fit the user well, it will not be worn and apparently it will not protect. While farmers may be aware of the necessity of using protective equipment when using pesticides, they usually prefer not to use such equipment which they consider as uncomfortable, cumbersome, or non-essential (Perry *et al.*, 2002).

3. METHODS AND MATERIALS

3.1 Description of Study area

Hawassa is the capital of the Sidama National Regional State and it is located in the Sidama Region on the shores of Lake Hawassa in the Great Rift Valley. It is situated along the international road that connects Addis Ababa with Nairobi at a distance of 275 kilometers south of Addis Ababa and 1125 km North of Nairobi. The city lies on the Trans-African highway Cairo-Cape Town, with a latitude and longitude of 7°3′N 38°28′E. It lies on a relatively flat plain in the rift valley topographic region having an average elevation of around 1,680 meters above sea level. Hawassa Town is bounded by Lake Hawassa in the west, Oromia Region in the north, Wendo genet and Malga woredas in the east and Shebedino and Gorche woredas in the south. Hawassa has a total area of 157.2 sq.km divided into eight (8) sub cities divided into 32 kebeles. These Eight sub cities are Hayek Dare, Menehariya, Tabore, Misrak, Bahile Adarash, Addis Ketema, Hawela Tula and Mehal ketema sub city. Currently, the city is serving as the seat of Sidama Region & Hawassa City Administration.

According to projections of the central statistics agency of Ethiopia in 2020, Hawassa's population is estimated to be 419,655, of whom 215,978 are males and 203,677 females; with an area of 157.21 square kilometres, Hawassa has a population density of 2,646.26. While 279,124 or 66.5% are urban and the rest 140,531 or 33.5% are rural inhabitants, a further 616 or 0.24% are pastoralists. A total of 64,279 households were counted in this city (HCAFEDD, 2020).

Annual rainfall of the City is 933.4 mm. Temperatures vary between 5°C in Keremit and 34°C in Bega.The cityexperiences sub humid-called 'Woina Dega' type of climate. The average annual temperature is 20.3°C. Hawassa gets rainfall twice a year. It falls during 'Belg' and 'Keremt'. An average annual rainfall of the town is 933.4 mm. The first rainfalls falls from 'megabit' to the mid of 'ginbot' and the next comes from 'sene' to the mid of 'meskerem'. Due to the town's location in rift valley and nearby lake, there is weather condition changing from day to night (HCAFEDD, 2020).

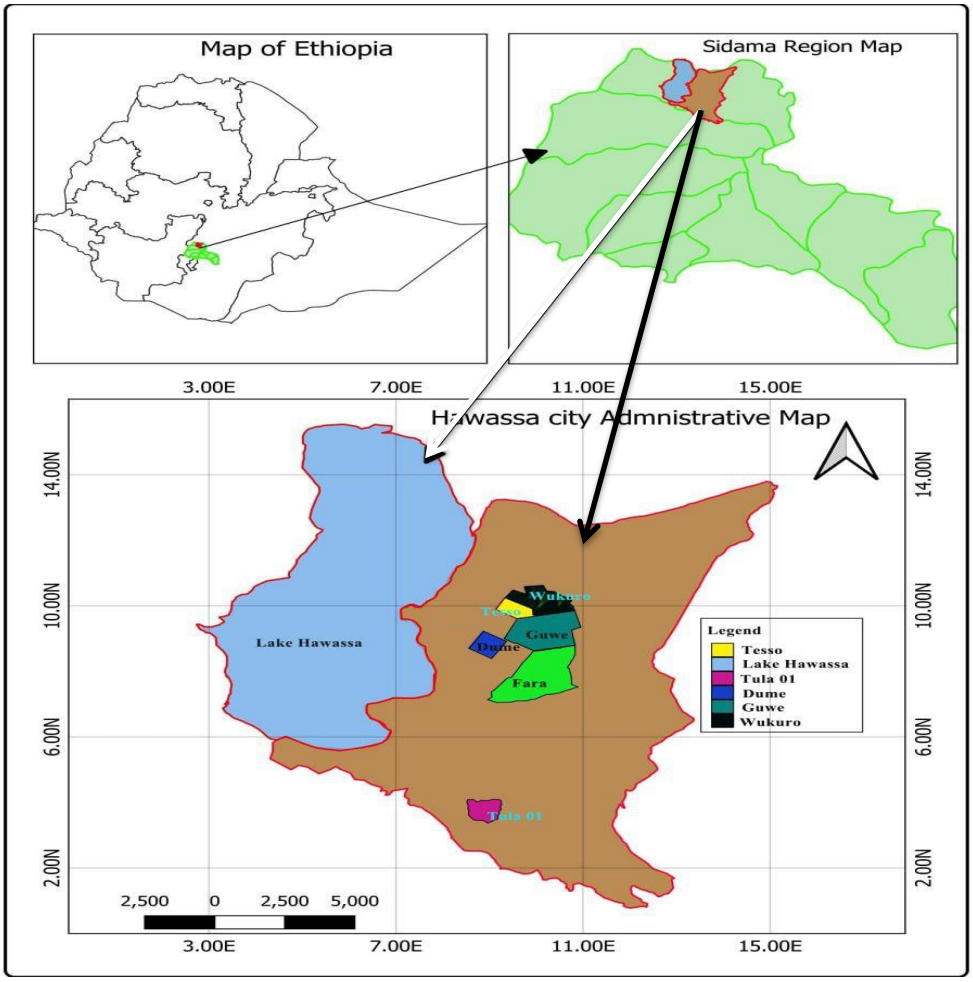


Figure 1: Map of the Study Area (Drawn by: Selamu Bulado)

3.2 Research Design

A descriptive cross-sectional study was conducted to assess the status of pesticide use in homes or home environment and possible health impacts of the occupants based on proposed objectives. Descriptive survey method was employed by using qualitative and quantitative method of data collecting and describing in a systematic manner including the characteristics, features or facts about the given population in this study to make the obtained data more feasible and preferable to examine the present situation on safety use of pesticide practice of occupants in the research site.

3.3 Study Population

According to projections of the central statistics authority of Ethiopia in (2020), Hawassa city has eight (8) sub cities divided into 32 Kebeles. The total population of Hawassa city is estimated to be 419,655, of whom 215,978 are males and 203,677 females, respectively. A total of 64,279 households were counted in Hawassa city (HCAFEDD, 2022). Out of these

13,291 are households in the six selected kebeles, namely the Guwe,Fara, Tula 01, Tesso, Wukuro and Dume kebekes that are considered for the present study.

3.4 Sampling Techniques and Sample Size Determination

3.4.1 Sample Size Determination

The study employed mixed sampling methods including purposive sampling, systematic random sampling and simple random sampling methods to identify or select the key informants (KIs), study kebeles, households. Among 13,291 households in the six selected kebeles of Hawassa city, 217 (43 females 162 males) and households were randomly selected for this study.

For 14 (4 females and 10 males) key informant interviews; 6 health experts, 6 households and 2 environmental experts from the environment forest and climate change office were selected purposively based on their profession, experience, knowledge on use of pesticides management and educational background. Determining the sample size is the key step on the overall statistical process. Since, the households of one kebele were have varied in number with each other and have variation on pesticide use, an appropriate sample size is means of a gaining high precision, accuracy and confidence with minimum cost. For the survey, sample sizes (n) of HHs who participated in the study were determined using formula developed by Cochran's (1977).

$$n = \frac{NZ^2P(1-q)}{d^2(N-1) + Z^2P(1-q)}$$

Where:

n = sample size of housing unit

N = total numbers of households = 13,291

p = housing unit variable (residential houses) = 85% (0.85)

q = non-residential houses (offices, institutions, commercial houses etc) = 1-P (=15%) (0.15)

Z = the standard normal deviation at 95% confidence interval, $Z = 1.96$

d = margin of error that can be tolerated, 5% (0. 05)

$$n = \frac{13{,}291 \text{ x } 1.96^2 \text{x} 0.85 \text{x} 0.15}{0.05^2(13{,}291-1) + 1.96^2 \text{x} 0.85 \text{x} 0.15} = 197$$

By adding 10% non-response rate, the final total sample size found to be 197 x 10% ≅ 20 then, 197 + 20= 217 and n= 217.

Purposive sampling was employed to select the sample kebeles while systematical random sampling was used for selecting households living in the selected kebeles of the city. Thus, the sample was selected from the kebeles documented list in which all the target population are listed. To determine the sampling interval of residential units from the target population in each the six selected kebele in systematic random sampling techniques, the following formula was employed.

K = N/n, Where K= Sampling interval

N = Total targeted population in each the selected Kebele

N = Sample size for each selected Kebele

Therefore, the sampling interval for selecting sample households has been calculated:

In Guwe Kebele,

HH= 2,107 n = 217

So, 2,107/217 = 10^{th} to the nearest.

In Fara Kebele,

HH = 2,293 n = 217

So, 2,293/217=10^{th} to the nearest.

In Tula 01 Kebele,

HH = 2,387 n = 217

So, 2,387/217=11^{th} to the nearest.

In Tesso Kebele,

HH = 2,192 n = 217

So, 2,192/217 = 10^{th} to the nearest.

In Wuquro Kebele,

HH = 1,967 n = 217

So, 1,967/217 = 9^{th} to the nearest.

In Dume Kebele,

HH= 2,345 n = 217

So,2,345/217=11th to the nearest.

Therefore, Guwe, Fara, Tula 01, Tesso, Wuquro and Dume kebele every 10th, 10th, 11th, 10th, 9th and 11th households after the first sample household selected, respectively using simple random sampling. This implies that the first household was selected from the total targeted households (2107, 2293, 2387, 2192, 1967 and 2345) from each sampled six kebeles from Hawassa city. Then after the first household was selected in lottery method, the next household could be selected by adding the sampling interval on the first selected household order number from the list of the kebeles household number. This step was continued till the required sample size is achieved by avoiding the already selected households from the sampling list.

Table 1: Households sample selected methods in study area

S.N	Name of Kebele	N^{o}of households	Sample household	Percent of sample household
1	Guwe	2,107	35	16
2	Fara	2,293	37	17
3	Tula 01	2,387	39	18
4	Tesso	2,192	36	16.6
5	Wuquro	1,967	32	14.8
6	Dume	2,345	38	17.6
	Total	13,291	217	100

Source: Survey (2023)

3.4.2 Identification of Study Households

In the study city, there are 32 kebeles; Amoung these, six kebeles were selected purposive sampling method for this study because highly populated and well known kebeles of the city. The housing number of each kebele is still valid the study was carried out based on obtained data from town with a total number of households. From each kebele, the numbers of residential housing units were identified with their numbers and sampling units, as a proportion of total housing units were determined. Then for each kebele, the sample houses were selected based on their housing number using a systematic random number table. After

the house numbers of the housing units of each kebele was selected, the housing units are identified using their housing number.

3.5 Sources of Data

For this particular investigation, both qualitative and quantitative data were collected from both primary and secondary data sources.

3.5.1 Primary Sources of Data

Primary data was gathered from sample respondents, key informants and focus group discussion participants using interviews and questionnaires. Field observation was used to determine practices of pesticides use in home.

3.5.2 Secondary Sources of Data

Secondary data was obtained from different sources including published and unpublished materials from other related journals, articles, newspapers, and from internet.

3.6 Data Collection Tools

The researcher used different data collection instruments, such as, key informant interviews, administered questionnaires, field observation and focus group discussion.

3.6.1 Questionnaire

.The questionnaire was distributed to the respondents to those, who could not read and write were assisted by the researcher in completing questionnaires. The researcher prepared structured and standardized questionnaire for data collection. The enumerators were selected on the base of fluency in speaking Amharic language as well as Sidaamu Afoo. Before the implementation of survey, enumerators were awered and tested for their clarity and understanding the questions. Then the researcher was trained for thirty munities on the concepts and contents of the questionnaire, ethical considerations, instruction of the questionnaire and data collection procedure. The survey questionnaire items were covered a wide range of information which include demographic section (which obtain questions regarding age, gender, work experience, education level), behavioral questions focusing on methods of protection during pesticide application, like wearing protective clothes and gloves, no smoking and eating washing hands after pesticide application; question items related to awareness and handling practice of pesticide and questions related to pesticide knowledge, attitude and practice of study participants. Finally, the distributed questionnaire was collected carefully from the respondents.

3.6.2 Key Informant Interview (KII)

A key informant interview was conducted to obtain vital information about the use and possible health impacts of pesticides on occupants. Semi-structured type of interview was prepared to collect data from health experts and selected households. Their insights are highly useful in understanding the nature of the problem. Therefore, to support and cross-check the findings from the questionnaire, well-constructed semi-structured interview question items prepared to collect and administer data in depth from selected six sample kebeles. Interviews were designed to elicit details on pesticide use, practice and awareness of households.

3.6.3 Direct Observation

Direct observation was conducted using check-list focusing on use of pesticide application during spraying in their home. The observation check list was used to identifying the different problems of the pesticide use application in the home. It is helpful in identifying the problems like to observing the instructions given on the pesticide label, proper handling of pesticide, proper use of personal protection equipment (PPE), considering windy direction, proper disposal, considering pictograms on the pesticide containers and pesticide storage in separate room in home. Then cross checking each survey questionnaire was administered to households.

3.6.4 Focus Group Discussion (FGD)

It helps to generate data on group dynamics, and allow a small group of respondents guided by the researcher to focus on key issue of the research topic. In this study, two focus group discussions are held while in each FGD the number of participants ranged from 4 to 6. The participants of each FGD was selected by households and health experts who lived long time in the area and also sprayed pesticides in their home frequently. In the selection process, practices, age and sex that intended to be discussion was considered. In the process of different FGDs, the health experts played a facilitator role while researcher took notes and recorded their voice during the FGDs. According to the procedure one FGD was conducted with pesticide sprayers and discussions mainly was focused on how they pesticides to apply, how much to apply, and when to apply, how their pesticide application practices have changed over time; other FGD was conducted with pesticide occupants and discussions mainly was focused on how they interact with health experts and environmental effects of pesticide use.

3.7 Data Collection Procedures

Primary data was collected using semi-structured questionnaires prepared in English (Appendix I) and then translated in to the Amharic (national language). Both open and close ended question items were included in the questionnaires. The questionnaire was filled in the presence of the researcher so as to ensure that all questions were understood. Prior to the administration of the questionnaires, conversations were held with the selected respondents to explain the objective of the study. A semi-structured interview schedule was also used to interview some of the respondents, namely, selected households and health officers. This technique would enable the assessment of people's knowledge, attitude and perception with respect to how they used pesticides in their own home. An observation checklist was also adopted where the researcher recorded issues on practices of how they spray and store pesticides in their own home during the assessment.

3.8 Data Quality Assurance

To minimize the possibility of obtaining biased information and variables, the questionnaire which was prepared in the English language was translated into national language, Amharic, to make it easy to understand and administer for both interviewers and interviewees. The latter version was back translated to English language, to ensure its consistency. In order to make sure quality of data, structured and pre-tested questionnaire on about of the sample size by interviewers were used to collect information.

3.9 Methods of Data Analysis

Data was analyzed using SPSS version 21. Descriptive statistics was used to analyze the data. Descriptive statistic was interpreted by using frequency, percentage and mean in describing the existing practices and use of pesticides in the study area as well as to explain the variables used in possible health impacts of misuse of pesticides. Finally results were presented in the form of tables and charts.

3.10 Ethical Consideration

The researcher obtained ethical clearance from Hawassa University, School of Graduate Studies' Ethical Review Committee. Permission was also obtained from Hawassa City Administration Health Department in order to take permission to conduct the study and informed oral consent was obtained from the study participants**.** It is very important to make sure that the subjects are well informed about the research objectives to emphasizing that the data was used only for the intended academic purpose, what it is about and that their participation is by free willingness. They are all volunteering to participate and they are informed on the research and its benefits. Respondents who participated in the study are voluntary and each respondent was asked to give verbal consent to participate and each HHs was assured that the information provided was kept confidential.

4. RESULTS AND DISCUSSION

4.1 Introduction

In order to do the research, 217 questionnaires were administered to household respondents of different walks of life in the study area. Out of those, 205 (94.5%) households were properly filled and returned while the rest 12(5.5%) of respondents were not returned. According to Mugenda (2003) asserted that return rates of above 50% are acceptable to analyse and publish, 60% is good and 70% is very good. Based on these assertions from renowned scholars, 94.5% return rate is very good for the study. Analysis of this paper was made based on returned questionnaires which accounts 205(94.5%).

4.2. Pesticide Used by Household Characteristics in Hawassa City

Table 2 presents the descriptive statistics of pesticide application levels at different households' characteristics such as sex, age, education and marital status of the households. Household were asked whether they used pesticides on their home and the questionnaire was filled by the enumerators. From a total (205) ofthe households that participated in the survey, majority (79%) of the household respondents were males whereas the rest(21%) of them were females. This finding indicated that, relatively male headed households are more vulnerable to pesticides risks than female headed households and they relatively apply higher dosage of pesticides and incur higher costs than female-headed households in the city.This finding was similar with previous studies Nigussie (2019) on his study pesticide use, practices awareness in case of Misrak Badawacho Woreda, Hadiya Zone, and Kalayou & Amare Abebe (2015) reported from six districts of North Showa Zone, Amhara Region.

With regard to age of the households, most(58%) of them were found in the 26-45 age group followed by 22.4% of respondents were found above 45 years and only 19.5% of them were found between 18 up to 25 years age. These results showed that more productive age group might be exposed to pesticide hazards. Youths even apply a relatively higher dosage of pesticides than others. However, they incur less cost than those in the youth age category. This might be because of price difference among various types of pesticides reflecting the quality of pesticides in the market.

As it can be seen in Table 2 (item 3),nearly half(49.3%)of the households were attended primary (grade 1-8) school level followed by 32.2% of them joined secondary school (grade 9-12) whereas 7.8% and 5.9% of the household respondents were qualified by diploma and

degree and above, respectively. While the remaining few(4.9%)of them not attended formal education but they can read and write. Therefore, as a survey result depicts, most of the household respondents were attended primary school level in the study area. Pesticide use by education status shows that quantity and cost of pesticides reaches a peak level for households with primary education. This finding was line with the early studies Dugassa (2019) on assessment of pesticide use and disposal in Gida Ayana District, Oromia Region.

In relation to marital status, majority (76.6%) of the respondents was married followed by 18% of the single whereas the small proportions (1.5%) of respondents' were widowed. Regarding to position in the household, majority (75.6%) of the household respondents were father head of their families while 17.5% of them were mother head of their families. Therefore, as a survey result reveals that most of the household were married and father head for their families in the study area. This initiates married households to use pesticides in the study area. This finding was similar with that Tadesse and Asferachew (2008) on assessment of the pesticide use, practice and hazards in the Ethiopian rift valley.

Table 2: Socio-demographic Characteristics of Household Respondents (n=205)

Characteristics of the HHs	**Category**	**Frequency (n)**	**Percentage (%)**
Sex of the respondents	Male	162	79.0
	Female	43	21.0
Age group in years	18-25	40	19.5
	26-45	119	58.0
	Above 45	46	22.4
Qualification	Not attended formal	10	4.9
	Grade 1-8	101	49.3
	Grade 9-12	66	32.2
	Diploma	16	7.8
	Degree & above	12	5.9
Marital status	Single	37	18.0
	Married	157	76.6
	Divorced	8	3.9
	Widowed	3	1.5
Position	Mother	36	17.5
	Father	155	75.6
	Child	14	6.9

Source: Primary Data (2023)

4.3. Pesticide Use in Home

4.3.1 Kind of Pests Troubled to Households in Homes

Households were asked different questions regarding their awareness about pests on their homes. Enumerators also showed pictures of the major kind of pests troubled households' and recorded their response. Table 3 shows that out of a total of 205 respondents, most (45.4%) of households were assured that Cockroach pests were troubled them, (23.4%)of households were replied that fly pests were troubled in their homes. The rest 13.7%, 7.8%, 5.9% and 3.9% of households were reported that their home was troubled by bed bugs, mice, mosquito and lice, respectively. Therefore, as a survey result depicts that most of the household were troubled by mice pets in their homes. Since households use pesticides in response to pest infestation, awareness of these pesticides is great significance in pest management. The result was consistent with a study Nigussie (2019)states that pesticide use, practices and farmer's awareness in case of Misrak Badawacho Woreda, Hadiya Zone, SNNPR, Ethiopia.

Table 3:Kind of Pests TroubledHouseholds in Home

S.N	Kind of Pests Troubled Households'	Frequency (n)	Percent (%)
1	Mice	16	7.8
2	Cockroach	93	45.4
3	Fly	48	23.4
4	Mosquitoes	12	5.9
5	Lice	8	3.9
6	Bed bugs	28	13.7
	Total	205	100

Source: Primary Data (2023)

4.3.2 Household Things Attacked by Pests in Home

Table 4 illustrates, out of those households whose things were attacked by pests in their homes, majority (42%) of them indicated that cooked foods (cabbage, salad and others) were attacked by insect pests followed by 22% of the respondents argues that their store foods attacked by pests. About 4.8% of them replied that their livestock attacked by pests in their home. Therefore, as survey result reveals, most of the households cooked food were attacked by insect pests in their homes.

Table 4: Household Things Attacked by Pests in Home

S.N	Household Things Attacked by Pests in Home	Frequency (n)	Percent (%)
1	Household member	28	13.7
2	Stored food	45	22.0
3	Cooked food	86	42.0
4	Pets	30	14.6
5	Livestock	16	7.8
	Total	205	100

Source: Primary Data (2023)

4.4 Methods of Pest Control and Labels on Pesticide Containersin Homes

4.4.1 Methods of Pest Control

Regarding to methods of pest control in their home (Table 5), majority (75.6%) of respondents were said that they used synthetic pesticides at different levels (regularly or occasionally) while (24.4%) of respondents were reported that they were applied traditional pesticides in their homes. Out of those who using traditional methods, most (44%) of them smoking their house using certain plant species (Gaggassa (*Agarista salicifolia),* Etan *(Boswellia (Del.) Hochst,* Nech bahir zaf (*Eucalyptus globules),* Urgessa (*Premnaschimperi),* and Yeayit-hareg (*Stephania abyssinica),*they placed the smoke around the bed against the Cockroach, Bedbug, mosquitoes and flies)whereas 16% of the respondents applied physical method to control pests in their home by removing pest stored utensils/materials and washed it immediately after meal. The rest (32%) and (8%) of the householdsspraying local prepared pests control drugs (instead of drug prepared by devastating dried leaves of (Gaggassa (*Agarista salicifolia)*and spreading other pests destroying animals like cats, respectively.

Table 5: Methods of Pest Control in Homes

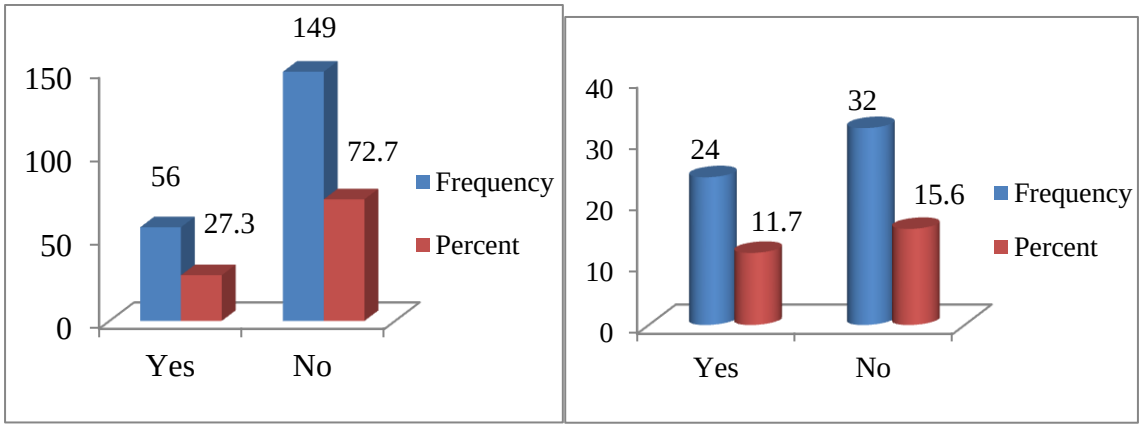
S.N	Methods of Pest Control in Home	Frequency (n)	Percent (%)
1	Apply synthetic pesticides	155	75.6
2	Using traditional methods	50	24.4
If you answer is traditional method, what are the traditional pests controlling methods in your home?			
1	By smoking the house using certain plant parts	22	44
2	Physical method	8	16
3	By spraying local prepared pests control drugs	16	32
4	Spreading other pests destroying animals	4	8
	Total	50	100
For which traditional pests controlling methods for each of the following?			
1	Mice	4	8
2	Cockroach	18	36
3	Fly	14	28
4	Mosquitoes	8	16
5	Lice	2	4
6	Bed bugs	4	8
	Total	50	100

Source: Primary Data (2023)

In relation to kinds of pests, most (36%) of them reported that they were using traditional pests controlling methods especially for controlling Cockroach pests while at least (28%) of the respondents using traditional pests controlling methods for controlling Fly in their home. According to the responses of interviewers, they usually performed by using the traditional charcoal stove (thermal expulsion) in the early evenings. Burning plants parties to make smoke or hanging fresh plants to deter nuisance biting insects entering or resting in house was identified by the interview of different participants in the study area. It is chiefly done by smoldering various repellant plants on the traditional charcoal stove. Generally, smoking was the most widely used method followed by Placed on selected places against the pests.

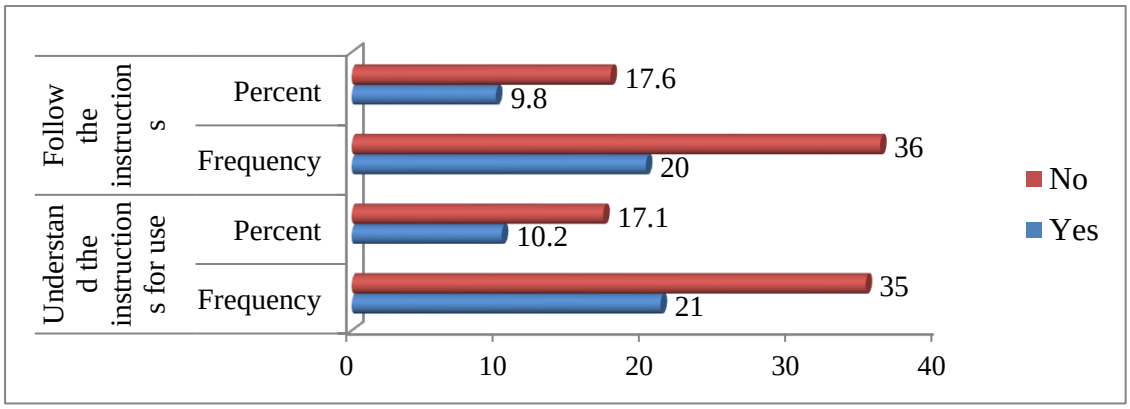
4.4.2 Reading Labels on Pesticide Containers, Understanding and Following Instructions

Figure 2 and Figure 3 presents, households who could read labels on pesticide containers, understanding and following instructions; even if 27.3% of the respondents indicated that they could read labels on pesticide containers in their homes. Correspondingly, out of those who could read labels on pesticide containers, only 11.7% of them replied that there was an expiry date on the container of pesticides, about10.2% of them could understand and 9.8% of the respondents followed instructions how to use in their homes. Other studies showed similar figures with only 2 and 18% of the surveyed small-scale occupants in Tanzania and It was in the same line with Gaber and Abdel-Latif (2012) in their study in Egypt; found that most of the users did not read labels or instructions on the pesticide containers. It was in contrast with Farahat *et al.* (2016) reported that in terms of attitudes, it indicated that more than half of the respondents believed that pesticides are poisonous and nearly two third believed that it is necessary to read or understand the label on OP pesticide containers.



Source: Field survey (2023)

Figure 1: Households who read labels and expiry date (A) on the container of pesticides (B)



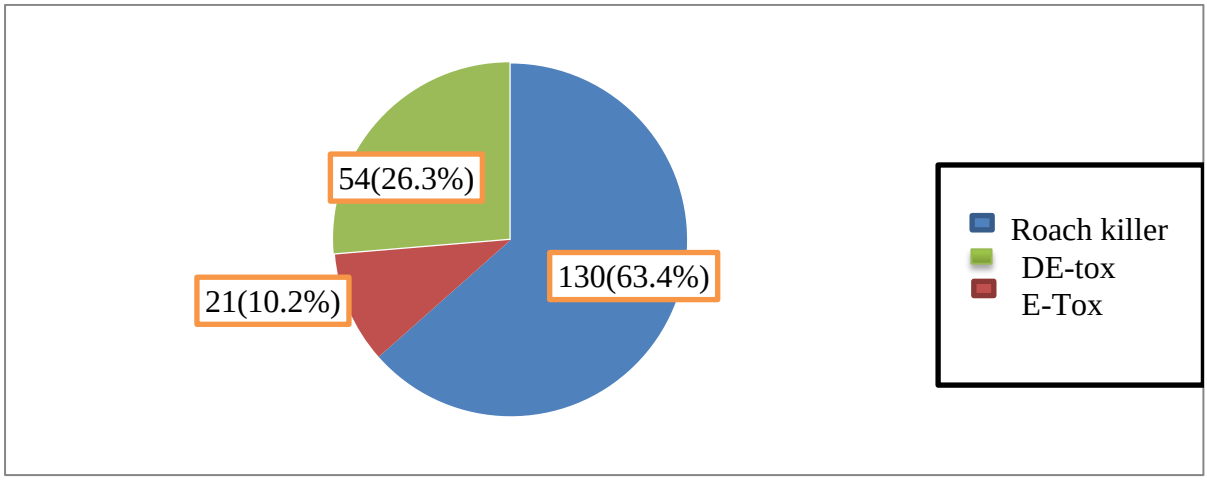
Source: Field survey (2023)

Figure 2: Households who follow and understand instructions

4.5. Types of Pesticides Used and Perceived Benefits of Pesticides

4.5.1 Most Common Types of Synthetic Pesticides Used by the Households

Concerning to most common types of pesticides used by the households (Figure 4), majority (63.4%) of the household respondents said that they used roach killer pesticides (ferithrothions, cypermethrin and bioallethrin) at different levels (regularly or occasionally) followed by 26.3% of them said that they used E-Tox pesticides for killing the pests in the homes. Whereas, about 10.2% of the respondents replied that they used DE-Tox pesticides to kill the pests in the home. Therefore, as a survey result indicates, majority of the households' used roach killer pesticides to kill the insect pests in the homes. And also the KIIs report showed that the use of pesticides increases public health status and it solve pest problems. However, these pesticides have different toxicity level and chemical behavior, if not properly transported, stored, disposed and handled households may be exposed to them and results several health risks and the environment also expected to be affected.



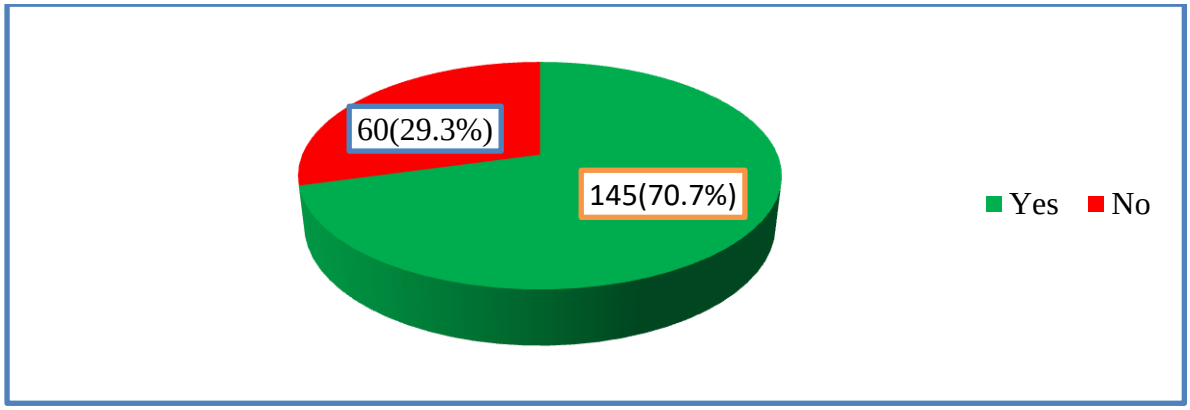
Source: Field survey (2023)

Figure 3: Types of synthetic pesticides used by households

4.5.2 Perceived Benefits of Pesticides

As indicated in Figure5, regarding the benefits of the pesticide they were using, most (70.7%) of them indicated that pesticide solved their pest problems whereas 29.3% of households denied on the issue raised. Therefore, as a survey result shows, most of the respondents reported that households after pesticide used to solve pest problem in home. According to the information obtained from the KIIs, the large majority of participants report indicated that the amount of pesticide use in the study area increases. And also the KIIs report showed that the use of pesticides to solve pest problems. However, these pesticides have different toxicity level and chemical behavior, if not properly stored, disposed and handled occupants may be

exposed to them and results several health risks on occupants also expected to be affected. This finding is similar with the information obtained from study households.



Source: Field survey (2023)

Figure 4: Benefits of the pesticides

4.6 Pesticide Practices of Households

4.6.1 Influences to Use of Chemicals Pesticides

As indicated in Table 6, responses on what initiation to use of chemicals pesticide, out of those households who use pesticides, majority (46.8%) of them indicated that they were used pesticides due to their own decisions followed by 23.4% of them assured that they were used pesticides due to the advice from neighbors/friends and the remaining few 20.5% and 9.3% of the household respondents were indicated that they were used pesticides due to the advice from no body and advice from health office experts, respectively.

Table 6: Responses on what influences to use of chemicals pesticides

S.N	What initiates your use of chemicals pesticides?	Frequency (n)	Percent (%)
1	Own decisions	96	46.8
2	Advice from experts	19	9.3
3	Advice from neighbor/friends	48	23.4
4	No body	42	20.5
	Total	205	100

Source: Primary Data (2023)

Figure 6: interview with selected respondents

4.6.2. Pesticide Spraying, Places of Buying and Storage of Pesticides

Table 7 indicates, out of the total (205) study households, most (32.2%) of the respondents reported that untrained fathers were sprays pesticide followed by 25.9% of them replied mother, 13.7% of the respondents argues that sons, 10.7% of them assured that daughters whereas 9.8% and 7.8%of them indicated that trained/licensed labor and untrained labor were sprays the pesticides to kill the pests in the home. This finding is agreed with that reported by Wasudha *et al.* (2015), majority of respondents of the study were sprayed by untrained labor, followed by Fathers 27.13%, trained /licensed labor 2.92%, sons 20.48%, wife 3.46%, daughter 3.99% and 4.52% sprayed by other means. This could result the human health and environmental effects as a result of poor applications of pesticide. This finding is disagreeing with that conducted from two Weredas of the Great Rift Valley of Ethiopia namely, Ziway and Arsi Negele (Tadesse and Asferachew, 2008).

As presented in Table 7, regarding the place where households buy the pesticides, majority (56.1%) of them bought pesticides from open market followed by 25.4% of the respondents bought pesticides from a vendor they know but they were not sure about license. Likewise,

12.7% and 5.9% of the household respondents were bought pesticides from a licensed vendor and mini-shops, respectively. Regarding to pesticide bough FGD report shows that most households were purchased the pesticide from unauthorized office and also this idea confirmed with the information obtained from KIIs. The most KIs report shows that households buy pesticides from open market. However, small proportions of them buy from licensed sealer and government office. This finding of the study agreed with (Belay, 2015).

Different storage places of pesticides were also provided in Table 7. Nearly half (48.8%) of the study subjects indicated that they stores pesticides in a separate place but 39.5% of them assured that they stores pesticide anywhere in the house and the rest (11.7%) of the households reports that they stores pesticides in the kitchen. The FGD and direct observation result reveals that regarding to pesticide storage FGD report shows that large members of participants said that they stored pesticide in anywhere in the house. The study participants said that they were used pesticide containers for different purposes in the house. Some of them were used for the storage of food items like salt, sugar and for milking purposes without proper treatment. This finding of the study indicated that there is poor pesticide use practice, knowledge and awareness in the study area.

Table 7: Responses on Pesticide Spraying, Places of Buying and Storage of Pesticides

S.N	Who sprays/applies pesticides in your home?	Frequency(n)	Percent (%)
1	Father	66	32.2
2	Mother	53	25.9
3	Sons	28	13.7
4	Daughters	22	10.7
5	Trained/ licensed labor	20	9.8
6	Untrained labor	16	7.8
	Where do you buy the pesticides?		
1	From a licensed vendor	26	12.7
2	From open market	115	56.1
3	From a vendor I know but I am not sure about license	52	25.4
4	From mini-shops	12	5.9
	Where do you store pesticides in your home?		
1	In the kitchen	24	11.7
2	Anywhere in the house	81	39.5
3	In a separate place	100	48.8

Source: Primary Data (2023)

During my observation, most households and sprayers mix their pesticides in their home near to the cooked materials and materials directly, which are used by residents for other domestic

purposes. Mixing takes place in a small container, often using a long stick but sometimes with bare hands. None of the households wears gloves and/or closed boots, enhancing direct contact of hands and feet with pesticides.

Although households keep no records of the amount of pesticides sprayed, they explained that their spraying frequency varied, depending on concentration level of pesticides and spray time. During early morning, households spray more. Then most households apply high dosages because from experience they learnt that recommended amount proved ineffective. They want eliminate pests at once and/or reduce spraying frequency. A wide range of dose rates (both excessive and reduced) were applied. If pests are not sufficiently reduced after pesticides application, households increased the concentration. The observation of 12 households during the spray of pesticides showed that the majority of households, who didn't follow label instructions in roach killers, Di-tox and E-tox, didn't use any calibrated utensils to measure the dose rate recommended (Fig 7).

Figure 7: Pesticide spraying practices in their home

4.6.3 Empty Pesticide Containers Management

Concerning empty pesticide containers (Table 8), most (49.3%) of the household participants indicated that they disposed empty pesticide containers on the open area followed by 30.2% of them were reported that they were stored it with domestic solid wastes. Whereas, the remaining few (11.7%) and (5.9%) of them burn it and use it for various purpose in their home, respectively. This finding of study shows that the small respondents were properly managed pesticide containers and also this result indicated that in the study households' lack of good attitude and awareness regarding to storage and disposal of pesticide spraying

equipment and containers. This finding is similar with the study reported in the district Commewijne in suriname (Wasudha *et al.,* 2015). The FGD and direct observation result reveals that manage of pesticides most households said that by using hand bag, pocket, animal backs and carts. Some members of participant said that, they couldn‘t separate the chemicals and other materials during transport. Regarding to pesticide storage FGD report shows that large members of participants said that they stored pesticide in anywhere in the house. The study participants said that they were used pesticide containers for different purposes in the house. Some of them were used for the storage of food items like salt, sugar and for milking purposes. This finding of the study indicated that there is poor pesticide use practice, knowledge and awareness in the study area.

Similar results of improper disposal of home used pesticide containers (burning, burying, or throwing) were reported by Egyptian (Ibitayo, 2006).According to (Ibitayo, 2006) majority (65.1%) users reuse to store food. A similar prevalence of re-use of pesticide containers for other activities has been reported in other studies (Gerken *et al.,* 2001; Lawal *et al.,* 2005; Tijani 2006; Ogunjimi and Farinde 2012b). According to Ibitayo (2006), where are close to drinking water sources and waterways (which is the case in many communities in this study area) the disposal of unwanted pesticide solutions and empty containers on the field causes a pollution problem for those who drink from these water sources as well as aquatic systems which are serve as drinking water. According to Gerken *et al.* (2001), the improper disposal of empty pesticide containers, unwanted pesticides or left over spray solutions may lead to contamination of environment.

Table 8: Management of empty containers pesticides by households

S.N	Empty Pesticide Containers Management	Frequency (n)	Percent (%)
1	Use it for various purpose in home	12	5.9
2	Sell it	6	2.9
3	Dispose it on open area	101	49.3
4	Burning	24	11.7
5	Stored with domestic solid wastes	62	30.2
	Total	205	100

Source: Primary Data (2023)

4.6.4 Recommended Personal Protection Equipment (PPE) While Spraying Pesticides

Regarding personal protection equipment (PPE) while spraying pesticides in Table 9, about 30.2% of the households were used PPE while spraying pesticides. Among those who used PPE; 17.6% of them wear gloves, 5.4% of the respondents use shoes and the rest 2.9% of them uses special clothes in order to applying pesticides in the homes. After applying pesticide, most (20.5%) of the household respondents were changed contaminated protective clothes but 9.8% of them did not changed contaminated protective clothes in the study area. This finding of the study was similar with the previous studies Belay (2015) but in the present study households understand hand washing in addition to wearing gloves. During the focus group discussion, the majority had little or no knowledge on the personal protection equipment use; levels on pesticide containers and nature of pesticide. But at the time of the focus group discussion they learnt that had to apply pesticides. They applied pesticides again when they noticed movement and biting of pests. No orders are placed and there is no information exchange about brands, product specifications, handling prescriptions or quality guarantees. Lack of information about health safety by using PPE, efficacy, and safe use of pesticides is important and need to be available through-out the supply chain. Local health experts sometimes had training, but not always. This finding of the study is similar with (Belay, 2015). The most KIs and FGD report indicates that training not given to the households but some of their report shows that training given to some households by health experts. The FGD and KII report confirmed that there is inadequate workshop/training regarding safety measure and use of pesticides. The lack of training may results poor safety measure regarding to pesticide use and which causes the human health risks and environmental effects.

Safety measure of households pesticide use practice' Regarding safety measures of households' pesticide use practice few of households were sometimes checked of spraying equipment before pesticide application whereas majority of them were never checked their spraying equipments before pesticide application. However, majority of study households were never washes their hands after pesticide application. This finding is agreed with the study was conducted at northern delta, Egypt (Moustafa and Saleh, 2017). The most KIs and FGD report indicates that some households were taking shower sometimes shower after pesticide application, but majorities of participants were never taking shower after pesticide application. This finding is consistent with the results of two Studies conducted in Greece and in Gaza (Yassin *et al.,* 2002; Damalas *et al.,* 2008).

Table 9: Protective Equipment Utilization while Spraying Pesticides

S.N	Do you use PPE while spraying pesticides in home?	Frequency (n)	Percent (%)
1	Yes	62	30.2
2	No	143	69.8
	Total	205	100
	If yes to above question, what do you wear when spraying pesticides in your home?		
1	Gloves	36	17.6
2	Hat	9	4.4
3	Boots	11	5.4
4	Glasses	6	2.9
	Total	62	30.2
	After applying pesticide, do you change contaminated protective clothes?		
1	Yes	42	20.5
2	No	20	9.8
	Total	62	30.2

Source: Primary Data (2023)

4.7 Households Health Effects of Pesticides

4.7.1 Major Ways by Which Pesticides Enter into the Body

Regarding ways by which pesticides enter in to the body (Table 10),majority (65.9%) of the respondents indicated that pesticides enter in to the body via skin followed by 20.5% of them argue that pesticides enter in to the body through mouth whereas 10.7% and 2.9% of the household respondents reported that pesticides enter in to the body through nose and eyes, respectively.

Table 10 Major ways by which pesticides enter in to the body

S.N	Major ways by which pesticides enter in to the body	Frequency (n)	Percent (%)
1	Through mouth	42	20.5
2	Through skin	22	10.7
3	Through nose	135	65.9
4	Through eyes	6	2.9
	Total	205	100

Source: Primary Data Output (2023)

4.7.2 Practice of Safety Precautions during Pesticide Application

All respondents want to properly spray pesticide and get safety precautions during pesticide application but they use different application methods on spraying of the pesticides. As Table 11 shows, only 34.1% of the respondents expressed that they get of safety precautions during pesticide application, but most (65.9%) of themdid not get of safety precautions during pesticide application in homes.Although it seems they have a little awareness on pesticides impacts they have seen to ignore this in practical implementation which shows inadequate knowledge on pesticides handling and toxicity. This result indicated that the most study participants had not good awareness about pesticide used. This finding is similar with that conducted by Tadesse and Asferachew (2008).

Table 11: Practice of safety precautions during pesticide application

Practice of safety precautions during pesticide application	Number of Respondents (n=205)			
	Yes		No	
	Frequency	Percent	Frequency	Percent
	70	34.1	135	65.9

Source: Primary Data Output (2023)

Figure 8: Practice of safety precautions during pesticide application

4.7.3 Performing Activities of Households While Pesticide Handling and Pesticide Application

Regarding applying pesticides properly and handling of pesticides, most (62.9%) of the respondents reply ever use of anything specially food whereas but 3.9% of them answered that they drinking water while pesticide handling and pesticide application (Table 12).Although it seems they have a little awareness on pesticides impacts they have seen to

ignore this in practical implementation which shows inadequate knowledge on pesticides handling and toxicity.

Table 12: Performing activities of households while pesticide handling and pesticide application

S.N	While pesticide handling and pesticide application what do you performing	Frequency (n)	Percent (%)
1	Drinking	8	3.9
2	Eating	10	4.9
3	Smoking	58	28.3
4	Never	129	62.9
	Total	205	100

Source: Primary Data Output (2023)

4.7.4 The Preferable and Common Time to Take Care (Safe) During Spray

As Table 13 reflects, regarding to the preferable and common time to take care (safe) during spray, majority(57.1%) of the households were reported that the preferable time to take care (safe) at any time during spray, 21.5% of the households were reported that the preferable time to take care (safe) spray pesticides at afternoon. The rest 18.5% and 2.9% of the respondents were reported that preferable time to take care (safe) during evening and mid-day in study area. Concerning to common time of spraying, most (54.6%) of the household respondents responded that the common time of spraying pesticide was morning whereas 27.8% of them replied at after-noon while 10.7% and 6.8% of household participants said the common time of spraying pesticide was mid-day and early after-noon (Table 13).

With regard to the recommended time to re-entry of home following pesticide spraying, majority (69.7%) of the household participants assures that the recommended time to re-entry of home following pesticide spraying was 30 minutes but 23.4% of them replied that the recommended time to re-entry of home following pesticide spraying was one day.These finding shows that households had a good personal hygiene practice and attitude during time of spraying. However, they did not considered the re-entry time after spraying.

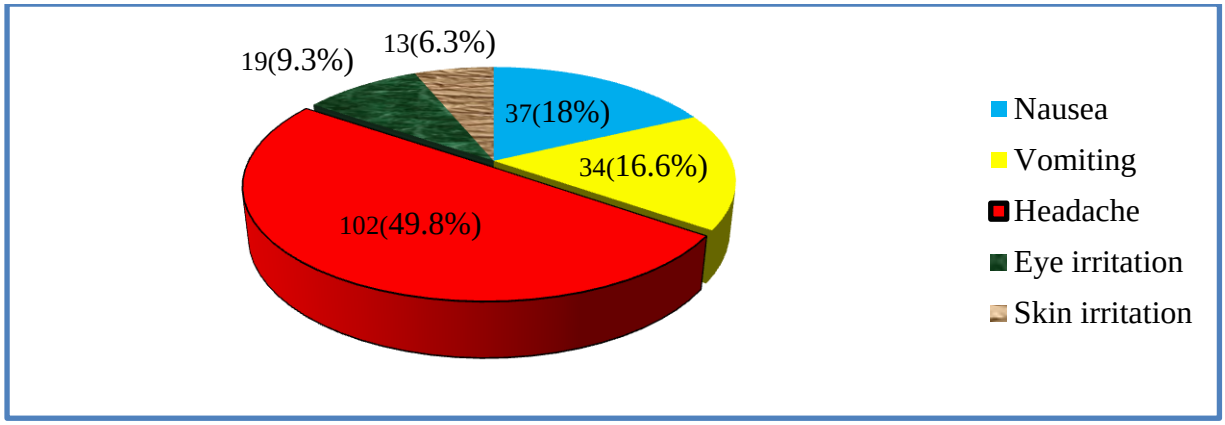
Table 13: The preferable and common time to take care (safe) during spray (n=205)

S.N	The preferable time to take care (safe) during spray	Frequency (n)	Percent (%)
1	Evening	38	18.5
2	Mid-day	6	2.9
3	Afternoon	44	21.5
4	At any time of spraying	117	57.1
	What is the recommended time to re-entry of home following pesticide spraying?		
1	One day	-	-
2	12 hour	-	-
3	6 hour	2	1
4	3 hour	12	5.8
5	1 hour	48	23.4
6	30 minutes	143	69.7

Source: Primary Data Output (2023)

4.7.5 Discomfort/Illness after Pesticide Application

Figure 6presents the illness of households after pesticide application, majority (67.3%) of the household participants indicated that they felt discomfort after application and 32.7% of them indicated that they sometimes feel discomfort after pesticide application. However, almost half percent of the household respondents felt by head ache illness whereas 18% of them indicated vomiting followed by 16.6% of the respondents indicated a feeling of nausea, 9.3%of them indicated eye irritation, and 6.3% of the household participants indicated skinitching discomforts after pesticide application. This study also consistent with that reported by (Maumbe and Swinton 2003) potentially contributed to range of short term symptoms such as headache, general weakness, diarrhea, vomiting, abdominal cramps, excess sweating and nausea. Several studies indicated that inhalation, injury and contact were means of expose through nose, mouth and skin rout of entry (Vega, 1994; Mathur *et al.,* 2005; Chitra *et al.,* 2006; Ntow *etal.,* 2007).



Source: Field survey output (2023)

Figure 9: Discomfort/Illness after Pesticide Application

4.8 Awareness about Pesticide Use and Handling of Households

Regarding the awareness of pesticide toxicity level in Table 14, out of total (205) household respondents, most (61%) of the households read the label on the package but 39% of them could not read the label on the package of pesticides in the study area. About 36.1% of the household participants were considering pesticides toxicity level whereas 63.9% of the households did not considering pesticides toxicity level. Besides, more than 90% of the household respondents did not eat, drink or smoke while spraying pesticides while less than 10% of them reflect that they eat, drink or smoke while spraying pesticides. Moreover, most (72.7%) of the households store food items in pesticide bottle after used whereas 27.3% of them did not store food items in pesticide bottle after used. About 88.3% of the household participants did not spray pesticides when it was windy but 11.7% of them sprays pesticides when it was windy in the study area. This result indicated that the most study participants had not good awareness about pesticide used. This finding is similar with that conducted by (Tadesse and Asferachew, 2008) and this finding is also similar with study was carried out in Bayelsa State of Nigeria (Samuel *et al.*, 2015).

Table 14: Awareness about pesticide use and handling of households (n=205)

S.N	Awareness about pesticide use & handling of households	Yes	No
1	Do you read the label on the package?	80(39.0)	125(61.0)
2	Are you aware of pesticide toxicity level?	74(36.1)	131(63.9)
3	Do you eat, drink or smoke while spraying pesticides?	20(9.8)	185(90.2)
4	Do you store food items in pesticide bottle after use?	149(72.7)	56(27.3)
5	Do you spray when it is windy?	24(11.7)	181(88.3)

Note: Numbers within the parenthesis is denotes percentage

Source: Field survey (2023)

4.9 Safety Measures about Pesticide Use of Households

Table 15, confirms that, majority (71.7%) of the households' checked their spraying equipment before pesticide application but 28.3% of them did not checked their spraying equipment before pesticide application in the study area. About 68.3% of the household participants washed their hands after pesticide application whereas 31.7% of the households did not wash their hands after pesticide application. Besides, nearly 90% of the household respondents did not take a shower after pesticide application while almost 10% of them reflect that they took a shower after pesticide application. This finding is consistent with the results of two Studies conducted in Greece and in Gaza (Damalas *et al.,* 2008; Yassin *et al.,* 2002).

Table 15: Safety measures about pesticide practices (n=205)

S.N	Safety measures about pesticide use of households	Yes	No
1	Do you check your spraying equipment before pesticide application?	147(71.7)	58(28.3)
2	Do you wash your hands after pesticide application?	140(68.3)	65(31.7)
3	Do you take a shower after pesticide application?	22(10.7)	183(89.3)
4	Do you wash your contaminated clothes separately?	52(25.4)	153(74.6)
5	Do you wear special face mask?	60(29.3)	145(70.7)

Note: Numbers within the parenthesis is denotes percentage

Source: Field survey (2023)

Moreover, most (84.4%) of the households did not regularly or occasionally transport pesticides with other goods such as food items whereas 15.6% of them regularly or occasionally transport pesticides with other goods. About 74.6% of the household participants did not wash their contaminated clothes separately but 29.3% of them wash their contaminated clothes separately in the study area. And also, Table 15, deals that, most (70.7%) of the respondents did not wear special face mask while 29.3% of them wear special face mask. Therefore, as a survey result shows that households did not wear face mask when pesticide application. This finding is agreed with the study was conducted at northern delta in Egypt (Moustafa and Saleh, 2017).

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

Based on the survey results and discussions listed above, the following conclusions were drawn.

This study finding indicates the most common pests' troubled households in the homes were cockroach, fly, bed bugs, mice, mosquitoes and lice 45.4%, 23.4%, 13.7%, 7.8%, 5.9% and 3.9% respectively. In order to control pests 75.6% and 24.4% of households were used traditional methods and synthetic pesticides respectively. The result of the analysis indicated that the pesticide problem appears in the present study areas like headache, vomiting, nausea, eye irritation and skin itching due to poor pesticides application by households. Using the chemicals can also cause health problems to people and their animals. Some of the health problems the survey results indicated include headache, vomiting, nausea, eye irritation and skin itching. Careless handling of the chemicals and improper disposal of containers can cause different types of diseases. A large number of pesticide users indicated that they were exposed to those health problems, which occurred after they used pesticides. This shows that there are both benefits and risks associated with pesticides use.

In the researcher view the risks could be reduced and the benefits could be maximized if the awareness of pesticides users is created and improved through frequent training programs and orientation workshops. In other words, to reduce potential and actual health and environmental effects associated with pesticide use, it is necessary to carefully read labels on pesticide containers and follow instructions of extension workers of agricultural and health bureaus.

Households were the pesticide users in the study area and the biggest to be exposed to the side-effects of using pesticides. This is due to careless ways of storing the chemicals and disposing empty pesticide containers. The survey results indicate that households who use pesticides without any safety measures were most exposed to the consequent health problems as well.

In addition to the survey results, empty pesticide containers were bury empty pesticide containers in the soil in the study with potential health effects to humans and domestic animals as well as consequences for the environment. The respondents agree that there should be careful system of storing excess pesticides and disposing empty pesticide containers in the

study area. But the majority of them were not willing to pay a fee required for empty pesticide containers disposal.

Appropriately using pesticides weresafe the public health as well as increase economic status for the benefits to the society. But the issue of hazards posed by pesticides has not been given attention to by users in the study area. The use of pesticides is serious threat to biodiversity, which is the natural system up on which living organisms depend.

As per the feedback from the households and the survey, the awareness level in the community is very minimal; the use of pesticide equipment and follow-up of protection precaution in relation to pesticide management is low and the environmental and public health impacts being caused by improper utilization of pesticides is very serious.

5.2 Recommendations

In light of the major problems described above regarding the assess pesticide use in homes and possible health impacts on occupantsthe following measures are forwarded as recommendations.

1. There should be an integrated effort from governmental and nongovernmental organizations that focus on the awareness rising of households on proper pesticide management and related issues.
2. It is important to create and promote awareness of the pesticide users about the side-effects of pesticides. This could be done through organizing frequent training and orientation-workshop programs.
3. Careful pesticide containers disposal is an important role of a responsible pesticide user. Careless disposal measures can lead to contamination of the soil and ground water, thereby causing serious health problems for pesticide users.
4. Organizing training and orientation-workshop programs are duties of concerned bodies such as agricultural and health sectors in the study area. Important is also all pesticide users have to be accessible to the training and workshop opportunities without any form of discrimination.
5. Finally, the government and other stakeholders should enable the community to improve the handling, separation, and storage and disposal practice of recyclable materials and enhancing environmental awareness and participation of stakeholders.

6. REFERENCES

Ajayi, O.C., & Akinnifesi, F.K. (2007). Farmers‟ understanding of pesticide safety labels and field spraying practices: a case study of cotton farmers in northern Côte d‟ Ivoire. Sci Res Essays, 2(6): 204–210.

Akhabuhaya J (2009). Needs for pesticide safety outreach programmes in developing countries: a Tanzania example. Afr Newslett Occup Health and Safety, 15:68–70.

Ali SM,Rahaman MM and Hossain (2002). Pesticide use and male fertility in Bangladesh, in Ahmed M.F(Eds), Bangladesh, in Environment (Bangladish, Pariash Andolon(BAPA),1:5-10.

Amal M, Nahed M and Soad S (2016).Effect of an educational program for farming mothers to protect their children from pesticide exposure. IOSR Journal of Nursing and Health Science (IOSR-JNHS), 5(5): 25- 35.Available at www.iosrjournals.org.

Amare Ayalew and Kalayou Hiluf.(2015).Assessment of pestici de use, Practice and Environmental Effects on the Smaller Holder Farmers in North Shoa Zone of Amhara National, Regional state of Ethiopia, Research Journal of Agricultural and Environmental Science,2(2):16-24.

Amera T, and Abate A. (2008). An assessment of the Pesticide use practice and Hazards in Ethiopian Rift valley. Pesticide Action Network (PAN- UK) and Institute for sustainable Development.www.thenrgroup.net/theme/PAN-ecotox/pdf/annex_6_ethiopia_mini- project_report.pdf.

Anonymous, E. & Dehne, H. (2009).Safeguarding production-losses in major crops and the role of crop protection. Crop Prot, 23, 275-285.

Antwi-Agyakwa AK(2013).Susceptibility of feld populations of cocoa mirids, sahlbergella singularis haglund and distantiella theobroma (distant) to bifenthrin. (Unpublished Master‟s thesis).Kwame Nkrumah University of Science and Technology, Kumasi, Ghana.

Arcuy,T.A.Quandt,AJ.Cravey,Rebrcca C-Elmoreand Gregory and B.Russella.(2001).Farm Workers reports of pesticide safe and sanitation in the work Environment, American Journal on industrial medicine, 39:487-498.

Arcuy,T.A.Quandt,AJ.Cravey,Rebrcca C-Elmoreand Gregory and B.Russella.(2007). pesticide safe and sanitation in the work Environment, American Journal on industrial medicine, 39:487-498.

Arias-Estevez M., Lo´pez-Periago E., Martı´nez-Carballo E. and Simal-Ga´ndara J(2008). The pollution of groundwater resources.Agriculture, Ecosystems and Environment, 123:247– 260.

Belay, T. (2015). Pesticide use practices among smallholder vegetable farmers in Ethiopian Central Rift Valley. Environmental Policy Group, Wageningen University and Research Center, Hollandseweg 1, 6706 KN Wageningen, The Netherlands.

Brittain, C.A., Vighi, M., Bommarco, R., Settele, J.and Potts, S.G. (2010).Impacts of a Pesticide on pollinator species richness at different spatial scales. Basic and Applied Ecology, 11(2): 106- 115.

Calvert G.m,Kamik J and Meher L.(2008).Acute pesticide poisonous among agricultural workers in the united states .

Cesna, I., Afzal, S., Hussain, I. & Sultana, N. (2005). Pesticides exposure in Pakistan: A review. Environ. Int., 33.1107-1122.

Cessna A J, Wolf T M, Stephenson G R and Brown R B. (2005). Pesticide movement to field margins: routes, impacts and mitigation. Field boundary habitats: implications for weed. Insect and Disease Management, 1: 69-112.

Chew, J., Stober, J. & Besbelli, N. (2008). Acute pesticide poisoning: a proposed classification tool. Bull World Health Organ; 86 (3):205-9.

Chirra GA, Muraleedharan VR,Swanina and T,Veeraghavan D.(2006). Use of pesticide and its implication on the health of farmers in south India. Journal of Occupational and Environmental Health, 12(3):228-333.

Cochran G., (1977). Sampling Techniques, 3rd edition, Wiley Series in productivity and Applied Mathematical Statistics. New York, USA.

Cooper, J., & Dobson, H. (2007). The benefits of pesticides to mankind and the envirment: Crop Prot, 26(9), 1337–1348.

Corondo GD,Thomson Strong L , Griftith WC and Islas I.(2004). Agricultural task and expose to organophosphate pesticide among farm worker‟s.Environ Health,18:142-147.

Damalas, C. & Eleftherohorinos, I. (2011). Pesticide exposure, safety issues, and risk assessment indicators. Int J Environ Res Public Health; 8: 1402–19.

Damalas, C., Telidis, G., Stavros, D. & Thanos, S. (2008). Assessing farmers' practices on disposal of pesticide waste after use. 390:341-345.

Dellavalle, C., Hoppin, J., & Alavanja, M. (2012). Risk-accepting personality and personal protective equipment use within the agricultural health study. Agromed; V:17:26476.

Draggan, F. & Miller, B. (2012).Directory of Least-Toxic Pest Control Products.The IPM practitioner.Monitoring the Field pest Management. 32(11/12): 1 – 52.

Dugassa, O. (2019). Assessment of pesticide use and disposal in Gida Ayana District, Western Oromia, Ethiopia.

Elmore, R. & Arcury, T. (2001). Pesticide exposure beliefs among Latino farmworkers in North Carolina‘s Christmas tree industry: Am J Ind Med 40:153 – 160.

Elzinga, K. & Dharmani, C. (2004). Sources of exposures and public health implications for Organophospheric pesticides V: 14(3):171-85.

Environmental Protection Authority (2012). Pesticides and food: health problems Pesticides may pose. http://www.epa.gov/opp00001/food/risks.htm

EPA(Environmental Protection Agency). (2004). Environmental Impact Assessment Guidline on Pestcides In: The Federal Democratic Republic of Ethiopia.

EPA.(2005). Environmental Impact Assessment Guideline on Pesticides, Addis Ababa, Ethiopia.

Farahat, T. M., Shaheen, H. M., Sanad, Z. F., & Frag, N. A. (2016). Knowledge, attitudes, and practices of organo-phosphorus pesticide exposure among women affiliated to the Manshat Sultan Family Health Center (rural area) in Menoufia.

Farinde, D. (2012). Letter from David Hackenberg to American growers.Plattform Imkerinnen Austria.

Food Agricultural Organization (FAO) (2002). Manual on the Submission and Evaluation of Pesticide Residues Data for the Estimation of Maximum Residue Levels in Food and Feed;

Food Agricultural Organization (FAO) Rome, (2001). Guide lines on organization and operation of training schemes and certification procedure for operators of pesticide application equipment.

Gaber.Sherine& Abdel-Latif. Soha Hassan (2012), Effect of education and health locus of control on safe use of pesticides: across sectional random study, Journal of Occupational Medicine and Toxicology, 7: 1-3.

Gerkan A,Suplo J and Braun M.(2001).Pesticide use policies in Ghana :An economic and institutional analysis of current practices and factors influencing pesticide use. A publication of the pesticide project.Publication series Hanover Uni, Hanover.

Gianessi, L., & Williams, A. (2011).Overlooking the Obvious: The Opportunity for Herbicides in Africa. Outlooks on Pest Management, 22(5): 211–215.

Gilliom, R. (2007). The Quality of our nation‘s waters: Pesticides in the nation‘s streams and ground water, 1992–2001. US Geological Survey

Grube, A., Lawin, H., Gounongbe, F., Dossou, F., Fayomi, B. (2011). Knowledge, Attitudes, Practices of farmers exposed to pesticides at Banikoara Township (Republic of Benin). J Environ Health Sci 1(2):1-5.

Gruchalla, J., Mol, F. & Gerowitt, B. (2005).The ‗necessary extent‘of pesticide use—Thoughts about a key term in German pesticide policy. Crop Prot. 27, 343-351.

Hawassa City (2020). Aadministration Food Economy Development Department, Sidama region

Henry, L. (2003). Levels of some Pesticides in Environmental Samples from Southern Lake Victoria and its Catchments and their Chemodynamics in Tilapia Species, Water and Sediments under Experimental Conditions, Tanzania,

Horton, F., Nwanze, K. & Youdeowei, A. (2011).Impact of integrated pest management on food and horticultural crops in Africa.Entomol. Exp. Appl. 128, 355-363.

Ibitayo OO. (2006). Egyptian farmers‟ atitudes and behaviors regarding agricultural pesticides: implications for pesticide risk communication. Risk Anal; 26: 989–95.

Jansen, K. & Dubois, M. (2008). Global pesticide governance by disclosure: Prior informed consent and the Rotterdam convention. In A. Gupta & M. Mason (Eds.), Transparency in environmental governance: Critical perspectives (pp. 107–131). Cambridge, MA: MIT Press.

Jensen, H., Konradsen, F., Jors, E., Petersen, J. & Anders, A. (2011).Pesticide Use and Self-Reported Symptoms of Acute Pesticide Poisoning among Aquatic Farmers in Phnom Penh.J Toxicol.

Kalayou, H. & Amare, A. (2015).Assessment of pesticide use, Practice and Environmental Effects on the Small Holder Farmers in the North Shoa Zone of Amhara National Regional State of Ethiopia. Research Journal of Agricultural and Environmental Sciences, 2(2):16-24.

Karuna, P., Howteerakul, N., Sujirarat, D., Siri, S. & Suwannapong, N. (2012). Serum cholinesterase levels of Thai chilli-farm workers exposed to chemical pesticides: Prevalence estimates and associated factors. J. Occup. Health 52, 89

Karunamoorthi K, Mohammed A, and Jemal Z. (2011). Peasant Association Member‟s Knowledge, Atitudes, Practices towards Safe Use of Pesticide Management. Am J Ind Med; 54: 965–70.

Kerle, E. A,, Jenkins, J. J., and Vogue PA. (2007).Understanding pesticide persistence and mobility for groundwater and surface water protection .Oregon State Univ Extension Service,EM8561-E.

Lawal, B., Torimiro, D., Banjo, A. & Joda, A. (2005). Operational habits and health hazards associated with pesticide usage by cocoa farmers in Nigeria: Lessons for extension work. J Hum Ecol 17(3):191-195

Liu, Aiwerasia, V., Ngowi & Leslie, L. (2002). Farmers' knowledge, practices and injuries associated with pesticide exposure in rural farming villages inTanzania. BMC Public Health 14:389.

Lorenz, E. (2009). Potential Health Effects of Pesticides.‖ Ag Communications and Marketing. 1-8

Lotter, D., Seidel, R., & Liebhardt, W. (2003).The performance of organic and Conventional cropping systems in an extreme climate year". American Journal of Alternative Agriculture 18: 146–154

Margni, L., Anger, W. & Keifer, M. (2002). Studying health outcomes in farm workers population exposed to Pesticides. Environ ealth Perspect; 114: 953–60.

Maroni, M., Fanetti, A. & Metruccio, F. (2006).Risk assessment and management of occupational exposure to pesticides in agriculture. Med Lav; 97 (2):430-7.

Marquis, E. (2013). Economic analysis of strengthening the governance of pesticide management in Uganda‘s agriculture sector. International Journal of Development and Sustainability, 1(2), 527–544.

Mathur HB, Agarwal HC,Johonson S and Saikian N.(2005). Analysis of pesticide residue in Blood samples from Villages of Punjab.CSE/PML/PR-21.

Maumbe, B. M. and S. M. Swinton.(2003). “Hidden health costs of pesticides use in Zimbabwe‟s smallholder cotton growers”, Social Science & Medicines, 57:1559-1571.

McFarlane, E., Chapman, A., Benke, Meaklim, J. & McNeil, J. (2007). Training and other predictors of PPE use in Australian grain farmers using pesticides. Journal of occupational and Environmental Medicine 65:141-146.

Mekonnen Y and Agonafer T. (2002) Pesticide sprayers‟ knowledge, atitude and practice pesticide use on agricultural farms of Ethiopia. Occup Med; 52: 311–5.

Miller, G. (2004). Sustaining the Earth, 6th edition:Thompson Learning, Inc. Pacific Grove, California, USA.

Ming, T. (2005). An Integrated Crop Management as fundamental basis for sustainable production. Pflanzenschutz-Nachrichten Bayer, 53, 131-153.

Monosson E., Agriculture, Food and Environmental health. (2007). Encyclopedia of Earth. Eds. Cutler J. Cleveland (Washington, D.C.: Environmental Information Coalition, National Council for Science and the Environment.

Moustafa, M. & Saleh, A. (2017).Farmers Knowledge, Attitude and Practices, and their Exposure to Pesticide Residues after Application on the Vegetable and Fruit Crop. Case Study: North of Delta, Egypt. J Environ Anal Toxicol 7:510. Doi:10.4172/2161- 0525. 1000510.

Mugenda, O. & Mugenda, A. (2003). Qualitative and Quantitative approaches: Research Methods Africa Center for Technology Studies (Acts) Press. Nairobi Kenya.

Mulualem, M., Fanetti, A. & Metruccio, F. (2005).Risk assessment and management of occupational exposure to pesticides in agriculture. Med Lav97:430–437.

Murphy, H., Hoan, N., Matteson, P. & Morales, A. (2002). Farmer‘s selfsurveillance of pesticide poisoning: a 12-month pilot in Northern Vietnam. Int J Occup Environ Health:8(3): 201–221.

Naidoo S, London L and Rother HA (2010) .Pesticide safety training and practices in women working in small-scale agriculture in South Africa. Occup Environ Med; 67: 823–8..

Ngowi A.V.F., Mbise T J., Ijani A.M., London and L., Ajay, C., (2007).Smallholder vegetable farmers in Northern Tanzania: Pesticides use practices, perceptions, cost and health effects. Crop Prot., 26:1617- 1624.

Ngowi AV.,Maeda D, WesselinC, PortanenTJ,Sanga MP and Mbise G. (2001).Pesticide handling practice in Tanzania: observational data from 22 coffee and cotton fqrm. IntJ Occup Environ Health, 7:326- 332.

Ngowi AVF. (2003) A study of farmers‟ knowledge, attitude and experience in the use of pesticides in coffee farming. Af Newsleter Occup Health Safety; 13: 62–4.

Nigussie, K. (2019). Pesticide use, practices and farmers’ awareness in case of Misrak Badawacho Woreda, Hadiya Zone, SNNPR

Northern Press-byterian Agricultural Services(NPAS) (2012). Ghana‟s pesticide crisis: The need for further government action.

Ntow WJ, Gijzen HJ, Kelderman P and Drechsel P.(2006). Farmer perceptions and pesticide use practices in vegetable production in Ghana. Pest Manag Sci, 62(4):356–365. doi:10.1002/ps.1178.

Ntzani, E., Chondrogiorgi, M. & Ntritsos, G. (2013).Literature review on epidemiological studies linking exposure to pesticides and health effects. European Food Safety Authority supporting publication.

Ogunijim SI and FarindeAJ.(2012a).Farmer‟s knowledge level of precautionary measures on agro- chemical usage on cocao production in Osum and Edo States,Nigeria. InJ Agric For,2(4):186-194.

Ogunijim SI and FarindeAJ.(2012b). Measures and associated health problems in the use of agro- chemical on cocao production in Osum and Edo States,Nigeria.InJ Agric Sci Res, 2(2):1-13.

Okonya, J. S., &Kroschel, J. (2015).A cross-sectional study of pesticide use and knowledge of smallholder potato farmers in Uganda.BioMed Research International, 2015.

PANG, (2012). Hazardous pesticides and health impacts in Africa: Food and fairness Briefing No.6. www.pesticideinfo.org.

Pedlowsk, M.A., CanadaM.C;Dacosta Terra M.A and Ramos Faria.,R.M,(2012).Modes of pesticide until by Brazilian small holders and their implication for human health and the environment. Crop protection, 31:113-118.

Perry, M., Marbella, A. & Layde, P. (2002). Compliance with required pesticide-specific protective equipment use:Am J Ind Med 41:70 – 73

Pimentel, J. (2009). Pesticides reduce symbiotic efficiency of nitrogen-fixing rhizobia And host plants, proceedings of the National Academy of Sciences, USA.

Relyea, R.A and Hoverman, J.T. (2008).Interactive effects of predators and a pesticide on aquatic communities. Oikos, 117(11): 1647-1658.

Ross, (2005). Pesticide risk perceptions and the differences between farmers and extensionists: Towards a knowledge-in-context model. Environmental Research, 124, 43–53.

Sacramento, C. (2008). Department of Pesticide Regulation ―What are the Potential Health Effects of Pesticides?‖ Community Guide to Recognizing and Reporting Pesticide Problems, 27-29.

Saleh, I. (2017). Pesticides and Health in Vegetable Production in Kenya.BioMed Research International. Article ID 241516. http://dx.doi.org/10.1155/2015/241516.

Samuel, N., Apiakise, E, Akpe, B. & Obele, R. (2015).Knowledge, attitude and practices of small scale farmers on pesticide handling in Bayelsa State. Point J. Med. Med. Res. 1(3): 054-059.

Soares, W.L. and Porto, M.F.D. (2009).Estimating the social cost of pesticide use: An assessment from acute poisoning in Brazil. Ecol. Econ., 68: 2721 - 2728.Switzerland.

Stevenson, M., Hoppin, J. & Kamel, F. (2000). Health effects of chronic pesticide exposure: Cancer and neurotoxicity. Ann. Rev. Publ. Health, 25, 155–197.

Tadesse, A. & Asferachew, A. (2008). Assessment of the pesticide use, practice and hazards in the Ethiopian Rift Valley in 2007, Institute for Sustainable Development (ISD) and Pesticide Action Network (PAN-UK), Addis Ababa.

Teklu, B.M., Retta, N. and Van den Brink P.J (2016) Sensitivity analysis of Ethiopian aquatic macroin vertebrates to the pesticides endosulfan and diazinon, compared to literature data. Ecotoxcology 25: 1226-1233.

Tijian AA. (2006). Pesticide use practice and safety issues: The case Cocoa farmers in Ondo state, Nigeria Hum Eco, 19 (3):183-190.

Toth, S. J., and Buhler W. G. (2009). Environmental effects of pesticides, Department of Entomology and Horticultural Science, North Carolina State University Vitosh ,M. , Agricultural Extension . Bulletin, 15:102-107.

United States Department of Agriculture (2014). Pesticide Use in U.S. Agriculture: 21 Selected Crops, 1960- 2008. Economic Information Bulletin Number 124.Washington DC: Economic Research Service.

Vega SS.(1994). Note on the toxicity of pesticide used in tropical crops. Ciencias Ambientales,11:181.

Vega, M. & Van, E. (1994).Integrated pest management in practice-pathways towards successful application. Crop Prot.19, 81-103.

Vergucht, S., deVoghel, S. & Misson, C. (2006).Health and Environmental Effects of Pesticides and Type 18 Biocides.

Wasudha, M., Lydia, O. & Henry, O. (2015).A study of pesticide usage and pesticide safety awareness among farmers in Commewijne in Suriname. Journal of Agricultural Technology 11(3):621- 636.

WHO (2009). WHO Recommended Classification of Pesticides by Hazard. Geneva, Switzerland.

Williamson, S. (2003). Pesticide Provision in Liberalized Africa: Out of Control Agricultural Research and Extension Network Paper No. 126. Overseas Development Institute: London, UK.

Williamson, S. (2011). Understanding the Full Costs of Pesticides: Experience from the Field, with a Focus on Africa. [book auth.] M. Stoytcheva. Pesticides - The Impacts of Pesticides Exposure. s.l. : InTech.

World Health Organization (WHO) (2004).The WHO Recommended Classification of Pesticides by Hazard and Guidelines to Classification. Geneva, Switzerland.

World Health Organization (WHO) (2010). International Code of Conduct on the Distribution and Use of Pesticides: Guidelines for the Registration of Pesticides; World Health Organization: Rome, Italy, Int. J. Environ. Res. Public Health.

Yassin, M., Abu-Mourad, T. & Safi, J. (2002). Knowledge, attitude, practice, and toxicity symptoms associated with pesticide use among farm workers in the Gaza Strip. Occup Environ Med, 59:387-394.

Zhi-Yong Zhang, Xian-Jin Liu,Xiang-Yang Yu, Cun-Zheng Zhang and Xiao- Yue Hong.(2006). Pesticide residues in the spring cabbage (Brassica oleracea L. var. capitata) grown in open fieldJ. foodcont .

APPENDICES

Hawassa University

School of Graduate Studies

College of Natural and Computational Science

Department of Biology

MSc in Ecotoxicology and Environmental Health

Data Collection Instruments

I. Questionnaire Prepared for Sample Households

Dear respondents, this questionnaire is prepared for an academic purpose for the fulfillment of MSc Degree in Ecotoxicology and Environmental Health in the Department of Biology, Hawassa University. Specifically the objective of the study was to **assess knowledge, attitude and practice of indoor use of pesticide households in Hawassa City and possible health impacts on occupants, Sidama National Regional State, Ethiopia.** Therefore, your response is very important for the success of the study because all information that you provide determines the analysis and conclusion of the research. Hence, you are kindly requested to give your response by selecting informed that your response is kept in confidential and you are not required to write your name. I would like to thank you for your cooperation!

With Best Regards!

Agegnehu Alemu

Mobile: +251916021734

Questionnaire Code N^{o}:_____	Date of Data Collection: ___/___/_____
Name of Enumerator: _____	Signature:_____

General Instructions:

- No need to write your name and put in the box(x) provided response
- Please fill the space provided for open-ended questions
- Data collection date: _____
- Household number _____

Part I: Personal Information of the Respondents

1. Sex:
   - A) Male ☐ B) Female ☐
2. Age in years:
   - A) 18-25 ☐ C) Above 45 ☐
   - B) 26-45 ☐
3. Marital status: ☐
   - A) Single C) Divorced ☐
   - B) Married ☐ D) Widow ☐
4. Educational level:
   - A. Not attended formal ☐ C. 9-12 grade ☐
   - B. 1-8 grade ☐ D. Diploma ☐
   - E. Degree and above ☐
5. Your position in the household
   - A. Mother ☐
   - B. Father ☐
   - C. Child ☐

Part I: Questionnaire Prepared for Sample Respondents

1. What kind of pests are you troubled with?

A. Mice
B. Cockroach
C. Fly
D. Mosquitoes
E. Lice
F. Bed bugs G. Others specify _____

2. What are the things that pests attack or spoil in your home?

A. Household member
B. Stored food
C. Cooked food
D. Pets
E. Livestock F. Other specify _____

3. How did you control these pests mainly?

A. Apply synthetic pesticides

B. Using traditional methods

4. If your answer is B for the above question, what are the traditional pests controlling methods in your home?

A. By smoking the house using certain plant parts

B. Physical method

C. By spraying local prepared pests control drugs

D. Spreading other pests destroying animals

E. Others specify _____

5. For which traditional pests controlling methods for each of the following?

A. Mice

B. Cockroach

C. Fly

D. Mosquitoes

E. Lice

F. Flea

G. Bed bugs H. Others specify _____

6. Do you usually read the labels on pesticide containers?

A. Yes

B. No

7. Do you understand the instructions for use?

A. Yes

B. No

8. Can you always accurately follow the instructions?

A. Yes

B. No

9. Is there an expiry date on the container of pesticides?

A. Yes

B. No

C. I don't know

10. The common types of pesticides used by the households?

A. Roach killer

B. Mobil

C. DDT

D. Others specify _____

11. Does your pesticide use solve your pest problem in your home?

A. Yes

B. No

C. Don't know

12. What initiates your use of those chemicals?

A. Own decisions

B. Advice from health office

C. Advice from environmental protection experts

D. Advice from neighbor/friends H. Others, please specify_____

13. Who sprays/applies pesticides in your home?

A. Father

B. Mother

C. Brother

D. Sister

E. Trained/ licensed labor

F. Untrained labor H. Others_____

14. Where do you buy the pesticides?

A. From a licensed vendor B. From open market

C. From a vendor I know but I am not sure about license E. others, please specify

D. From agricultural store

15. Where do you store pesticides in your home?

A. In the kitchen

B. Anywhere in the house

C. In a separate place

D. Others, please specify----------

16. What do you do with empty pesticide containers?

A. Use it for water and/or food storage B. Sell it

C. Dispose it by burying it in the soil D. Burning

E. Leave it on farm land F. others, specify----------

17. Do you use recommended personal protection equipment (PPE) while spraying pesticides in your home?

A. Yes, always

B. Yes, sometimes

C. No/Never

18. If yes to question 17, what do you wear when spraying pesticides in your home?

A. Normal clothes B. Gloves

C. Hat D. Boots

E. Bare feet F. Glasses

G. Cotton overalls H. others, specify---------

19. After applying pesticide, do you change contaminated protective clothes?

A. Yes

B. No

20. Major ways by which pesticides enter in to the body?

A. Through mouth

B. Through skin

C. Through nose

D. Through eyes

21. Do you practice safety precautions during pesticide application?

A) Yes B) No

22. While pesticide handling and pesticide application what do you performing:

A. Drinking

B. Eating

C. Smoking

D. Never

23. The preferable time to take care (safe) during spray?

A. Raining season

B. Don't spray against wind

C. Spray at morning and afternoon

D. Can spray any time

24. What is the common time of spraying?

A. Early morning

B. Mid-day

C. Late afternoon

D. Evening

25. What is the recommended time to re-entry of home following pesticide spraying?

A. One day D. 3 hour

B. 12 hour E. 1 hour

C. 6 hour F. 30 minutes

26. Have you ever felt any discomfort/illness after pesticide application?

A. Yes

B. Yes, sometimes

C. No

D. Don't know

27. If yes to the question 26, what was your feeling?

A. Nausea B. Vomiting C. Headache

D. Eye irritation E. Skin irritation

28. Awareness about pesticide use and handling of households

Instruction: please fill the necessary information by making [x] in the below table.

S.N	Items	Yes	No
28	Do you read the label on the package?		
29	Are you aware of pesticide toxicity level?		
30	Do you eat, drink or smoke while spraying pesticides?		
31	Do you store food items in pesticide bottle after use?		
32	Do you spray when it is windy?		

29. Safety measures about pesticide use of households

S.N	Items	Yes	No
33	Do you check your spraying equipment before pesticide application?		
34	Do you wash your hands after pesticide application?		
35	Do you take a shower after pesticide application?		
36	Do you regularly or occasionally transport pesticides with other goods such as food items?		
37	Do you wash your contaminated clothes separately?		
38	Do you wear special face mask?		

II. Checklist for Key Informant Interviews (KIs)

1. Did you or your office give awareness giving training to households on pesticide issues in the past? A. Yes B. No
2. If yes to question 1, what were the households trained on (trained topics of) pesticides?
    A. How to use pesticides
    B. Health & safety issues
    C. Disposal of leftover pesticides &containers
    D. Environmental effects of pesticides
    E. Others, please specify_____
3. What do you think about positive and negative effects of pesticides to human health & to the environment?

    _____

    _____

    _____

    _____

4. Do households use other kind of methods to control pests?

    A. Yes

    B. No

5. If yes, what method do they use?

_____

_____

_____

6. From where households get pesticides?

    A. Buy from licensed sealer
    B. Buy from unlicensed illegal sealer
    C. Buy from open market
    D. Buy from government office
    E. Other place, please specify _____

III. Checklist for Focus Group Discussion (FGD): how many FGD questions? No. 1 is missing

2. Have you ever attend any workshop or training regarding safety measure and use of pesticides?

   _____

   _____

3. What personal protective equipment do you use during application of pesticide?

   _____

   _____

4. How do you transport and storage pesticides?

   _____

   _____

5. For what purpose do you do with pesticides containers?

   _____

   _____

6. What do you think about positive and negative effects of pesticides to the human health and to the environment?

   _____

   _____

IV. Checklist for Field Observation

1. Do households follow the instructions given on the label?

_____

_____

2. Do households properly transport pesticide?

_____

_____

3. Did the households use PPEs properly?

_____

_____

4. Did the households spray when it is windy?

_____

_____

5. Did pesticide containers properly disposed?

_____

_____

6. Do households consider pictograms on the pesticide containers?

_____

_____

7. Did the pesticide stored in separated room?

_____

_____

ሀዋሳ ዩኒቨርሲቲ

የድህረ ምረቃ ትምህርት ክ

የተፈጥሮ እና ስሌት ሳይንስ ኮሌጅ

የባዮሎጂ ክፍል

ኤምኤስሲ በኢኮቶክሲኮሎጂ እና በአካባቢ ጤና

የውሂብ መሰብሰቢያ መሳሪያዎች

I. ለቤተሰብ ናሙና የተዘጋጀ መጠይቅ

ውድ ምላሽ ሰጪዎች፣ ይህ መጠይቅ የተዘጋጀው በሐዋሳ ዩኒቨርሲቲ የባዮሎጂ ትምህርት ክፍል በኢኮቶክሲኮሎጂ እና በአካባቢ ጤና ኤምኤስሲ ዲግሪን ለማሟላት ለአካዳሚክ ዓላማ ነው። በተለይም የጥናቱ ዓላማ ነበርበሲዳማ ብሄራዊ ክልላዊ መንግስት በቤት ውስጥ ፀረ ተባይ መድሃኒቶችን መጠቀም እና በነዋሪዎች ላይ ሊደርስ የሚችለውን የጤና ችግር መገምገም። ስለዚህ የሰጡት ምላሽ ለጥናቱ ስኬት በጣም አስፈላጊ ነው ምክንያቱም ሁሉም የሚሰጡት መረጃ የጥናቱን ትንተና እና መደምደሚያ ይወስናል። ስለዚህ ምላሽዎ በሚስጥር የተያዘ መሆኑን እና ስምዎን እንዲጽፉ የማይገደዱ መሆኑን በመምረጥ ምላሽዎን እንዲሰጡ በአክብሮት እንጠይቃለን። ስለ ትብብርዎ ላመሰግናችሁ እወዳለሁ!

ከአክብሮት ሰላምታ ጋር!

አገኘሁ አለሙ

ሞባይል፡ +251916021734

መጠይቅ ኮድ N^ኦ:_____	የውሂብ መሰብሰብያ ቀን፡- ____/_____/_____
የቆጣሪው ስም፡- _____	ፊርማ:_____ _____

አጠቃላይ መመሪያዎች፡-

- ስምዎን መጻፍ እና በቀረበው ሳጥን (x) ውስጥ ማስገባት አያስፈልግም
- እባክዎን ክፍት ለሆኑ ጥያቄዎች የቀረበውን ቦታ ይሙሉ
- የውሂብ መሰብሰቢያ ቀን፡- _____
- የቤተሰብ ቁጥር _____

ክፍል አንድ፡ የተጠሪዎች የግል መረጃ

1. ወሲብ፡

   ሀ) ወንድ ☐ ☐ ለ) ሴት

2. በዓመታት ውስጥ ዕድሜ;

   ሀ) 18-2☐ ☐ 45 በላይ

   ለ) 26-45 ☐

3. የጋብቻ ሁኔታ:

   ሀ) ነጠላ ሐ) የተፋታ ☐

   ለ) ያገባች መ) ባልቴት ☐

4. የትምህርት ደረጃ፡-

   A. መደበኛ ☐ C.9-12 ክፍል አልተማረም። ☐

   B. 1-8 ክፍል ☐ D. ዲፕሎማ ☐

   E. ዲግሪ እና ከዚያ በላይ☐

5. በቤተሰብ ውስጥ ያለዎት አቋም

   A. እናት ☐

   B. አባት ☐

   C. ልጅ ☐

ክፍል ፡ ለናሙና ምላሽ ሰጭዎች የተዘጋጀ መጠይቅ

1. በምን አይነት ተባዮች ተቸግረዋል?

   A. አይጦች
   B. በረሮ
   C. መብረር
   D. ትንኞች
   E. ቅማል
   F. ትኋን ሰ. ሌሎች _____ ይገልጻሉ

2. በቤትዎ ውስጥ ተባዮች የሚያጠቁት ወይም የሚያበላሹት ነገሮች ምንድን ናቸው?

A. የቤተሰብ አባል

B. የተከማቸ ምግብ

C. የበሰለ ምግብ

D. የቤት እንስሳት

E. የእንስሳት እርባታ ረ. ሌላ ይግለጹ _____

3. እነዚህን ተባዮች በዋናነት እንዴት ተቆጣጠሩት?

A. ሰው ሠራሽ ፀረ-ተባይ መድኃኒቶችን ይተግብሩ

B. ባህላዊ ዘዴዎችን መጠቀም

4. ከላይ ላለው ጥያቄ መልስዎ B ከሆነ፣ በቤትዎ ውስጥ ባህላዊ ተባዮችን የሚቆጣጠሩት ዘዴዎች ምንድናቸው?

A. የተወሰኑ የእፅዋት ክፍሎችን በመጠቀም ቤቱን በማጨስ

B. አካላዊ ዘዴ

C. በአካባቢው የተዘጋጁ ተባዮችን የሚከላከሉ መድኃኒቶችን በመርጨት

D. እንስሳትን የሚያበላሹ ሌሎች ተባዮችን ማሰራጨት

E. ሌሎች _____ ይገልጻሉ

5. ለእያንዳንዳቸው የሚከተሉት ባህላዊ ተባዮችን የመቆጣጠር ዘዴዎች የትኞቹ ናቸው?

A. አይጦች

B. በረሮ

C. መብረር

D. ትንኞች

E. ቅማል

F. ቁንጫ

G. ትኋኖች H. ሌሎች ደግሞ _____ ይገልጻሉ

6. ብዙውን ጊዜ በፀረ-ተባይ መያዣዎች ላይ ያሉትን መለያዎች ያነባሉ?

A. አዎ

B. አይ

7. የአጠቃቀም መመሪያዎችን ተረድተዋል?

A. አዎ

B. አይ

8. ሁልጊዜ መመሪያዎቹን በትክክል መከተል ይችላሉ?

A. አዎ

B. አይ

9. በፀረ-ተባይ መድሃኒት መያዣ ላይ ጊዜው የሚያበቃበት ቀን አለ?

A. አዎ

B. አይ

C. አላውቅም

10. አባወራዎች የሚጠቀሙባቸው የተለመዱ የፀረ-ተባይ ዓይነቶች?

A. Roach ገዳይ

ቢ. ሞቢል

ሲ.ዲዲቲ

መ. ሌሎች _____ ይጠቅሳሉ

11. የፀረ-ተባይ መድሃኒትዎ በቤትዎ ውስጥ ያለውን የተባይ ችግር ይፈታል?

ኡ. አዎ

ለ. አይ

ሐ. አላውቅም

12. እነዚያን ኬሚካሎች እንድትጠቀም ያነሳሳህ ምንድን ነው?

ሀ. የራሱ ውሳኔዎች

ለ/ ከጤና ቢሮ የተሰጠ ምክር

ሐ. ከአካባቢ ጥበቃ ባለሙያዎች የተሰጠ ምክር

መ. ከጎረቤት/ጓደኞች ምክር H. ሌሎች፣ እባክዎን ይግለጹ_____

13. በቤትዎ ውስጥ ፀረ ተባይ መድኃኒቶችን የሚረጭ/የሚተገብር ማነው?

A. አባት

B. እናት

C. ወንድም

D. እህት

E. የሰለጠነ / ፈቃድ ያለው የጉልበት ሥራ

F. ያልሰለጠነ ጉልበት H. ሌሎች_____

14. ፀረ-ተባይ መድሃኒቶችን የት ነው የሚገዙት?

ሀ. ፈቃድ ካለው ሻጭ B. ከክፍት ገበያ

ሐ. እኔ ከማውቀው ሻጭ ግን ስለ ፍቃድ E. ሌሎች እርግጠኛ አይደለሁም፣ እባክዎን ይግለጹ

መ. ከእርሻ መደብር

15. በቤትዎ ውስጥ ፀረ-ተባይ መድሃኒቶችን የት ነው የሚያከማቹት?

A. በኩሽና ውስጥ

ለ. በቤቱ ውስጥ በማንኛውም ቦታ

ሐ. በተለየ ቦታ

መ. ሌሎች፣ እባክዎን ይግለጹ----------

16. ባዶ ፀረ ተባይ ኮንቴይነሮችን ምን ታደርጋለህ?

ሀ. ለውሃ እና/ወይም ለምግብ ማከማቻ ይጠቀሙበት ለ. ይሸጡት

ሐ. በአፈር ውስጥ በመቅበር ያስወግዱት D. ማቃጠል

ሠ. በእርሻ መሬት ላይ ይተውት F. ሌሎችን ይግለጹ ----------

17. በቤትዎ ውስጥ ፀረ-ተባይ መድሃኒቶችን በሚረጩበት ጊዜ የሚመከሩ የግል መከላከያ መሳሪያዎችን ይጠቀማሉ?

A. አዎ፣ ሁልጊዜ

ለ. አዎ፣ አንዳንዴ

ሐ. አይ/በጭራሽ

18. ለጥያቄ 17 አዎ ከሆነ፣ በቤትዎ ውስጥ ፀረ-ተባይ መድሃኒቶችን ሲረጩ ምን ይለብሳሉ?

ሀ. መደበኛ ልብሶች B. ጓንቶች

C. ኮፍያ D. ቡትስ

E. ባዶ እግር ኤፍ መነጽር

G. ጥጥ ቱታ ኤች.ሌሎችን ይግለጹ ---------

19. ፀረ-ተባይ መድሃኒት ከተጠቀሙ በኋላ የተበከሉ መከላከያ ልብሶችን ይለውጣሉ?

አ. አዎ

ለ. አይ

20. ፀረ-ተባይ መድሃኒቶች ወደ ሰውነት ውስጥ የሚገቡባቸው ዋና ዋና መንገዶች?

ሀ. በአፍ

ለ. በቆዳ በኩል

ሐ. በአፍንጫ በኩል

መ. በአይኖች

21. ፀረ-ተባይ መድሃኒት በሚጠቀሙበት ጊዜ የደህንነት ጥንቃቄዎችን ይለማመዳሉ?

ሀ) አዎ ለ) አይደለም

22. ፀረ-ተባይ አያያዝ እና ፀረ-ተባይ መድሃኒት በሚጠቀሙበት ጊዜ ምን እየሰሩ ነው:

ሀ. መጠጣት

ለ. መብላት

ሐ. ማጨስ

መ. በጭራሽ

23. በሚረጭበት ጊዜ ለመንከባከብ (ደህንነቱ የተጠበቀ) ተመራጭ ጊዜ?

ሀ. የዝናብ ወቅት

ለ. በነፋስ ላይ አይረጩ

ሐ. ጠዋት እና ከሰዓት በኋላ ይረጩ

መ በማንኛውም ጊዜ ሊረጭ ይችላል።

24. የተለመደው የመርጨት ጊዜ ምንድነው?

ሀ. በማለዳ

ለ. እኩለ ቀን

ሐ. ከሰአት በኋላ

መ. ምሽት

25. ፀረ ተባይ መርጨትን ተከትሎ ወደ ቤት ለመግባት የሚመከረው ጊዜ ስንት ነው?

ሀ. አንድ ቀን D. 3 ሰአት

B. 12 ሰዓት ኢ. 1 ሰዓት

C. 6 ሰአት ረ 30 ደቂቃ

26. ፀረ ተባይ መድሃኒት ከተጠቀምክ በኋላ ምንም አይነት ምቾት/ህመም ተሰምቶህ ያውቃል?

አ. አዎ

ለ. አዎ፣ አንዳንዴ

ሐ. አይ

መ. አላውቅም

27. ለጥያቄ 26 አዎ ከሆነ፣ ስሜትህ ምን ነበር?

ሀ. ማቅለሽለሽ ለ. ማስመለስ ሐ. ራስ ምታት

መ. የአይን ብስጭት E. የቆዳ መቆጣት

28. ስለ ፀረ-ተባይ አጠቃቀም እና የቤት አያያዝ ግንዛቤ

መመሪያ፡ እባክዎ ከታች ባለው ሠንጠረዥ ውስጥ [x] በማድረግ አስፈላጊውን መረጃ ይሙሉ::

ኤስ.ኤን	እቃዎች	አዎ	አይ
28	በጥቅሉ ላይ ያለውን መለያ አንብበዋል?		
29	የፀረ-ተባይ መርዝ ደረጃን ያውቃሉ?		
30	ፀረ ተባይ መድኃኒቶችን በሚረጭበት ጊዜ ይበላሉ፣ ይጠጣሉ ወይም ያጨሳሉ?		
31	ከተጠቀሙ በኋላ የምግብ እቃዎችን በፀረ-ተባይ ጠርሙዝ ውስጥ ያከማቻሉ?		
32	ንፋስ ሲሆን ትረጫለህ?		

29. የቤት ውስጥ ፀረ-ተባይ አጠቃቀምን በተመለከተ የደህንነት እርምጃዎች

ኤስ.ኤን	እቃዎች	አዎ	አይ
33	ፀረ-ተባይ መድሃኒት ከመተግበሩ በፊት የሚረጩ መሳሪያዎችን ይፈትሹ?		
34	ፀረ-ተባይ መድሃኒት ከተጠቀሙ በኋላ እጅዎን ይታጠቡ?		
35	ፀረ-ተባይ መድሃኒት ከተከተለ በኋላ ገላዎን ይታጠባሉ?		
36	በመደበኛነት ወይም አልፎ አልፎ ፀረ-ተባይ መድሃኒቶችን ከሌሎች እቃዎች ጋር እንደ ምግብ እቃዎች ያጓጉዛሉ?		
37	የተበከሉ ልብሶችዎን ለየብቻ ታጥበዋል?		
38	ልዩ የፊት ጭንብል ይለብሳሉ?		

II. ለቁልፍ መረጃ ሰጪ ቃለመጠይቆች (KIs) ማረጋገጫ ዝርዝር

1. እርስዎ ወይም ጽህፈት ቤትዎ ከዚህ ቀደም በፀረ-ተባይ መድሀኒት ጉዳይ ላይ ለቤት አባወራዎች የግንዛቤ ማስጨበጫ ስልጠና ሰጥተዋል? A. አዎ ለ. አይደለም
2. ለጥያቄ 1 አዎ ከሆነ፣ አባ / እማወራዎቹ በፀረ-ተባይ ኬሚካሎች (በሠለጠኑ አርእስቶች) ምን ላይ ሥልጠና ወሰዱ?
   A. ፀረ-ተባይ መድሃኒቶችን እንዴት መጠቀም እንደሚቻል
   B. የጤና እና የደህንነት ጉዳዮች
   C. የተረፈውን ፀረ-ተባዮች እና ኮንቴይነሮች መጣል
   D. ፀረ-ተባይ መድሃኒቶች የአካባቢ ተጽእኖ
   E. ሌሎች፣ እባክዎን ይግለጹ_____
3. ፀረ-ተባይ መድሃኒቶች በሰው ጤና እና በአካባቢ ላይ ስላሉ አወንታዊ እና አሉታዊ ውጤቶች ምን ያስባሉ?

   _____

   _____

   _____

   _____
4. ቤተሰቦች ተባዮችን ለመቆጣጠር ሌላ ዓይነት ዘዴዎችን ይጠቀማሉ?

   አ. አዎ

   ለ. አይ
5. አዎ ከሆነ ምን ዓይነት ዘዴ ይጠቀማሉ?

   _____

   _____

   _____

   _____

6. አባ/እማወራ ቤቶች ፀረ ተባይ መድኃኒቶች የሚያገኙት ከየት ነው?

A. ፈቃድ ካለው ማተሚያ ይግዙ
B. ፍቃድ ከሌለው ህገወጥ ማሸጊያ ይግዙ
C. ከክፍት ገበያ ይግዙ
D. ከመንግስት ቢሮ ይግዙ
E. ሌላ ቦታ፣ እባክዎን _____ ይግለጹ

III. የትኩረት ቡድን ውይይት (FGD) ዝርዝር

2. የደህንነት መለኪያ እና ፀረ-ተባይ አጠቃቀምን በተመለከተ በማንኛውም ወርክሾፕ ወይም ስልጠና ላይ ተገኝተህ ታውቃለህ?

_____

_____

3. ፀረ-ተባይ መድሃኒት በሚጠቀሙበት ጊዜ ምን ዓይነት የግል መከላከያ መሳሪያዎችን ይጠቀማሉ?

_____

_____

_____

4. ፀረ ተባይ መድኃኒቶችን እንዴት ማጓጓዝ እና ማከማቸት ይቻላል?

_____

_____

5. ለምን ዓላማ ፀረ-ተባይ መያዣዎችን ታደርጋለህ?

_____

_____

_____

6. ፀረ-ተባይ መድሃኒቶች በሰው ጤና እና በአካባቢ ላይ ስለሚያስከትሉት አወንታዊ እና አሉታዊ ውጤቶች ምን ያስባሉ?

_____

_____

IV. የመስክ ምልከታ ዝርዝር

1. አባወራዎች በመለያው ላይ የተሰጡትን መመሪያዎች ይከተላሉ?

   _____

   _____

   _____

2. ቤተሰቦች ፀረ ተባይ መድኃኒቶችን በትክክል ያጓጉዛሉ?

   _____

   _____

   _____

3. አባወራዎቹ PPEs በትክክል ተጠቅመዋል?

   _____

   _____

   _____

4. አባወራዎቹ ነፋሻማ በሆነ ጊዜ ይረጩ ነበር?

   _____

   _____

   _____

5. የፀረ-ተባይ መያዣዎች በትክክል ተጥለዋል?

   _____

   _____

   _____

6. አባወራዎች በፀረ-ተባይ ኮንቴይነሮች ላይ ምስሎችን ያስባሉ?

   _____

   _____

   _____

7. ፀረ-ተባይ መድሃኒቱ በተለየ ክፍል ውስጥ ተከማችቷል?

   _____

   _____

   _____

Figure 13: interview with health experts

Figure 14: interview with households

Figure 15: interview with h vendor

ሀዋሳ ዩኒቨርሲቲ
በዮሎጂ ት/ክፍል

Hawassa University
Biology Department
☎+251462211934
✉ 5, Hwassa, Ethiopia

ቁጥር: Bio/313/13
Ref.No.
ቀን : 22/07/19
Date:

ለሚመለከተው ሁሉ

ጉዳዩ፣ ትብብር ስለመጠየቅ

በሀዋሳ ዩኒቨርሲቲ በባዮሎጂ ት/ክፍል "የEcotoxicology and Enviromental Health" ትምህርት ዘርፍ ሁለተኛ ድግሪ ተማሪ የሆነው አገኘሁ አለሙ "*Assessment of pesticide use in home in Hawassa city and possible health impacts on occupants, Sidama regional state Ethiopia*" በሚል ርዕስ ኘሮፖዛሉን በትምህርት ክፍሉ አጸድቆ የምርምር ስራውን ለመስራት በዝግጂት ላይ ይገኛል። ስለሆነም ለምርምር ስራው በእናንተ በኩል አስፈላጊውን ትብብር እንድታደርጉለት በትህትና እንጠይቃለን።

ከሰላምታ ጋር

ሀዋሳ ዩኒቨርሲቲ
ባዮሎጂ ትምህርት ክፍል
Department of Biology
Hawassa University

ከድር ወሊይ ጅሎ (ዶ/ር)
የባዮሎጂ ትምህርት ክፍል ኃላፊ
Kedir Woliy Jillo (phD)
Head, Department of Biology

HAWAASI QUCHUMI GASHSHOOTI FAYIMMATE BIDDISHSHA
ሀዋሳ ከተማ አስተዳደር ጤና መምሪያ
HAWASSA CITY ADMINISTRATION HEALTH DEPARTMENT

Kiiro/ቁጥር /Ref.No: ጤ/ኤ/ጽ/53.04/ 70

Barra/ቀን/Date: 25/7/15

ለሚመለከተው ሁሉ

ጉዳዩ፡-ትብብር እንዲደረግላቸው ስለመጠየቅ ይሆናል፤

በሀዋሳ ዩኒቨርሲቲ በባዮሎጂ ት/ክፍል "የEcotoxicology and Envairomental Health" ትምህርት ዘርፍ ሁለተኛ ድግሪ ተማሪ የሆነው አገኘሁ አለሙ "Assessment of Pesticide hse in home in Hawassa City and passible Health impacts on occupants,Sidama regional state Ethiopia" በሚል ርዕስ ፕሮፖዛሉን በትምህርት ክፍሉ አጸድቆ የምርምር ስራውን ለመስራት በገሚጅት ላይ መሆናቸውን በደብዳቤ ቁጥር Boi/313/15 ቀን 22/07/2015 የሀዋሳ ዩኒቨርስቲ ባዮሎጂ ት/ክፍል ገልያልናል።ስለሆነም ለምርምር ስራው በእናንተ በኩል አስፈላጊው ትብብር እንዲደረግላቸው እንጠይቃለን።

አንድም እናት መከላከል በሚቻል በወሊድ ምክንያት መሞት የለባትም!!

Hawaasi Quchumi Gashshooti Fayyimmate Biddishsha ★ ሀዋሳ ከተማ አስተዳደር ጤና መምሪያ ★

ግልባጭ፤

- ለመምሪያ ኃላፊ
  ሀዋሳ